



KONGSBERG



May 2016

## INNOVATIVE MARITIME COMMUNICATIONS SOLUTION PUT TO TEST

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In complex marine operations, every member of the team has to deliver if success is to be achieved. But individual performance on each player's part is not enough. If they don't communicate, they aren't a team.

That becomes even more critical when the 'players' are not human, but autonomous vehicles – in the air, on, and under the sea.

Kongsberg Maritime recently participated in a highly unusual, and equally intriguing, exercise in the fjord just outside Trondheim, Norway, (the home base of Kongsberg Seatex). Four autonomous units – an UAV (Unmanned Aerial Vehicle), and USV (Unmanned Surface Vessel), an AUV (Autonomous Underwater Vehicle), and

a tethered relay balloon – were guided from a mother ship in various tasks requiring precise coordination from the command centre, and with each other. KONGSBERG provided the one central element without which the operation would not have been possible: communication.

The exercise, going under the title of Autonomous Network of Heterogeneous Vehicles (ANOHV), had multiple goals, including demonstrating AUV operations using a multi-vehicle, multi-platform network, but also to demonstrate integrated operations using high bandwidth communication between all nodes in the network.

The bandwidth was provided by KONGSBERG's Maritime Broadband Radio. Marketed as MBR, it is an easy-to-use, flexible and robust means of transferring large amounts of data over long distances, even in the most challenging of conditions. Various MBR units were installed on all participating vehicles, and at the central station for the exercise located at the Norwegian University of Science and Technology (NTNU) in Trondheim.

The MBR is a new take on inter-vessel communication. By installing MBR communication units on every vessel/asset involved in an operation, a broadband link is established and a maritime 'information highway' created – one that enables high-speed, high capacity, low latency transfer of data, without the need for additional

infrastructure and no prospect of data 'disappearing' en-route.

The MBR system is a maritime radio network distribution system operating in the 5GHz band and has demonstrated stable, high capacity communication in a maritime environment, handling close by vessel operations, platform obstructions and beyond line-of sight distances. With MBR, there are no airtime charges; data transfer between vessels and assets is free once an MBR network has been established.

### **Critical connectivity**

"MBR has remarkable capabilities for transferring data beyond line-of-sight, even with obstructions and low antenna positions. Our performance in the exercise proved that," says





Erlend Vågsholm of Kongsberg Seatex.

“In large, complex operations at sea, for example in SAR operations and oil spill recovery, there are multiple vessels and aircraft at work simultaneously, and they all need to communicate and exchange data between each other,” Vågsholm explains. “MBR enables the exchange of high-resolution images and video and keeps all participants connected at high bandwidth of consistently good quality.”

