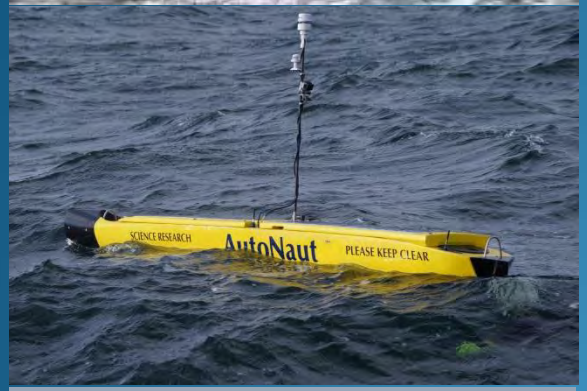
The Development of a UK Regulatory Framework for Marine Autonomous Systems [MAS] Drawing on Recent Practical Operational Experience and MAS Stakeholder Community Consensus

Mr James Fanshawe CBE, Chairman of the UK MASRWG [jamesf@most-av.com]

Mr Geraint West, Director of National Marine Facilities, National Oceanography Centre [gerw@noc.ac.uk]

Mr Roland Rogers, Advisor Marine law and Policy, National marine Facilities National Oceanography Centre [rxr@noc.ac.uk]



WHERE ARE WE NOW ?

Commercial

Scientific

Defence/Security

UK Marine Industries Alliance

The Maritime Autonomous Systems Regulatory Working Group (MASRWG) was formed to:

- identify the issues related to the **safe operation** of Maritime Autonomous Systems
- formulate a **regulatory framework** that could be adopted by the UK and other States as well as the international bodies charged with the responsibility to regulate the marine and maritime world.

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Origins of the MASRWG

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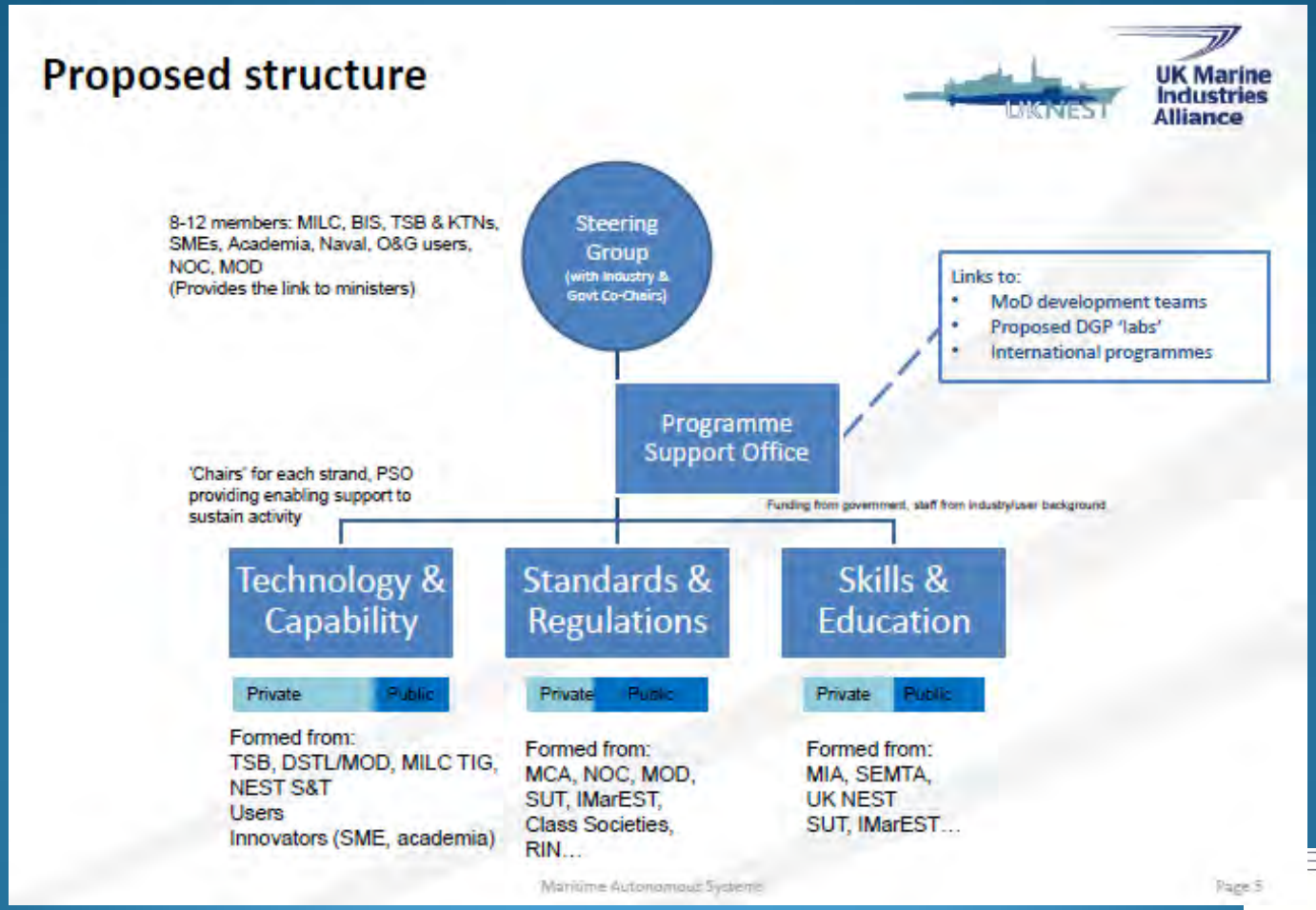
The Development of a UK Regulatory Framework for Marine Autonomous Systems

Origins of the MASRWG



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MASRWG – Governance

[1] BIS and DofT

[2] MILC

[3] UK MIA

[4] MASRWG

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MASRWG – Membership

- Marine Industry
- Offshore Industry
- Classification Society
- Operators
- Legal representatives
- Nautical Institute
- NOC
- Royal Institute of Navigation
- Royal Institution of Naval Architects

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MASRWG – Membership

- IET
- IMarEst
- Insurance
- Marine Federation
- Academia
- MCA
- MoD and Royal Navy
- BIS
- KTN

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MASRWG – Workstreams

- Legal
- Equivalence
- Standards, Training & Accreditation

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The regulatory framework will cover the following key aspects:

- Safety
- Environmental compliance
- Compliance with UNCLOS
- Compliance with other key maritime and marine conventions where identified.

