

National Oceanography Centre
Opening Address Marine Autonomy Technology Showcase (MATS)
12 November 2019, Southampton
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Welcome

1. I would like to welcome you to the National Oceanography Centre for this the 5th Marine Autonomy and Technology Showcase.

Decade of Ocean Science

2. As we look forward Decade of Ocean Science for Sustainable Development 2021-2030 with its vision of transformative activities to undertake the “Science [& technology] we need for the future we want”
3. What better place to start than some of the transformative, disruptive technologies that will change our knowledge and understanding of the ocean over the next decade. The future we want is characterised by:
 - **A healthy and resilient ocean - ecosystems** mapped, protected, multiple impacts measured reduced ecosystem services maintained
 - **A predicted ocean - society has capacity to understand current and future ocean conditions**, forecast their change and impact on human wellbeing and livelihoods
 - **A safe ocean - human communities protected from ocean hazards and safety of operations at sea and on the coast is ensured**
 - **A sustainably harvested and productive ocean - ensuring the provision of food supply and alternative livelihoods**
 - **A [data] transparent and accessible ocean - all nations, stakeholders citizens have access to ocean data information**, technologies have capacities to inform their decisions

Objective 4: To enhance ocean observing networks, data systems and other infrastructure, and their supporting cooperation and partnerships to service the demands of all nations by 2030;

MATS conference 2019 at Southampton

4. It is encouraging to hear about the increased abstract submissions, delegate numbers (over 260) and growing exhibits. Not only would it suggest that we are putting on an event that people consider important to the combined marine science and industrial communities but it also demonstrates that there is a growing interest in the marine technologies.

5. The way this year's conference has been themed was intentionally designed to encourage anyone with a stake in marine technologies to take an interest and become involved.
6. This year MATS will take you through the stages of consideration when deploying marine autonomous technologies.
 - We start with a user with an identified application or need
 - Next, we'll look at planning and controlling the mission before moving on to understanding the vehicle that will deliver the mission for the user.
 - And then, we'll consider the eyes, ears, nose and hand of the vehicle that are the sensors, cameras and manipulators that will be used to gather data for the user
 - before finally taking the data from the vehicle and converting it into an exploitable piece of information for the user.
7. Across the three days of the conference, you will see
 - a number of presentations delivered from scientists and engineers at the NOC.
 - You'll also see a number of presentations from industry partners that will reference working with the NOC.
8. It is only through this collaborative approach that we can continue to push the boundaries of the technology to achieve more for the scientific or industrial end user.

NOC Independence

9. On 1 November, NOC finally secured its status as an independent organisation. As a charitable organisation our purpose is advancement of knowledge and understanding of the ocean and associated education and training. Almost all major advances in ocean science have been enabled by technology and the innovation of continuous distributed presence in the ocean enabled by autonomous technologies is no exception – indeed it will transform the way ocean science is done over the next Decade.
10. That is why technology innovation will always be a key part of the mission of NOC along with the partnerships necessary to turn concepts into workable systems – for the benefit of science and the wider benefit of all those who operate in the ocean realm – to improve the efficiency, cost effectiveness, safety, and environmental sustainability of key marine operations.
11. We believe our freedom as an independent organisation will greatly improve our ability to develop new partnerships to develop and exploit these technologies. This is why we have formed a trading subsidiary NOC Innovations Ltd to support this work

12. This year (2019) has seen some important developments in MAS technologies and I would like to give you a few highlights

Developments in 2019: Oceanids capital

13. The Oceanids capital investment programme has seen new platforms, sensors and control systems developed for MAS. Through the £15m invested in MAS by the NERC, the NOC is at the forefront of the evolution of develops that will push this technology forward.
- We now have six operational ALR vehicles including three 1500m rated vehicles and three 6000m rated, including the now famous 'Boaty McBoatface'.
 - We have been working collaboratively with industry partners such as Sonardyne and Nortek to deliver increased navigation capabilities enabling longer-range missions.
14. Throughout 2019, the Marine Autonomous and Robotics Systems Facility (MARS) engineers at NOC have been working on the design for the 2000m depth-rated AUV for under ice operations, Autosub2KUI and as we move into 2020 we will see the vehicle assembly and first trials (full A2KUI presentation by Matt Kingsland on day 2).
15. The Oceanids investment has also seen ~£5m focused on the development of the next generation of miniaturised, low-power sensors for integration into MAS platforms. This investment is already paying dividends as we have seen new sensors integrated into the ALR vehicles for projects such as AutoNut[e]s that uses colourimetrics to sample nutrients in the ocean. There will be a number of presentations from NOC's Sensor Development team on days 2 and 3 of this year's conference. We've also worked to integrate the University of Southampton's BIOCAM into Autosub6000 which was successfully deployed on the Darwin mounds in Sept. Blair Thornton from UoS will be presenting on BioCam this week.
16. A truly ground-breaking element of the Oceanids programme has been our work on control systems. Our Command and Control system for our long range fleet of MAS and our on board control systems have improved the interoperability of MAS platforms, allows for more simplified piloting of assets and easier and faster development, including the integration of new payloads, a higher degree of autonomy and situational awareness and reduces costs and time for vehicle preparation.

