# URready4OS News

UNDERWATER ROBOTICS READY FOR OIL SPILLS

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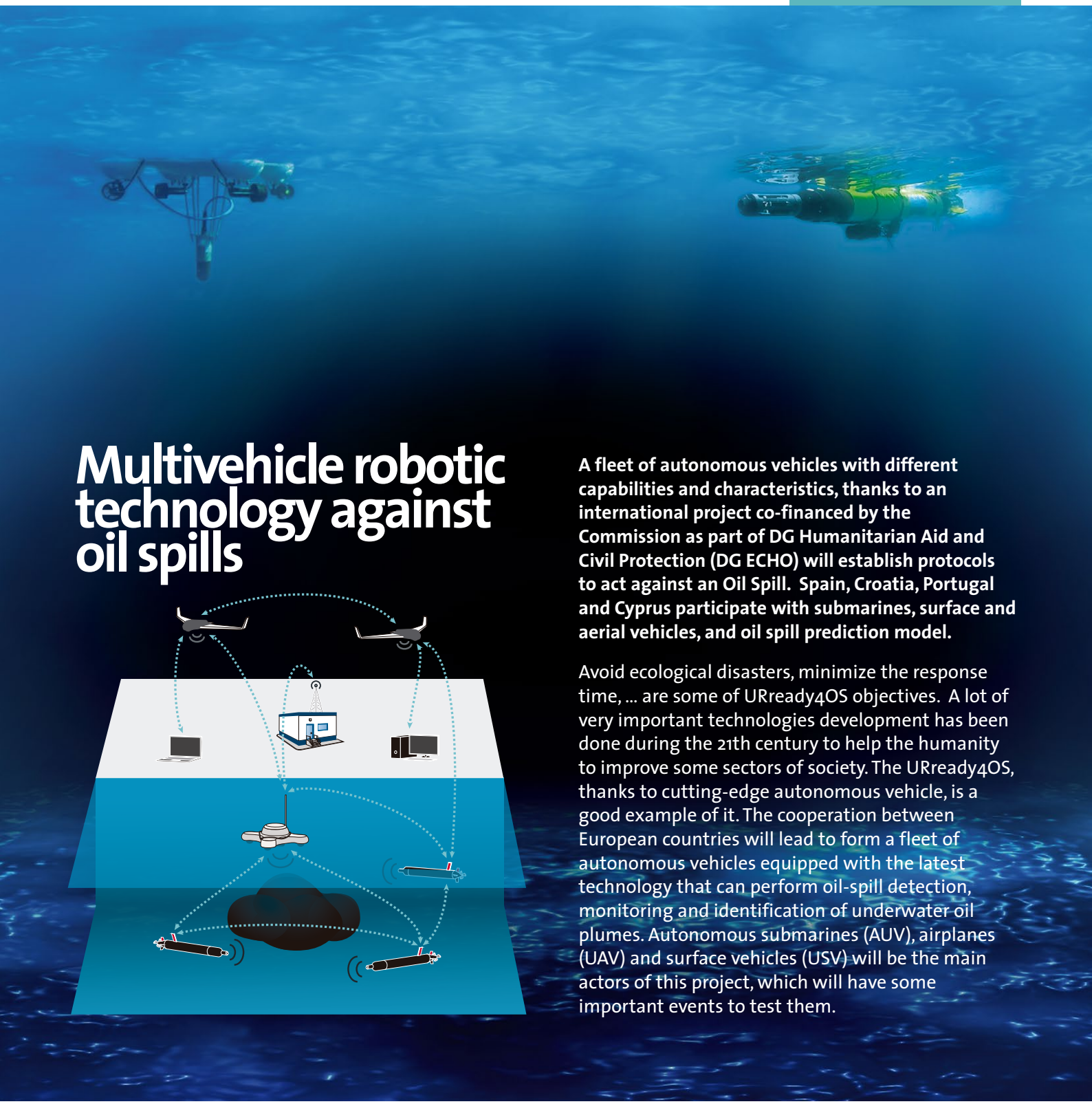