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Using an 'equivalence' approach the MASRWG are reviewing the following themes:

- The IMO COLREGS
- Issues of ownership, registration and insurance
- Structural integrity with a view to developing a set of classification rules
- Requirements for additional training, accreditation and certification

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Scope

The work of the MASRWG will:

- Focus on Unmanned Surface Vehicles (USV).
- Will not include
  - Unmanned Underwater Vehicles (UUV)
  - Remotely Piloted Aircraft (RPA)/Unmanned Air Vehicles (UAV)

However, the MASRWG will report on the implications of co-ordinated MAS operations including UUV and RPA/UAV on the USV regulatory framework

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The Development of a UK Regulatory Framework for Marine Autonomous Systems

Aim

Engagement with national bodies [e.g. MCA, SUT, IAIN and IMarEST] and through them to international bodies and organisations as required, in the development of a regulatory framework for USV.

Particular activity will:

Identify the current regulatory landscape at national and international levels to include:

- Customary Practice
- International Conventions
- National Legislation
- Legal precedence through court cases

exploring where there is commonality and alignment in these sources of legislation that affect delivery of a UK MAS regulatory framework

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Aim [Continued]

Identify, evaluate and disseminate a **UK MAS regulatory framework** based on best practice at national and international levels;

Identify **barriers and challenges** to suggested improvements and areas of shared concern and formulate collective solutions to tackle these;

Provide a **forum** to discuss UK regulator involvement;

Examine **technical solutions** to support the regulatory requirements;

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Aim [Continued]

Assess the regulatory landscape and to undertake general horizon scanning to ensure that the planned MAS regulatory delivery is viewed within the wider context;

Recommend a UK approach for future regulation and provide a suitable evidence base to underpin this approach and in doing so create greater clarity around the benefits of better regulation; and

Recommend priority areas impacting on the regulatory environment for problem solving and making proposals for future government funding.

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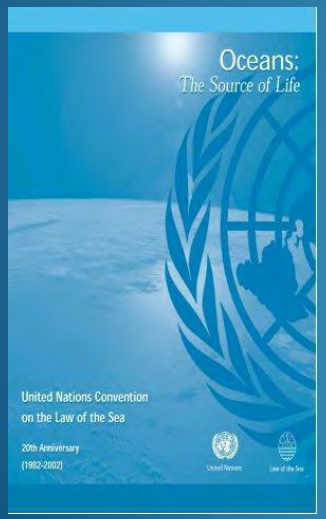
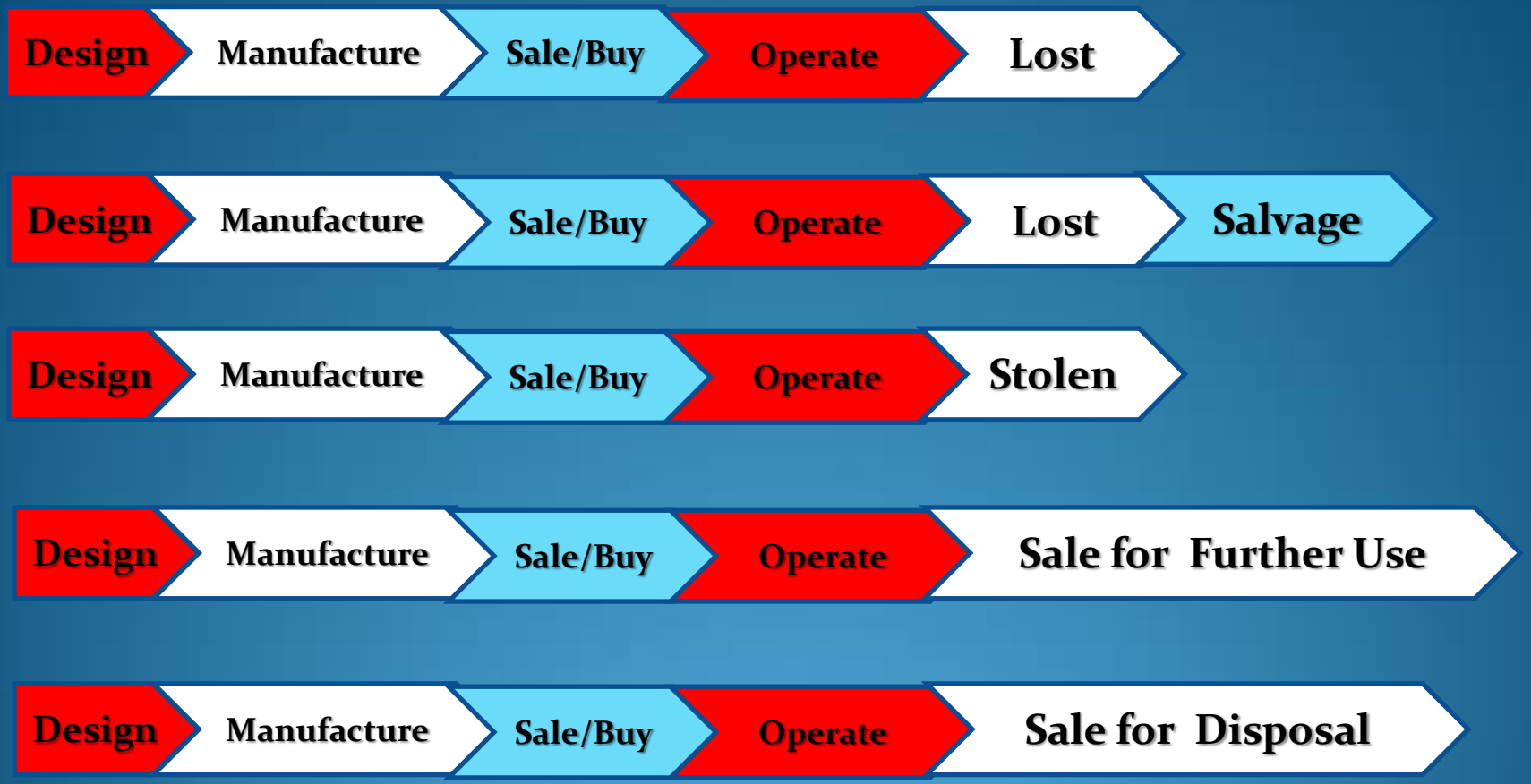
The Development of a UK Regulatory Framework for Marine Autonomous Systems

- Primary requirement of any maritime system is to be able to operate safely.
- What does this mean for autonomous maritime capabilities?
- Regulatory void – needs to be proportionate/affordable
- Certification and Verification will be key to Acceptance



The Development of a UK Regulatory Framework for Marine Autonomous Systems

'WHERE ARE WE NOW ?'



