

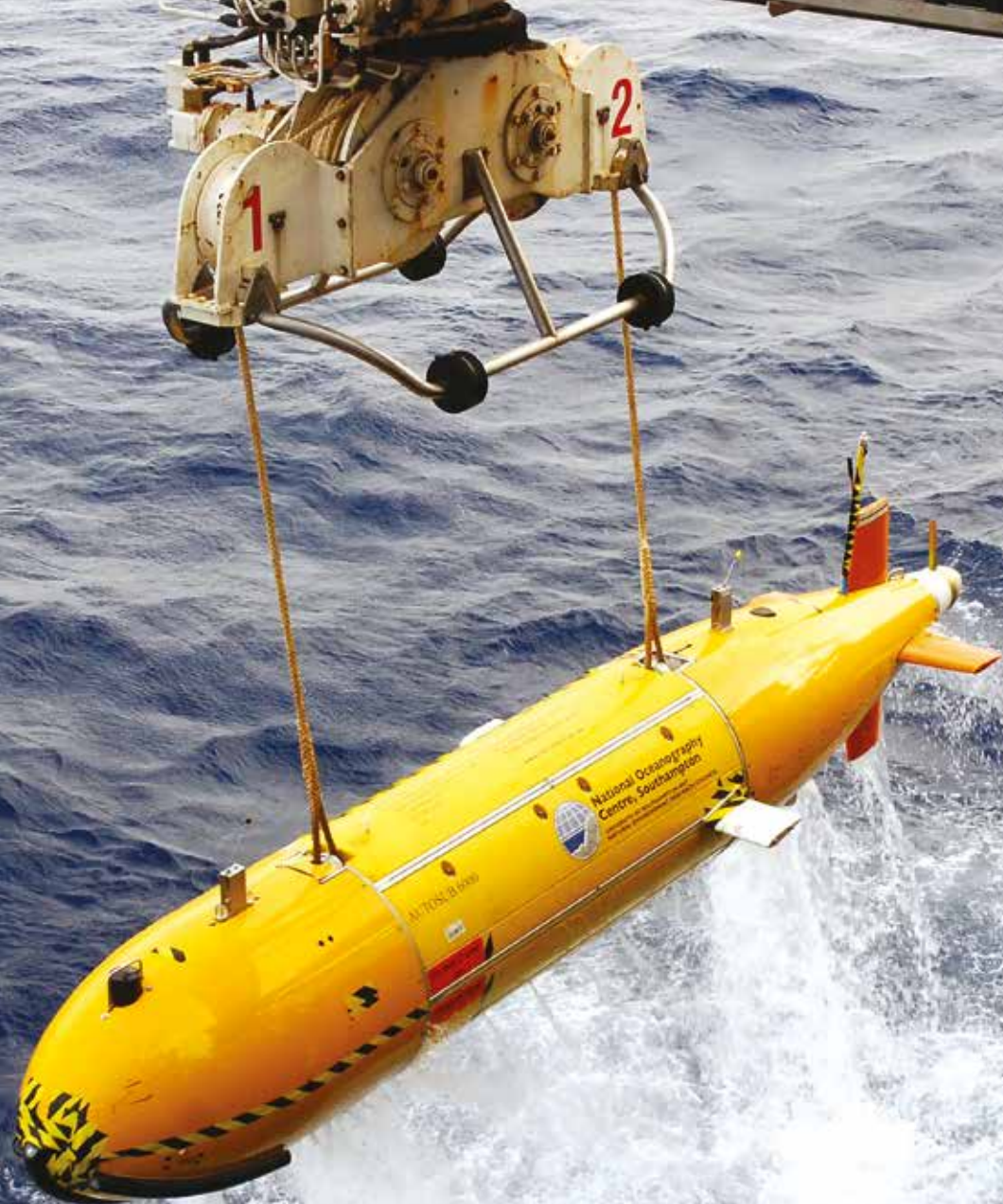
MARINE ROBOTICS INNOVATION CENTRE

WHERE SCIENCE MEETS BUSINESS



**National
Oceanography Centre**
NATURAL ENVIRONMENT RESEARCH COUNCIL

NERC SCIENCE OF THE
ENVIRONMENT



Introducing the Marine Robotics Innovation Centre

As part of the Department of Business, Energy and Industrial Strategy (BEIS) 'Eight Great Technologies' initiative, the National Oceanography Centre (NOC) has invested over £3m in the development of the Marine Robotics Innovation Centre. The centre provides a collaborative space, linked to specialist engineering and test facilities to enhance cooperation between academia and SMEs for the advancement of autonomous technologies and business growth.