Developments in 2019: The NOC has been expanding its partner network

17. At around the same time as MATS 2018 was happening a consortium including the NOC was successful in an application for funding from Innovate UK under their Robotics and AI in extreme environments call.
18. The Autonomous Aquatic Inspection and Intervention (**A2 I2**) project sees the NOC MARS team working with a new grouping of partners, including lead partner ROVCO, Forth Engineering, University of Manchester, DRisQ and Thales, to develop two AUVs. One vehicle will meet the requirements of the offshore industry

and one will be designed to operate in wet nuclear storage ponds for inspections and interactions. There will be a presentation later today from ROVCO that explores the use cases for this project.

19. Traditionally the NOC has focused in technology innovations when it comes to Marine Autonomy, however, throughout 2019 the NOC has also been involved with an MCA and DfT led programme called MARLab (Marine Autonomous Regulation Lab). This project focuses on exploring opening UK waters to MAS testing by reducing regulatory uncertainty and providing regulatory guidance, important work as MAS become more prevalent in the ocean.

Developments in 2019: Working with existing partners in the UK and Europe

20. Those of you that have attended previous MATS events will be familiar with the ecoSUB story, a collaborative project between the NOC and a number of partners led by Planet Ocean. This year, working with Newcastle University ecoSUB has taken a further step and we've seen deployments of multiple vehicles communicating in a network – you'll hear more about that one in a presentation on Wednesday from our colleagues at Planet Ocean.
21. The NOC continues to engage on EU projects, including the demonstration of the BRIDGES deep-glider which happened this summer and we have ongoing collaborations with EU marine Robotics.
22. We've also continued our relationship with Dstl and the Royal Navy working with multiple partners on a number of projects under the Progeny Framework including looking at the deployment of Gliders Under Ice. The most recent of which will see the NOC maintain and operate the RN's underwater glider capability. This Friday, following MATS the NOC will be hosting the UK Glider Community Workshop.

Developments in 2019: Using MAS in to support developing nations

23. This year has also seen two projects utilise MAS in demonstrator programmes for developing nations.
24. The SOLSTICE-Western Indian Ocean project was aimed at demonstrating how marine autonomous systems can be used in the West Indian Ocean to help nations like Tanzania, Kenya and South Africa to understand their marine habitats. Teams of NOC scientists and engineers have been working with researchers and communities in Africa to build an understanding of the capability that these systems can provide. This summer saw deployments of gliders in the West Indian Ocean, in a joint mission between the NOC and the Tanzanian Institute of Marine Sciences.
25. We have also had deployments of our CAMEL system in Belize. CAMEL is a Containerise Autonomous Marine Environmental Lab that includes an Unmanned Surface Vehicle, a small ROV and a small AUV. This project is aimed at demonstrating that it is possible to replicate the survey capability of a region class research/survey vessel in a cost effective way. The CAMEL team returned from deployment last week and you'll see a presentation from Sarah Cryer after lunch today.

The UKRI large infrastructure roadmap

26. On 6 November UKRI published its large research infrastructure roadmap – a vision to 2030 and which paints a promising future for autonomous technologies with explicit reference to marine autonomous systems.

27. Under Environment it foresees “Sentinels of change” – structures focused on global change such as fleets of underwater autonomous vehicles

Conclusion

28. Once again, I would like to extend my warmest welcome to NOC in Southampton and to MATS where I trust you will see not only exiting developments in the technology but an expansion in the use cases which I believe will increasingly demonstrate
 - how MAS technology makes a difference in real situations
 - grow confidence in the technology
 - engage users from right across the maritime sector from science and industry and to share in their experiences of this innovative, exciting and disruptive technology