SIMPLE EXAMPLES OF MAS LIFE CYCLE SCENARIOS

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The Development of a UK Regulatory Framework for Marine Autonomous Systems

'WHERE ARE WE NOW ?'

Design

Lost

Manufacture

Salvage

Sale/Buy

Stolen

Operate

Sale for Further Use

Sale for Disposal

Some of these processes occur within an existing legal framework - or do they for MAS vessels?

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The Development of a UK Regulatory Framework for Marine Autonomous Systems

NERC SCIENCE OF THE ENVIRONMENT

National Oceanography Centre
NATURAL ENVIRONMENT RESEARCH COUNCIL

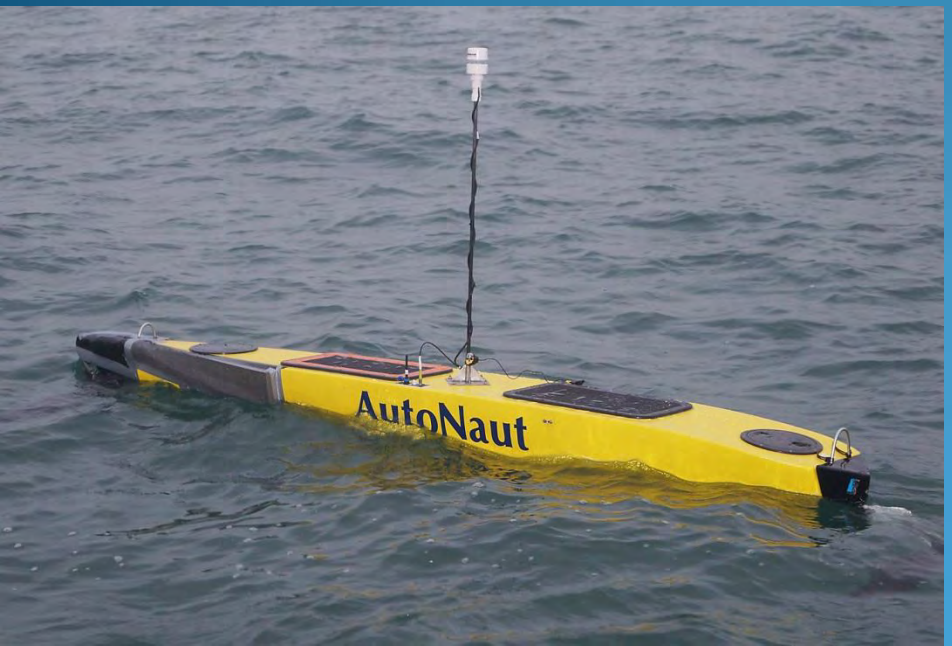
ROYAL NAVY · Cefas · PML Plymouth Marine Laboratory · University of Exeter · University of St Andrews · SA instrumentation · ASV unmanned marine systems · LIQUID ROBOTICS

Met Office · dstl · UEA University of East Anglia · Department for Environment Food & Rural Affairs · The Marine Biological Association · Isles of Scilly IFCA Inshore Fisheries and Conservation Authority · TELEDYNE WEBB RESEARCH Everywhereyoulook · AutoNaut watching over the oceans · RS AQUA · JS

MASSMO: aims and objectives

- Trial new USVs developed as part of SBRI (co-funded by NERC/NOC and DSTL)
- Share resources and expertise regarding MAS fleet operations in UK waters
- Collect acoustic, metocean and biological data with a range of MAS sensors
- Deploy towed acoustic array on a USV to measure oceanic 'noise' (DSTL co-funded)

MOST AV 'AutoNaut' GORDON



ASV 'C-Enduro' THOMAS

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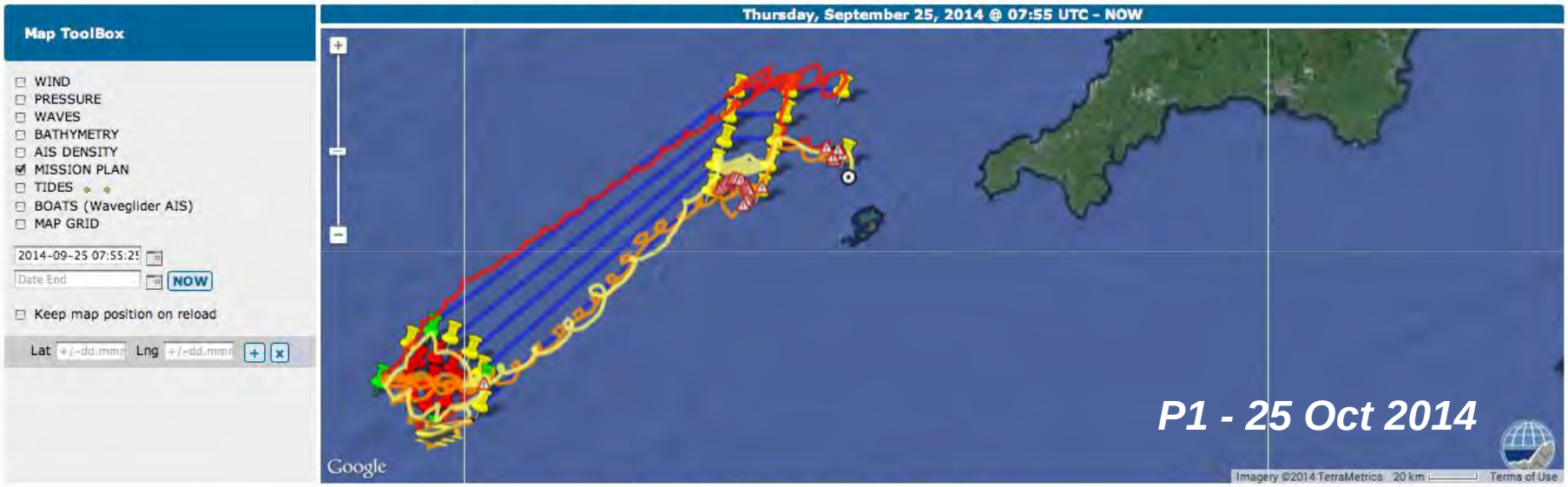
P1 - USVs and submarine gliders targeting oceanic fronts off southwest UK