The NOC has an established operational and developmental Marine and Robotics Facility and over the last decade has seen significant advances in marine autonomous and robotic systems.

In particular with the advent of Autonomous Underwater Vehicles (AUVs), they are now being used

widely in the scientific, commercial and defence environments.

AUVs have proved their worth collecting scientific data from across the oceans. Only recently Unmanned Surface Vehicles (USVs) have begun to be adopted by the marine science community and trials are being conducted to exploit their capabilities and sensors suites.

Marine Autonomous Systems are exciting new technical developments that have the potential to replace shipping for subsea inspection and other 'dull, dirty or dangerous' offshore applications. In a rapidly expanding global market currently estimated to be worth £9bn, UK companies have established a credible lead, and the Marine Robotics Innovation Centre at the NOC will help stimulate further economic developments for these and overseas companies looking to establish a footprint in Europe.





The Vision

Incorporating specialist engineering and test facilities and modern office space, the centre provides a nurturing environment for collaborative engagement and development.

The centre hosts a community of innovative companies developing technology for platforms, components and sub-systems in order to develop the next generation of marine autonomous and robotics systems.

This community shares specialist facilities with the NOC's Marine Autonomous and Robotics Systems team who have extensive experience of the deployment of marine autonomous platforms in the ocean's most challenging environments, including extensive missions under ice and to the depths of the Cayman Trough.

The promotion of supporting R&D funds and support from regional, national and international sources will help to share the risk of developments and optimise the chances of successfully commercialising the new technologies and systems that are developed.

The NOC's extensive relationships with future end-users of marine autonomy in defence, oil & gas, offshore renewables and other emerging offshore sectors, will help to shape technical development towards emerging requirements.

The NOC will also continue to engage with the UK Maritime Industries Alliance and the Marine Autonomous Systems Regulatory Working Group to promote wider use of autonomous systems to the seafaring community and acceptability to the public at large.

A new centre built on solid foundations

The NOC has an extensive track record of supporting marine autonomy companies to bring about new technological developments.

Long Endurance Marine Unmanned Surface Vehicle competition

With a brief to develop an Unmanned Surface Vehicle with a 90 day endurance capability and the ability to sprint if required at 10kt over 100NM, six £50k concept studies were awarded in 2012. The studies were later down-selected to platforms designed by ASV and MOST Ltd, each leading to the production of new vehicles now both competing in the global market.

Autonomous Adaptive Ocean Sensing Networks

With a supporting budget of £1.5m split into two phases looking at feasibility and then prototype development, the aim of this project is to assess and develop, novel Adaptive Autonomous Ocean Sampling Network (AAOSN) management systems capable of coordinating a suite of marine autonomous systems.

Autosub Battery Technology

Over a number of years the NOC has developed a pressure tolerant lithium polymer battery as part of the Autosub 6000 development. MSubs Ltd, a supplier of manned and unmanned underwater submersibles for both military and commercial users has signed an exclusive licence agreement with the NOC, to market this technology.

Sensors on Gliders

The NOC has been working in partnership with Kongsberg to integrate NOC developed Lab-on-chip nutrient sensors into the Seaglider product. This partnership has enabled Kongsberg to demonstrate Seaglider's ability to be used flexibly with the next generation of sensor technology, not yet on the market.

Carbon Capture and Storage Monitoring System

The NOC is a partner on a £1m project to develop a monitoring system incorporating marine robotics to ensure the integrity of carbon capture and storage sites below the seabed. Fugro GEOS Ltd and Sonardyne lead the project, other partners include British Geological Survey, University of Southampton and Plymouth Marine Laboratory. The project is funded by the Energy Technology Institute.