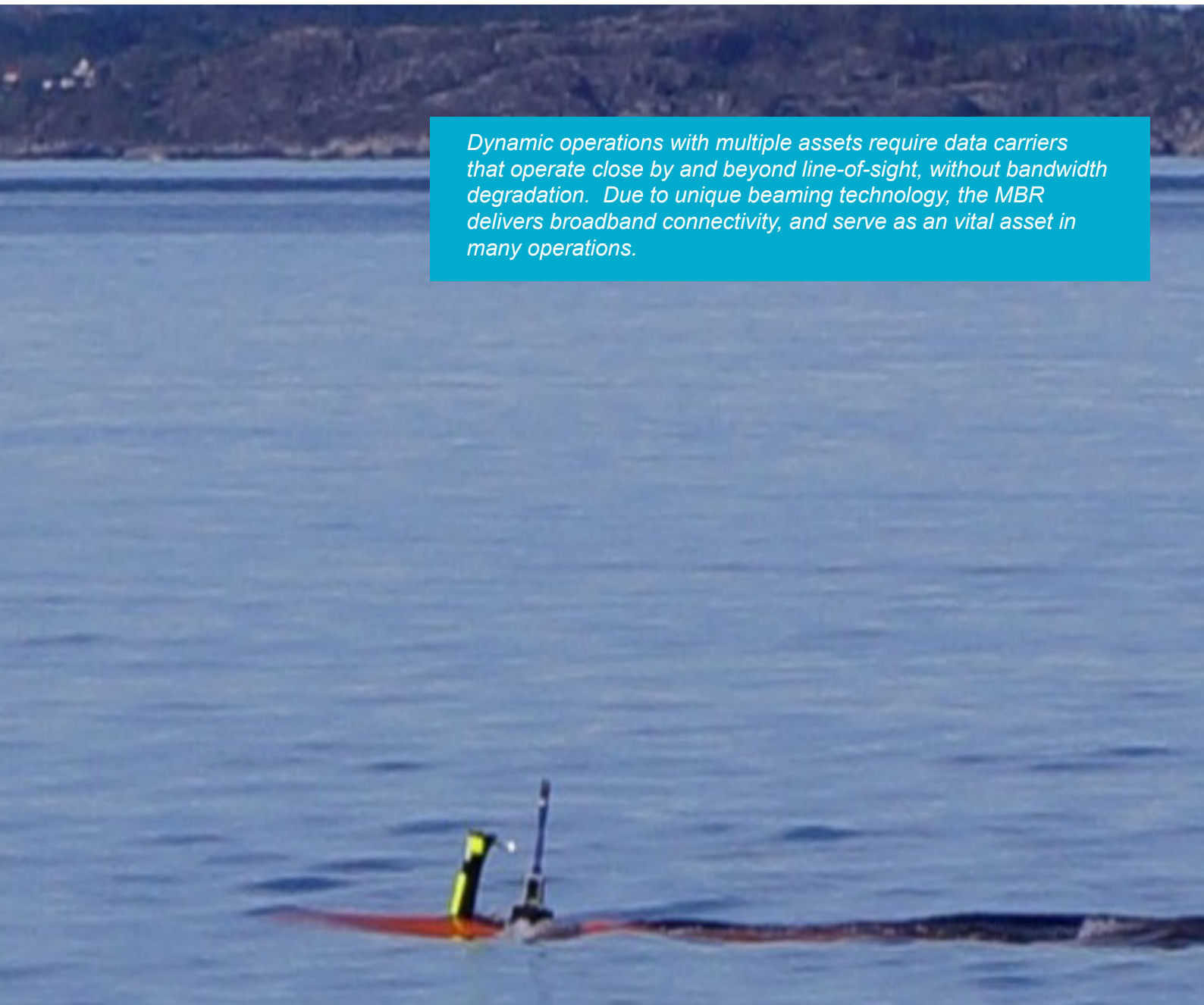
For the ANOHV operation, an aerial drone supplied streaming images, the tethered relay balloon, named OceanEye, was elevated from the autonomous surface vehicle Telematron, which also shadowed HUGIN, an AUV developed by KONGSBERG. The command centre for the

exercise was located on-board R/V Gunnerus, the research vessel of the Norwegian University of Science and Technology.

HUGIN collected bathymetric data and identified pre-set targets, even performing a mid-dive redirection on command from the R/V Gunnerus via a relay station, using MBR and an acoustic communication link, demonstrating flexibility that opens new opportunities for use of AUVs.

### **All ashore**

Ironically, the ultimate goal of the team on the Gunnerus is to make themselves redundant, at least on board. Operating a manned command ship is one of the larger cost drivers in complex operations at sea, and using an autonomous vessel commanded from shore would shrink



*Dynamic operations with multiple assets require data carriers that operate close by and beyond line-of-sight, without bandwidth degradation. Due to unique beaming technology, the MBR delivers broadband connectivity, and serve as a vital asset in many operations.*

costs, eliminate risk to crew, and even improve performance, as access to resources on land could give the team an even broader knowledge and experience base.

The key to reaching that goal lies in the hands of those who enable communications. Overall conclusions from the operation were largely positive, MBR consistently performed according to expectations, and in many cases beyond.

With the ANOHV manoeuvres in the Trondheim fjord, fully autonomous, integrated remote operations came one step closer to becoming reality, and KONGSBERG's MBR solution proved to be the glue bonding all the pieces together.



*Serving as autonom vehicle during operation*



*HUGIN with MBR mounted*



*HUGIN in operation*

ANOHV partners:

- Norwegian University of Science and Technology (NTNU)
- Kongsberg Seatex
- Maritime Robotics
- Norwegian Defence Research Establishment (FFI)

Vehicles and equipment:

- Command vessel R/V Gunnerus
- Unmanned Surface Vehicle Telematron
- Autonomous Underwater Vehicle HUGIN
- Moored balloon system OceanEye
- Unmanned Aerial Vehicle X8 drone
- Maritime Broadband Radio, MBR
- Acoustic communication link (ACL)
- Real-time data collection system Neptus

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