Name & ID	Last Dive	Last Lat	Last Lng	Last Update	Last Comm	Status
= WAVEGLIDERS =						
Nocl 998	-	49 12.96 49.21600	-8 34.32 -8.57202	16 minutes ago 2014-10-25 06:38:25	Distance Over Ground: 339 Heading Desired: 294 Heading Skew: 0 Heading Sub: 301 Target Waypoint: 19 Temp Sub: 16 Total Power: 28491 Water Speed: 0	
= SLOCUMS =						
Churchill unit_398	THRMASS.MI unit_398-2014-278-1-493	49 14.63 49.24390	-8 33.74 -8.56233	59 minutes ago 2014-10-25 05:55:57	Surface Log	OK
Drake unit_400	- -	49 14.56 49.24270	-8 31.24 -8.52062	17 minutes ago 2014-10-25 06:37:43	Surface Log	OK

- 5 USVs + 2 submarine gliders, supported by Scilly IFCA RIB / RV Cefas Endeavour
- Satellite data from PML, metocean data from UK Met Office and Cefas Smartbuoy
- Vehicles traveled up to 400 km in a 12-day period reaching >150 km from land
- Winds >70 mph and waves >7 m high affected vehicles, oceanography and biology!
- Valuable test of platforms and operations (piloting, C&C, data management etc)

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The Development of a UK Regulatory Framework for Marine Autonomous Systems

P2 - test of new seabed receiver array and USV-based fish tracking off Plymouth

P2 - 5 Nov 2014

Mission MASSMO :: Glider Waimea (sv3026) :: WAVEGLIDERS

Map ToolBox

Monday, November 03, 2014 @ 09:27 UTC - NOW

Right-click on the map to trun the measuring tool on or off

Name & ID	Last Lat	Last Lng	Last Update	distanceOverGround	headingDesired	headingSkew	headingSub	targetWaypoint	tempSub	totalPower	waterSpeed
Waimea	50 21.80	-4 7.96	25 minutes ago	68	232	0	327	255	13		
	50.36340	-4.13273									

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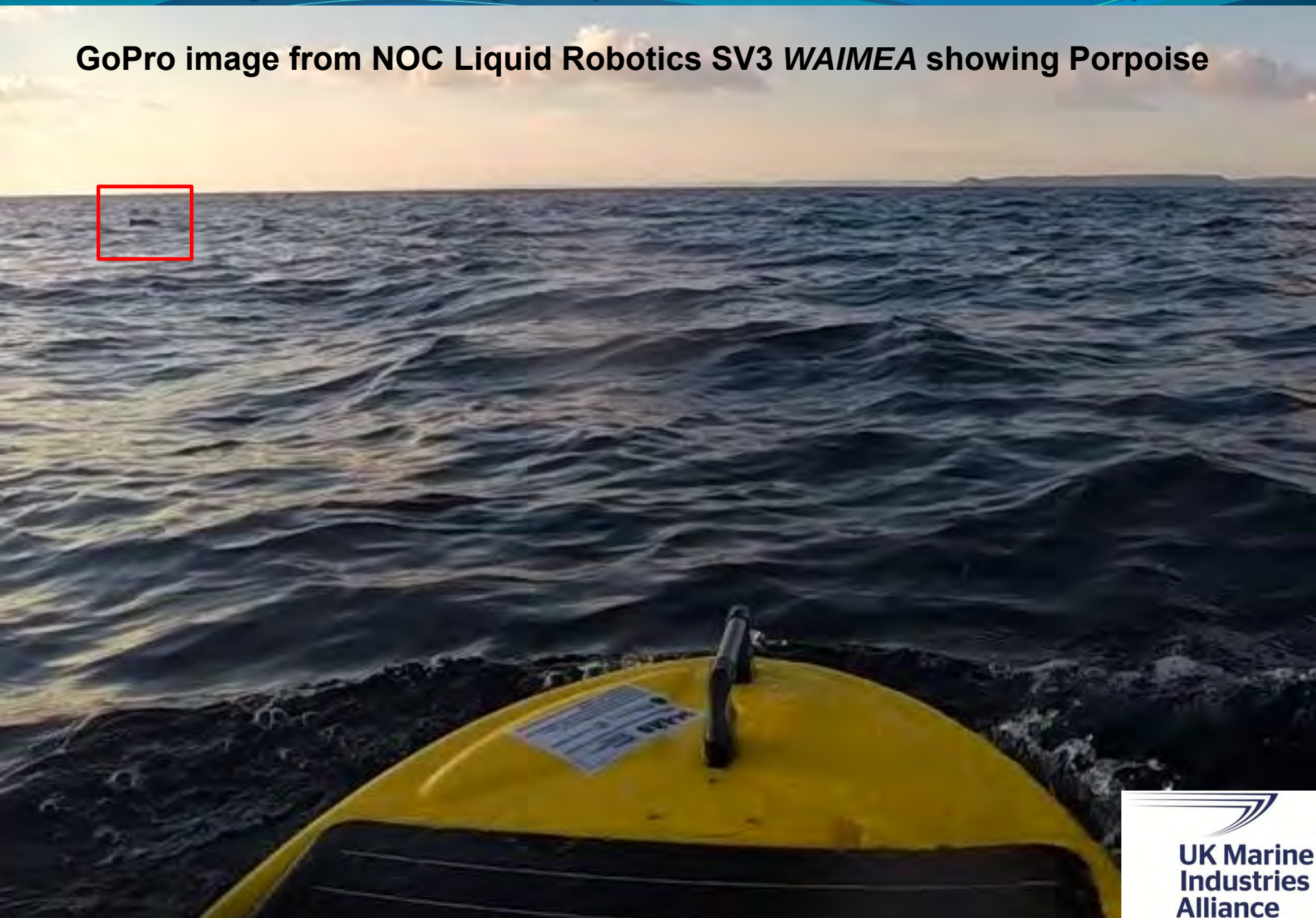
The Development of a UK Regulatory Framework for Marine Autonomous Systems

GoPro image from AutoNaut *Gordon* showing Northern Gannet and Narcine acoustic array