In good company

In 2015 the NOC collaborated with three consortia to secure funding from Innovate UK. The following projects are currently underway at the centre:



Pressure Tolerant Lithium Sulfur Battery

The need to collect more data from the marine environment means that Marine Autonomous Systems need to be at sea for longer, requiring more power. Supported by Innovate UK and DSTL, Steatite Ltd, OXIS Energy Ltd, MSubs Ltd and the NOC are collaborating to develop a solution to this problem. As part of this Steatite Ltd led project, the NOC will be sharing expertise on providing power to AUV's at depth.

Autonomous Surface / Sub-surface Survey System

This project will see the NOC's Autosub Long Range work with ASV's C-Enduro Unmanned Surface Vehicle to develop a low cost, integrated, shore based method of surveying the full water column. Success in this project, which also includes Sonardyne and SeeByte, will enable long term, low-cost survey and monitoring operations for a range of applications.

These include offshore energy, deep sea mining prospecting and pipeline surveys for offshore industries.

Launch and recovery of multiple Autonomous Underwater Vehicles from an Unmanned Surface Vehicle

The NOC has contributed expertise in developing Autosub technology as part of a project to launch and recover multiple AUVs from an USV, led by Planet Ocean Ltd. Launched in 2017, ecoSUB's are a fleet of small, low cost AUV's designed for multiple applications including; defence, oil spill monitoring and science.

The next step of this project will be to develop a system of launching and recovering these AUVs from an Unmanned Surface Vehicle. This will reduce the dependence of the user on the availability of research ships, which can be expensive. This system will have applications in scientific discovery, the defence sector, and oil spill monitoring.

Bringing ideas to life...

The centre has workshop facilities suitable for building prototype autonomous and robotic vehicles.

Glider workshop

- Work benches for four gliders
- Half tonne overhead gantry
- Ceiling mounted power
- Cupboards/lockable storage

Large vehicle workshop

- 10 tonne overhead gantry
- Roller doors to dockside access

Hanger workshop

- 5 tonne overhead gantry
 - 3D prototyping
 - Laser cutting
-







...and putting them to the test

The centre also offers test facilities for the development, maintenance and operational support for all types of marine autonomous vehicles.

- Freshwater and saltwater ballasting tanks
- Environmental test chamber with shaker
- Pressure testing chambers
- Salt spray test chamber
- Co-ordinate Measuring Machine Room
- Battery testing facility
- Calibration Laboratory
- Communication aerial mast
- Waterfront launching capability

Other specialist testing and workshop facilities are available to access on the University of Southampton's Boldrewood Innovation Campus:

- Rapid prototyping
- Towing tank
- Wind tunnels



Watch the operations unfold

Our dedicated Operations Room allows partners to remotely co-ordinate and pilot fleets of MAS anywhere in the world.

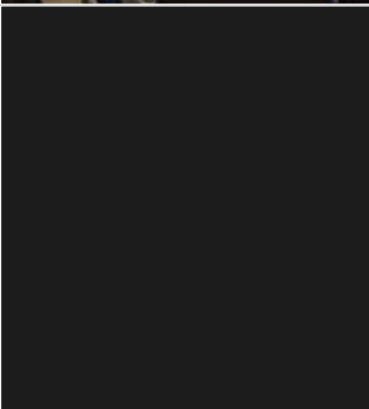
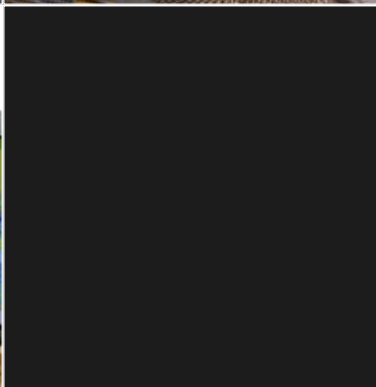
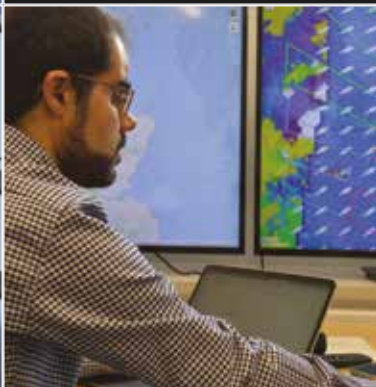
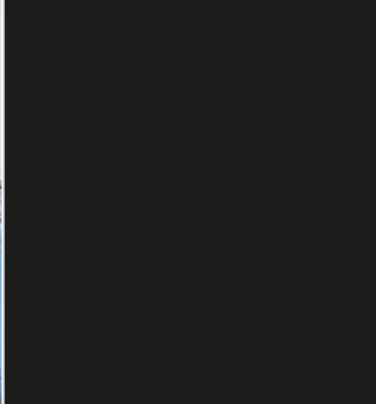
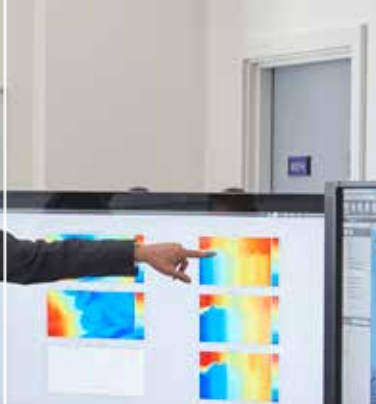
Incoming data received via satellite from surface and submarine platforms can be viewed and analysed, combined with satellite remote sensing, weather / shipping data and ocean modelling to provide a fully three-dimensional, real-time picture of the marine environment. Recent operations have included the largest simultaneous deployment of MAS in UK waters.