# Multivehicle robotic technology against oil spills



**A fleet of autonomous vehicles with different capabilities and characteristics, thanks to an international project co-financed by the Commission as part of DG Humanitarian Aid and Civil Protection (DG ECHO) will establish protocols to act against an Oil Spill. Spain, Croatia, Portugal and Cyprus participate with submarines, surface and aerial vehicles, and oil spill prediction model.**

Avoid ecological disasters, minimize the response time, ... are some of URready4OS objectives. A lot of very important technologies development has been done during the 21th century to help the humanity to improve some sectors of society. The URready4OS, thanks to cutting-edge autonomous vehicle, is a good example of it. The cooperation between European countries will lead to form a fleet of autonomous vehicles equipped with the latest technology that can perform oil-spill detection, monitoring and identification of underwater oil plumes. Autonomous submarines (AUV), airplanes (UAV) and surface vehicles (USV) will be the main actors of this project, which will have some important events to test them.

Co-financed by the EU

Universidad Politécnica de Cartagena

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# In first person

## Technical University of Cartagena

Universidad Politécnica de Cartagena

**What is your contribution to the project?**
Our group coordinates the project ensuring the objectives established will be achieved. We will also integrate an oil spill probe in a commercial AUV. This imply an extra difficulty because it's the first time this probe has been equipped on this vehicle, to do that we have had to build a new head and add a second CPU to our vehicle. On the other hand, Command and Control Unit Neptus (University of Porto) has been upgraded to receive data from Iver vehicles and plan missions for them too.

**What difficulties are you expecting to find?**
Coordination of a large and diverse set of vehicles (aerial, surface and aunderwater) and oil spill models is as challenging as exiting. We are working hard on that to decrese the impact of oil spills with this new technologies.

## University of Porto

U.PORTO

**What is your contribution to the project?**
We are going to adapt one of our Light Autonomous Underwater Vehicle (LAUV) to be used as an underwater oil spill detector and mapper. We will also adapt our Command and Control Unit (CCU) Neptus to plot data gathered by multiple underwater platforms and plan oil spill mapping missions based on that same data. Moreover, an Unmanned Aerial Vehicle (UAV) will be used as a data mule to convey data from the AUVs to the base station.

**What's the role of Unmanned Aerial Vehicle in the project?**
The UAVs will be used as data mules, by downloading from the AUV any data gathered during an oil spill mapping, and quickly bring it back to the nearest base station for analysis.

## University of Zagreb

**What is your contribution to the project?**
Our Laboratory is responsible for the integration of oil-in-water probes to AUVs, defining the concept of operations protocols (CONOPS) and guidelines (white paper). We will also prepare the communication link between the surface and underwater vehicles (acoustic link) and deploy autonomous agents' individual missions to check navigational and communication capabilities.

**What's the role of unmanned surface vehicle (USV)?**
Autonomous unmanned surface vehicle (USV) have the role of the communication relay between the AUVs and UAVs. Cooperative behavior of USV and other agents is expected for better following and measuring data..

## Oceanographic Center University of Cyprus

**What is your contribution to the project?**
We are responsible for putting the AUV measurements of tracer/oil pollution into context. That is, we would like to know where this tracer will go and what actions could help prevent it from damaging the environment further. To do this, we will predict the fate of the spill using an oil spill model (Medslik). In addition, we are responsible for collecting any visual information on the spill, such as from satellite or airplane.

**How will influence this project in the future oil spill protocols?**
This project should add new tools, hardware and software, to the suite currently applied to address oil spill scenarios.

# Preliminary experiment

From 22/September to 1/October a field test (Preliminary experiment) will be held in Split (Croatia) to train the fleet of autonomous vehicles, check and identify weak points in protocols and software and establish guidelines to define the ConOps for deployment of robotics assets to oil spill preparedness. During the experiment some underwater Rhodamine deployment will be done to simulate a real oil spill event.