UK Marine Industries Alliance

GoPro image from NOC Liquid Robotics SV3 *WAIMEA* showing Porpoise



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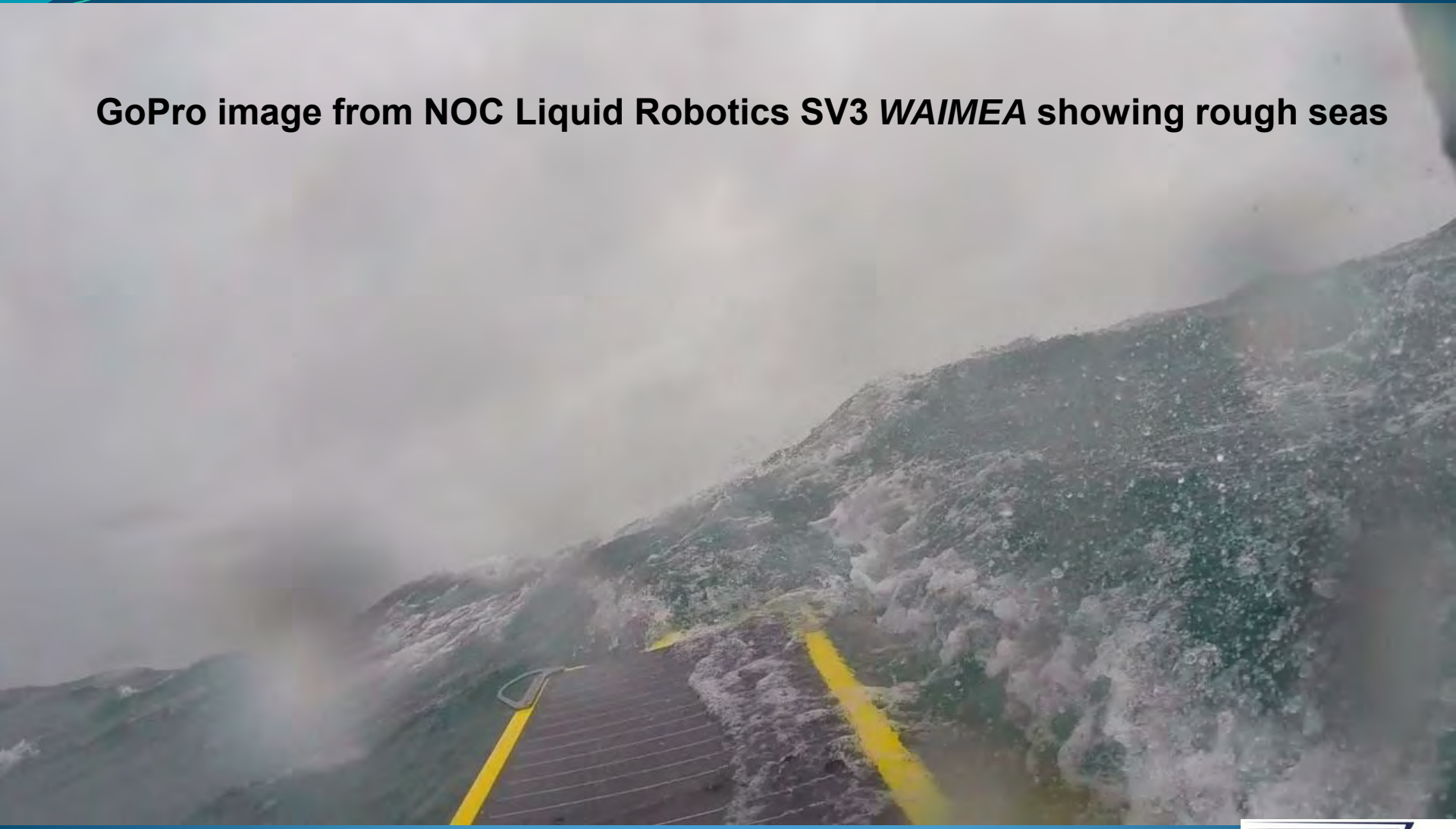
GoPro image from NOC Liquid Robotics SV3 *WAIMEA* showing rough seas



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AutoNaut
watching over the oceans

MOST (AV) Ltd Risk Assessment

AutoNaut 3.5m: Launching, Towing and Deployment/Retrieval; Operational Trials

Date: October 2014	Assessed by: D Maclean; M Poole	Activity/Location Launching, towing, deploying, retrieving AutoNaut 3.5m at Plymouth.

Work Activities	Hazards	No. at risk	Controls in place at present	Likelihood	Severity	Risk	Comments
Undertaking trials at sea	Sunburn; hypothermia	All trials personnel & visitors	Use of good quality and appropriate PPE. Warm, layered clothing and hat. Use of sunscreen on exposed skin.	1	2	L	MOST(AV) personnel will use company foul weather clothing and sunscreen. Visitors to provide own clothing.
Preparing launch on slipway	Slips & trips – cuts & fractures	MOST(AV) launch team x 3	Wear non-slip boots/waders and gloves as appropriate.	1	3	M	MOST(AV) team very experienced at launching AutoNaut from slipways.
Slipway environment	Drop-off from end/side of slipway	MOST(AV) launch team x 3	Slipway hazards to be identified and briefed to launch team.	1	1	L	
Embarking, onboard and disembarking support vessels	Slips & trips; vessel incidents	All trials personnel and visitors	All personnel briefed on hazards on pontoon before/after embarkation; vessel skippers to carry out full safety brief of all passengers before departure.	1	2	L	
Setting the tow alongside	Crushing / trapping of fingers or limbs; MOB.	MOST(AV) launch team	Clear and effective communication when setting up the tow between Launch team and tow vessel. Lifejackets to be worn at all times. Clear understanding by Launch Team and tow vessel regarding towing procedure to be adopted in the expected conditions.	2	2	M	Emergency blanket and one set of dry clothing & towel to be available in case of MOB.

MOST (Autonomous Vessels) Ltd, Unit A5, The Boatyard, Chichester Marina, Chichester PO20 7EJ

info@AutoNautUSV.com www.AutoNautUSV.com

MASSMO Legal Phase 1 and Phase 2

The Development of a UK Regulatory Framework for Marine Autonomous Systems

UK Marine Industries Alliance

The Development of a UK Regulatory Framework for Marine Autonomous Systems

DUCHY *of* CORNWALL
HARBOUR OFFICE ST MARY'S ISLES OF SCILLY TR21 0HU
Telephone: (01720) 422768 Email hm@stmarys-harbour.co.uk
Harbour Master: Dale Clark

LNtM No. 32/14

Marine Autonomous Systems in Support of Marine Observations (MASSMO) Experiment

Valid from: Tuesday 30th September

Mariners are advised that from Tuesday 30th Sept for approx. 1 week the National Oceanography Centre (NOC) will undertake an experiment with 7 unmanned vessels 6 of which will be launched from the Isles of Scilly.