Key features:

- Configurable 36sqm
- Multiple monitors
- Wifi and teleconferencing facilities

“Integrating a mass demonstration of autonomous technologies alongside a major military exercise was no small undertaking. (NOC) support before and during the event was pivotal to its success and has been recognised at the highest levels of UK Defence”

Commodore James Morley, Royal Navy



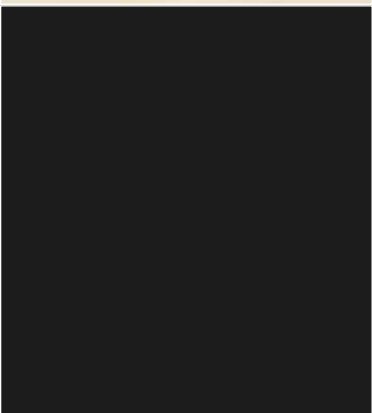
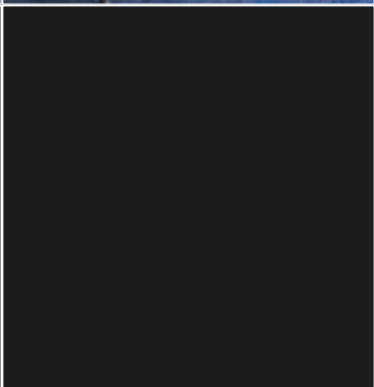
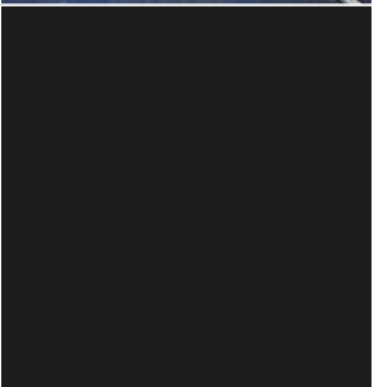
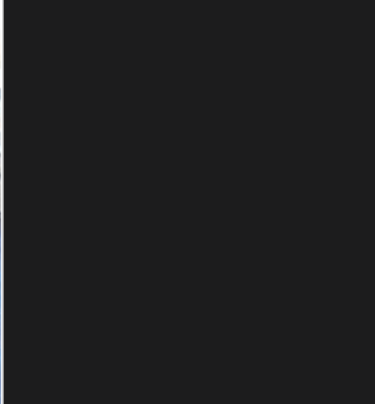
A space to work...

