SCIENCE AND TECHNOLOGY ORGANIZATION
CENTRE FOR MARITIME RESEARCH AND EXPERIMENTATION

CMRE shows advances in autonomous algorithms for mine countermeasures operations

Back from the French-led exercise Olives Noires 2016 , the NATO Research Vessel Alliance is now in the Ligurian Sea to continue scientific tests of new robotic solutions for naval mine countermeasures as part of the Multinational AutoNomous Experiment 2016 (MANEX '16).

- TECHNOLOGIES WERE PRESENTED TO THE PRESS DURING A MEDIA DAY AT SEA OFF THE COAST OF FRAMURA (LA SPEZIA, ITALY) -

From 30 September to 7 October 2016, the NATO Research Vessel Alliance, operated by the Italian Navy for the NATO Centre for Maritime Research and Experimentation (CMRE) based in La Spezia (Italy), is operating in the Ligurian Sea, off the coast of Framura (La Spezia) as part of the Multinational AutoNomous Experiment 2016 (MANEX '16) led by the Centre. The primary purpose of the experiment is to test solutions and advanced methods for using robotic systems in mine countermeasures (MCM), while consolidating results and lessons learned from the recent partipation in the French-led Olives Noires 2016 (ON16) exercise, just concluded off the French coast of Toulon.

Conventionally, the different phases of MCM (search, detect, classify, reacquire and identify) are performed sequentially making this a time-consuming effort. In these tests, CMRE is experimenting, for the first time, teams of robots tasked to operate simultaneously, with different goals, in the same water space, in order to demonstrate the capabilities of an accelerated MCM timeline. In practice, experimental autonomous underwater vehicles (AUVs), including the MUSCLE prototype developed by CMRE, are being deployed together to detect, classify and identify simulated naval mines on the seafloor, using their automatic behaviour capabilities. As part of this work, new methods for allowing the vehicles to localise themselves better and new types of sensors are also tested.

In the future, these robots will be not only intelligent and able to take autonomous decisions, but also capable to coordinate group actions by simultaneously carrying out different multiple complex tasks, thus resulting in quicker surveying solutions. The ongoing initial experiments to support the research and operational analysis include close collaboration with universities from Bath (UK), Heriot-Watt (UK), Bozen (Italy) and Florida Atlantic University (USA). During ONMEX16, additional experiments were conducted in conjunction with the conventional MCM vessels from multiple nations, in order to compare the performance of robots with legacy systems and assess practices for joint operations.

The outcome of this research will ultimately result in an increase in the capabilities of the NATO Alliance in the MCM field. CMRE also aims to demonstrate that having more localised and specialised autonomous equipment will augment the overall mission performance of this system-of-systems.

About CMRE. The STO CMRE (Science and Technology Organization – Centre for Maritime Research and Experimentation) is located in La Spezia, Italy. The Centre focuses on research, innovation and technology in areas such as defence of maritime forces and installations against terrorism and piracy, secure networks, development of the common operational picture, the maritime compo- nent of expeditionary operations, mine countermeasure systems, non-lethal protection for ports and harbours, anti-submarine warfare, modelling and simulation, and marine mammal risk mitigation. CMRE operates two ships, NATO Research Vessel *Alliance*, a 93-meter 3,180-ton open-ocean research vessel, and Coastal Research Vessel *Leonardo*, a smaller ship designed for coastal operations. In addition to its laboratories the Centre is equipped with a fleet of autonomous underwater and surface vehicles and a world-class inventory of seagoing sensors.

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