It is proposed to tow the unmanned vessels (after launch from Porthloo slip) to an area to the West of the islands using the IFCA rib Matt Lethbridge where they will then be released and continue to a sea area approx. 100' to the West of Scilly.

When towing it is expected that the Matt Lethbridge will be travelling at approx. 2kts – please ensure that you keep well clear and keep your wash to a minimum as you pass.

For further information on the unmanned vessels' characteristics and details of what to do if you encounter/find one then please email NOC_MASSMO@noc.ac.uk or rxr@noc.ac.uk or by phoning UK Mobile: 07525770526

Local Notice to Mariners in force: 17/14, 18/14

Dale Clark
Harbour Master
St. Mary's Harbour
Isles of Scilly

Notice NOC2014-MASSMO – PHASE1

National Oceanography Centre
NATURAL ENVIRONMENT RESEARCH COUNCIL

Notice to Mariners

Isle of Scilly to South West Continental Shelf Edge

Marine Autonomous Systems in Support of Marine Observations [MASSMO] – Experiment

For the period: 011014 to 241014

In the sea area: 50N 009W,
49N 009W,
49N 011W,
48N 011W.

Eight [8] unmanned vessels will undertake an experimental programme sponsored by the National Oceanography Centre [Southampton], Cefas and Defra in the sea area detailed above.

Of which five [5] are unmanned surface vessels [see attached images] with the following characteristics:

- Bright Yellow superstructure
- SOA of less than 1.5 to 4 kts
- Fitted with active radar reflectors
- AIS
- Powered by a mixture of solar power, battery, wind turbine, wave power and /or carbon fuel cells
- They are less than 4.5 metres in length
- They are fitted with navigation lights commensurate with their length

Of which three [3] are unmanned underwater vessels [see attached images] with the following characteristics:

- Bright yellow bodies

MASSMO Legal Phase 1

UK Marine Industries Alliance

The Development of a UK Regulatory Framework for Marine Autonomous Systems

- SOA of less than 0.3 Kts while on the surface
- Less than 2.5 metres in length
- They are only at the surface periodically

All eight [8] are piloted remotely

Seven [7] will be launched form the Isle of Scilly

One [1] an unmanned surface vessel will be launched from St Ives.

PLEASE KEEP SHARP LOOK OUT FOR THESE VESSELS AND KEEP WELL CLEAR.

Further information can be obtained by:

E Mailing either: NOC_MASSMO@noc.ac.uk or rxr@noc.ac.uk or by

Phoning UK Mobile: 07525770526

Written enquiries on the content of this NTM can be made to:

Roland J Rogers - Advisor Marine Law and Policy

Room 341

National Marine Facilities Sea Systems

National Oceanography Centre,

European Way

Southampton

Hampshire

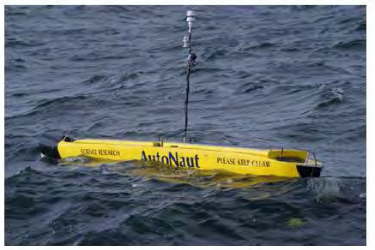
SO14 3ZH

United Kingdom

Notice NOC2014-MASSMO – PHASE1

UNMANNED SURFCAE VESSELS

ASV Ltd USV – C-Enduro - *Thomas*



MOST[AV] Ltd – AutoNaut - *Gordon*

Liquid Robotics SV2 x 1 and SV3 x 2

UNMANNED UNDERWATER VESSELS

Teledyne Gliders x 3

MASSMO Legal Phase 1

UK Marine Industries Alliance

The Development of a UK Regulatory Framework for Marine Autonomous Systems

Marine Management Organisation

Marine Licensing Team, Marine Management Organisation, Lancaster House, Hampshire Court, Newcastle upon Tyne, NE4 7YH
Tel: 0300 123 1032
Fax: 0191 376 2681
Email: exemptions@marinemanagement.org.uk

Notification of an exempt activity form

Marine and Coastal Access Act 2009
Marine Licensing (Exempted Activities) Order 2011
Marine Licensing (Exempted Activities) (Amendment) Order 2013

Please complete the form electronically, save it to your computer then email it to exemptions@marinemanagement.org.uk

Name	Roland Rogers
Address (including postcode)	National Oceanography Centre European Way Southampton SO14 3ZH
Telephone	023 80596314
Email address	rxr@noc.ac.uk

Activity details

MASSMO - MARINE AUTONOMOUS SYSTEMS IN SUPPORT OF MARINE OBSERVATIONS - PHASE 1

THE AIM OF THE MASSMO PROJECT IS ASSESS THE USEFULLNESS OF UNMANNED SYSTEMS IN UNDERTAKING SUSTAINED OBSERVATIONS IN SUPPORT OF THE UK'S DELIVERY AGAINST THE EU MSFD.

EIGHT [8] UNMANNED VESSELS WILL UNDERTAKE AN EXPERIMENTAL PROGRAMME SPONSORED BY THE NATIONAL OCEANOGRAPHY CENTRE SOUTHAMPTON UK AND SUPPORTED BY DEFRA AND CEFAS.

FIVE [5] ARE UNMANNED SURFACE VESSELS WITH CHARACTERISTICS: BRIGHT YELLOW, LESS THAN 4.5 METRES IN LENGTH AND FITTED WITH ACTIVE RADAR REFLECTORS, NAVIGATION LIGHTS COMMENSURATE WITH THEIR LENGTH AND AIS. THESE VESSELS EITHER HAVE SOLAR POWERED PROPULSION MOUNTED ABOVE OR BELOW DECK WITH SPEED APPROX 1.5-4.0KTS.

THREE [3] ARE UNMANNED UNDERWATER VESSELS WITH CHARACTERISTICS: BRIGHT YELLOW, LESS THAN 2.5 METRES IN LENGTH. ONLY AT SURFACE PERIODICALLY FOR DATA EXCHANGE.

THEY ARE PILOTED REMOTELY.

THE MCA HAVE BEEN INFORMED.