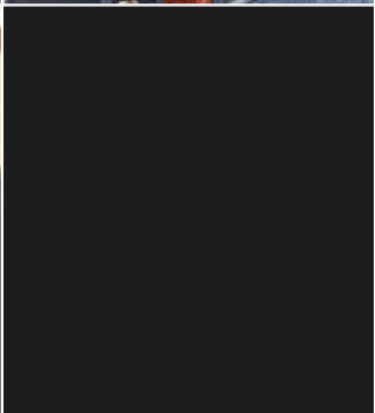
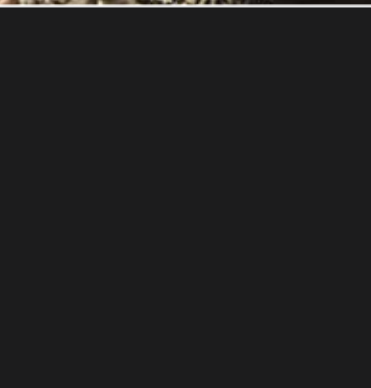
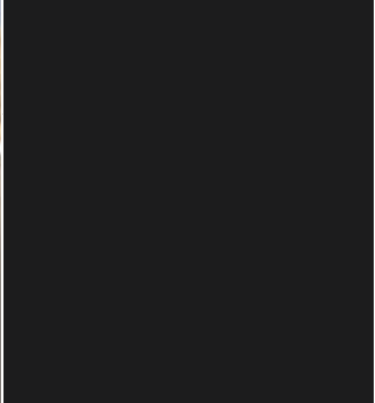
The centre comprises a large open plan office area as well as smaller enclosed spaces for those working on commercially sensitive projects.

The NOC's own Marine Autonomous and Robotics Systems team are based in the centre within the open plan office and in an office on the same floor.

Key features:

- 317sqm open plan office
 - Large desks with lockable pedestal
 - Lockable storage
 - Whiteboards and Screens
 - IT support
 - Fully serviced offices and lab spaces
(includes utilities, insurance and waste management)
 - Centre Manager & Administrative support
 - Parking
 - Wi-Fi Internet access
 - Staffed reception, post, fax handling and printing facility
 - Controlled access and security
 - Secure cycle storage and changing facilities
-





...and a place to meet

The kitchen and meeting area allows for informal ideas sharing and can also be transformed to hold formal meetings and presentations.

Four private meeting pods separate the meeting space from the desk space and three fully equipped meeting rooms are available.

Key features:

- Three meeting rooms with Video Conferencing and AV equipment available - 24sqm, 13sqm and 14sqm
- Sound minimising meeting pods
- Regular programme of networking and workshop events
- Kitchen with dishwasher, instant hot water tap and microwave

Right in the heart of the National Oceanography Centre

The National Oceanography Centre in Southampton is the largest of the two NOC sites. Around 450 staff work at the centre, alongside students and staff from the University of Southampton and other regional offices of UK marine based organisations. Innovation Centre residents can access the building's canteen and the National Oceanographic Library. Also based on site is the British Ocean Sediment Core Research Facility and the British Oceanographic Data Centre.

Location

The centre is located in the heart of the Solent region, thriving with marine based business and within the boundary of one of the UK's busiest ports. Southampton benefits from excellent transport links with an international airport just 5 miles away, regular trains to London Waterloo taking just over an hour and close proximity to the M3 and M27 Motorways. The Unilink U1 bus runs from Southampton Airport Parkway to the NOC via Southampton Central Station up to every 10 minutes.

1 Southampton

- Southampton airport
- Central station
- Airport parkway station

2 London

- Waterloo station
- Gatwick airport
- Heathrow airport

3 Liverpool

- Lime Street station
 - John Lennon airport
-





Partner Membership

Through partnership with the Innovation Centre your company can gain access to the wealth of knowledge and expertise of scientists and engineers based at the NOC.

Partnerships are available for small to medium enterprises looking to take physical space in the centre to enable collaborative working with innovative companies and the development of power capabilities, sensors, communications and autonomous platform technologies.



Associate Membership

Organisations wishing to benefit from the NOCs extensive knowledge in the development of marine autonomous and robotic systems, without a constant presence in the centre can still do so.



The centre benefits from supporters across a range of sectors with an interest in marine technology.

Benefits of Associate Membership are:

- Opportunity for early sight of and influence over technological development in your industry
- Branding presence
- Access to engage with partners
- Participation in event programme
- Hot desk
- Inclusion in newsletter circulation
- Access to testing facilities at commercial rates





Contact

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An underwater photograph showing sunlight rays (Tyndall effect) filtering down from the surface, creating a dramatic blue and white pattern against the dark water.

NOC.AC.UK/INNOVATIONCENTRE