**CROATIA**
**22 SEPT**
**01 OCT**

# The vehicles

## UNDERWATER VEHICLES

### IVER2 ECOMMAPER

The IVER2 AUV is a small man-portable AUV manufactured by Ocean Server Technology, Inc. With a proven track record over thousands of missions, it is ideal for imaging and environmental surveys, including research, development, and OEM based applications. The IVER2 design allows to integrate new sensors and capabilities.

### LAUV OCEANSCAN

The LAUV is an Autonomous Underwater Vehicle targeted at innovative standalone or networked operations for cost-effective oceanographic, hydrographic and security and surveillance surveys. It has acquired to OceanScan, an Spin-Off company from the University of Porto which developed it. The capabilities and features of the vehicle are continuous been improved.

## AERIAL VEHICLE (UAV X8)

The UAVs will be used as data mules, by downloading from the AUV any data gathered during an oil spill mapping, and quickly bring it back to the nearest base station for analysis. The X8 is a low-cost COTS (Components Off-The-Shelf) vehicle, modified at the LSTS, which allows for quickly deployable surveilance missions. It's a hand launchable vehicle perfected for low altitude reconnaissance scenarios with live video feed.

## SURFACE VEHICLES

The role of this vehicle is quite important too. They are in charge of the communication between underwatered AUVs and UAVs, and tracking the AUV while they are not in the surface. The vehicle used has been built and developed at UNIZG-FER for tracking of underwater objects communication router between the surface and the underwater navigation aid for the underwater.

# New AUV's Oil probes

## ONE OF THE BIGGER PROJECT DEALS WAS TO EQUIPPED THE VEHICLES WITH THE CAPABILITY TO DETECT CRUDE AND REFINED OIL.

New probes has been acquired and integrated in the vehicles, allowing them to detect this substances.

During the project some filed test will be done, so it is important to equippe the vehicles with a sensor to detect a non-toxic substance that allow us to work safely with no ecological impact. Rhodamine is a non-toxic dye used commonly in tracer experiment. The AUVs will be equipped with Rhodamine probes too.

### *Technical University of Cartagena*

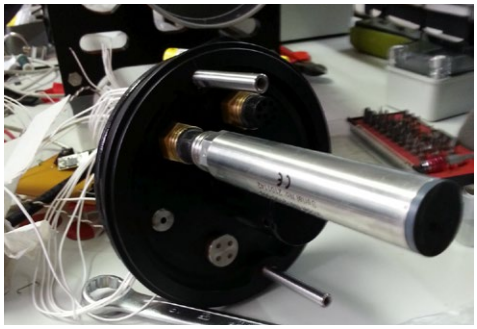
A new vehicle head has been designed by the Universidad Politécnica de Cartagena to integrate the Turner Cyclops Integrator from Turner Designs® in the IVER2 Ecomapper. A second CPU (backseat CPU) has been added to the vehicle to be in charge of recording the Oil and Rhodamine data provided by the probe and merge them with the navigation data from the vehicle.

The probe is going to be powered with the vehicles bateries.

### *University of Porto*

To integrate the Cyclops probes, OceanScan has designed a new nose section for the LAUV that can accommodate sensors from different manufacturers. Besides the probes for Refined Oil, Crude Oil and Rhodamine, we can also integrate dissolved oxygen, sound velocity sensor, pH, and the section also includes a forward looking sonar. The electronics board that interfaces with the sensors is based in AML's Metrec-X, that includes multiple analog input slots, to which the Cyclops C7 probes from Turner Designs® will be connected.

### *University of Zagreb*



From the hardware point of view: wet connector is installed between flooded nose and DVL compartment . Cyclops C7 Probe can be installed and connected directly on the connector. On the dry side, probe is powered by 12VDC from the AUV power distribution board and probe signal output (analog output) and range inputs are connected to the backseat PC. From the software point of view, backseat samples the probe measurement and automatically adjust the probe range. At the same time collects the position data from the front seat and internally log all this data together. In case of near real time data transfer, backseat communicate via Tritech MicroNav® modem with the surface transducer and handles the transfer.

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