Location (include co-ordinates in WGS84 format)

IN THE SEA AREA 50N 009W, 49N 009W, 49N 011W, 48N 011W. THIS ACTIVITY WILL REMAIN INSIDE UK WATERS

Date and duration of the activity	1st October to 24th October
Exempted activity (please select)	17 Scientific instruments etc

Safety EGC Received 2014-10-01 07:13:18 UTC

```
LES 121 - MSG 22396 - NAV/METAREA Safety Call to Area: 2 - PosOk

LES21 Airbus DS 10.10.107.29  1-OCT-2014 07:12:15 606557
NAVAREA TWO 329/14
PAZENN
1. EXPERIMENTAL OPERATIONS IN PROGRESS UNTIL 24 OCT 14, USING FIVE
4.5 METRE UNMANNED, REMOTELY CONTROLLED SURFACE VESSELS AND THREE 2.5
METRE SUBSURFACE VESSELS. ALL ARE COLOURED YELLOW. SURFACE CRAFT
ARE FITTED WITH LIGHTS, RADAR REFLECTORS AND AIS. OPERATING AT A
MAXIMUM SPEED OF 4 KNOTS WITHIN AREA BOUNDED BY 50-00N 009-00W,
49-00N 009-00W, 48-00N 011-00W AND 49-00N 011-00W.
2. SHARP LOOKOUT AND WIDE BERTH REQUESTED.
3. CANCEL THIS MESSAGE 250100 UTC OCT 14.
```

Safety EGC Received

Safety EGC Received 2014-10-01 05:38:59 UTC

```
LES 102 - MSG 21641 - NAV/METAREA Safety Call to Area: 1 - PosOk

STRATOS CSAT 81.136.179.164  1-OCT-2014 05:38:08 036621
NAVAREA I 285
CELTIC SEA. Whittard Canyon to Cockburn Bank. Charts BA2649 (INT 1063) and
4013 (INT 103).
1. Experimental  operations between 01 and 24 Oct 14, using five 4.5 metre
unmanned, remotely controlled surface vessels and three 2.5 metre
subsurface vessels.  All are coloured yellow.  Surface craft are fitted
with lights, radar reflectors and AIS. Operating at a maximum speed of 4
knots within area bounded by 50-00N 009-00W, 49-00N 009-00W, 48-00N
011-00W and 49-00N 011-00W.
2. Sharp lookout and wide berth requested.
3. Cancel this message 250100 UTC Oct 14.
NNNN
```

Safety EGC Received

MASSMO Legal Phase 1

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The Development of a UK Regulatory Framework for Marine Autonomous Systems

marinescotland

Kingfisher Fortnightly Bulletin

SEAFISH
THE KINGFISHER INFORMATION SERVICE

Oil and Gas Oil and Gas Oil and Gas

Area 4 23 October 2014 | Issue 22

For 'live' Kingfisher updates of offshore activities, visit www.fishsafe.eu and follow @KingfisherInfo onTwitter

Seabed Activity First Published: 23 October 2014 | Latest Update: 23 October 2014

Plymouth – Deployment Operations

Fish Tracking Instruments deployed without topmarks at the following locations

50°11.160'N 004°14.520'W
50°18.060'N 004°09.540'W
50°14.280'N 004°05.640'W
50°16.800'N 003°58.320'W
50°14.820'N 003°55.800'W
50°11.160'N 003°57.660'W

Deployment Date: 13th October 2014 – Ongoing

For further information: Dr Stephen Cotterell, MBA UK, Tel: +44(0)1752 633207 email: stette@MBA.ac.uk
http://www.mba.ac.uk/simslab/research/

Seabed Activity First Published: 23 October 2014 | Latest Update: 23 October 2014

Plymouth – Deployment Operations

Passive Acoustic Fish Tracking by unmanned Surface Vessels

50°21.680'N 004°20.000'W (near The Brawn, West of Portwrinkle)
50°05.000'N 004°20.000'W (at sea)
50°05.000'N 003°50.000'W (at Sea)
50°13.320'N 003°50.000'W (near Soar Mill Cove (beach)).

Deployment Date: 20th October 2014 to 14th November

The USVs are between 2.5 and 4.5 meters in length, are painted bright yellow and piloted remotely. They are fitted with cameras, navigational lights, radar reflectors and AIS. They can operate up to a maximum of 4kts.

The National Oceanography Centre working together with the MBA would be grateful if shipping would keep clear of these marine scientific research vessels.

For further information: Dr Stephen Cotterell, MBA UK, Tel: +44(0)1752 633207 email: stette@MBA.ac.uk Roland Rogers,NOC, Tel: 07525770526 email: rxr@noc.ac.uk http://projects.noc.ac.uk/exploring-ocean-fronts/

UK Marine Industries Alliance

The Development of a UK Regulatory Framework for Marine Autonomous Systems

Plymouth Local Notices to Mariners (PLNTM)

Plymouth Local Notice to Mariners are issued by the Queen's Harbour Master Plymouth pursuant to the Dockyard Port of Plymouth Order 1999, Schedule 1 Regulation 1, Regulation 11 and Regulation 29. These Notices are numbered consecutively starting at the beginning of each year. They contain information fundamental to the safety of mariners.

QUEEN'S HARBOUR MASTER PLYMOUTH

LOCAL NOTICE TO MARINERS

No 40/14

PLYMOUTH SOUND - UNMANNED SURFACE RESEARCH VEHICLES

1. This notice is issued for information by the Queen's Harbour Master Plymouth pursuant to the Dockyard Port of Plymouth Order 1999.

2. Three unmanned surface vehicles up to 4m in length will be launched from Queen Anne Battery and will transit to outside the port limits to commence trials between 3 Nov and 14 Nov. Each vessel is fitted with AIS and navigation lights.

3. Whilst in port limits the unmanned surface vehicles will be towed and/or escorted by a controlling vessel until the craft are 1nm clear of the port limits.

4. Once clear of the port limits the vessels will conduct scientific data gathering. During this phase the vehicles will be autonomous, unmanned and remote operated within an area to the south of the port, approximately bounded by:

   50 21.5 N 4 20.00 W

   50 05.00 N 4 20.00 W

   50 05.00 N 3 50.00 W

   50 13.5 N 3 50.00 W

   During the trials the vessels will be monitored by operators based ashore.

5. Mariners are advised to remain a safe distance from the controlling vessel and unmanned vessels.

6. Cancel this PLNTM 14 Nov 14.

C Necker

Commander Royal Navy

Queen's Harbour Master

Mon 3rd Nov 2014

Longroom House

RM Stonehouse

Plymouth.

MASSMO Legal Phase 2

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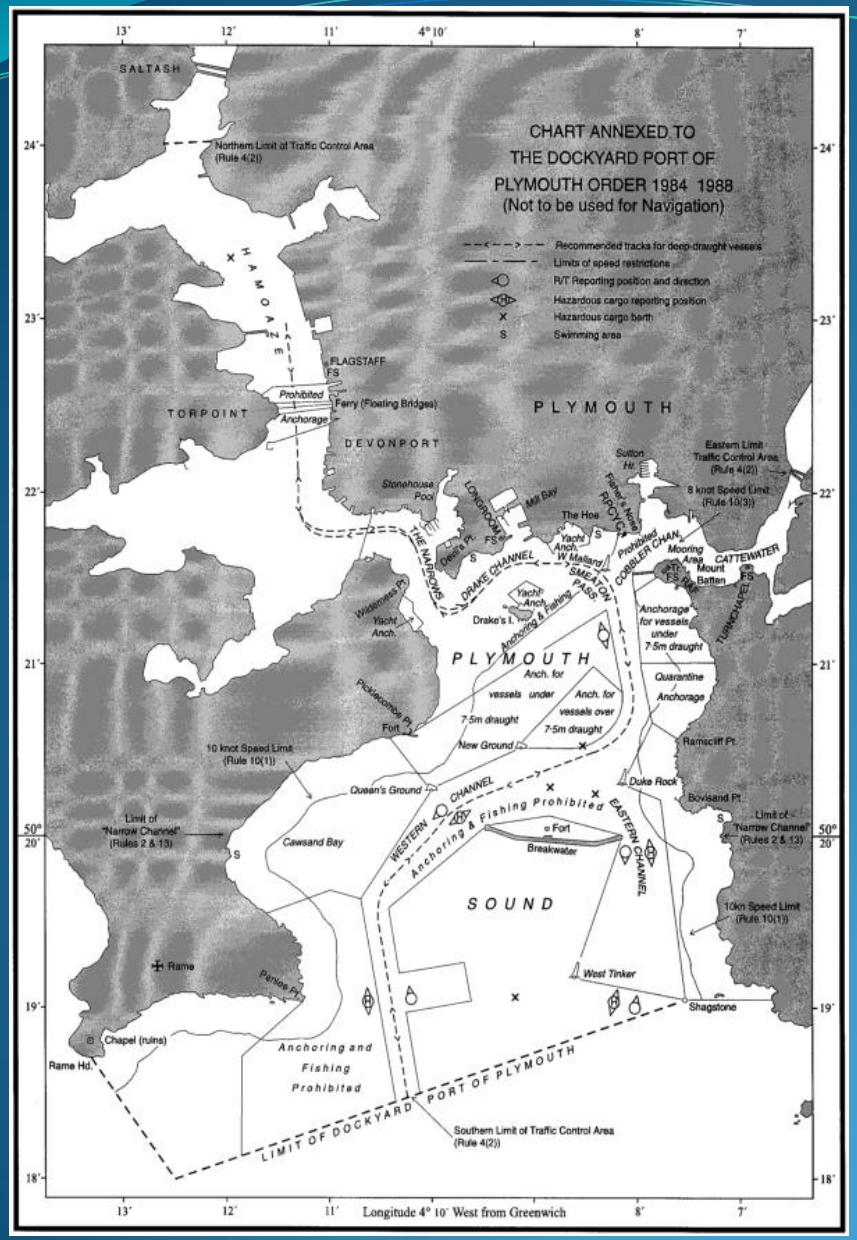

NON MAS Specific Legal Aspects

Fishing Licence

Permit to Tag Fish

Hydrographic Note for Sea Bed Acoustic Array

MASSMO Legal Phase 2

UK Marine Industries Alliance

The Development of a UK Regulatory Framework for Marine Autonomous Systems

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2 October 2014 Last updated at 18:01

Share

Big robot fleet takes to UK waters

By David Shukman
Science editor, BBC News

The BBC's David Shukman: "We are now entering a new era of almost constant observation of the oceans"

A fleet of marine robots is being launched in the largest deployment of its kind in British waters.

Unmanned boats and submarines will travel 500km (300 miles) across an area off the southwestern tip of the UK.

The aim is to test new technologies and to map marine life in a key fishing ground.

In total, seven autonomous machines are being released in a trial heralded as a new era of robotic research at sea.

Two of the craft are innovative British devices that are designed to operate for months using renewable sources of power including wind and wave energy.

The project, led by the **National Oceanography Centre**, involves more than a dozen research centres and specialist companies.

Chief scientist Dr Russell Wynn told BBC News: "This is the first time we've deployed this range of vehicles carrying all these instruments.

Related Stories

- Deep-sea sub 'implodes' 10km-down
- Electric fish inspire agile robots
- UK sub surveys deep ocean floor

Drones of the de

Marine robots come i
and sizes, and no few

THE INDEPENDENT TUESDAY 14 OCTOBER 2014

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New underwater robots set to revolutionise marine science

National Oceanography Centre launches ambitious new project

CHRIS GREEN | Tuesday 07 October 2014

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A fleet of seven aquatic robots has been launched into the ocean off the south west of England, ushering in a new era of marine research carried out by unmanned vehicles.

The project, led by marine researchers [illegible] National Oceanography Centre Southampton, is the most [illegible] of its kind in Europe. The selection of crafts will travel 300 miles

Ads by Google

track, report, 250,000+

PEOPLE

MASSMO media coverage

UK Marine Industries Alliance

MASSMO: summary

- *Successful sharing of resources and expertise for UK MAS deployments*
- *Proof-of-concept demonstrated for new USVs and submarine gliders*
- *Acoustic array towed for 400 km from USV; GoPro camera images obtained*
- *Piloting of USVs dependent on weather conditions (platform specific)*
- *Further joint MAS trials planned for 2015/16 in UK waters*
- *Appear to be no legal impediment to operating in UK waters*

UK Marine Industries Alliance

Next Steps

Codes of practice – ongoing development by operators and manufacturers

- **Cover aspects such as product safety (design & build), HS&E compliance, operational use, training and education**

Engagement with Regulatory Authorities

- **IMO Information paper to MSC95**
- **MCA representation within the RWG**

Continuing engagement with other maritime users

UK Marine Industries Alliance