



# URready4OS

UNDERWATER ROBOTICS READY FOR OIL SPILLS

# News

JANUARY 2015

## Preliminary Experiment Split, Croatia



Working together for the first time at sea with a total of 6 vehicles.

Undoubtedly, this was one of the first challenges of the preliminary experiment that took place from September 22nd to October 1st in Split, Croatia.

The teams involved in the URready4OS project had the important task of coordinating and checking the correct functioning of the vehicles carrying out joint work, and checking that the action protocols with all the arrangements put in place were executed correctly



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The main goal during the experiment was to check the ability that vehicles and devices carrying out joint work have when monitoring an oil spill under the sea. The place, provided by the Croatian Navy, for carrying out the experiment was in the North of the Marjan Peninsula in Split.



The vehicles that participated in the experiment were: a Light AUVs (Xplore1) and two X8 UAVs from the University of Porto, the Light AUV Lupis and the USV PlaDyPos from the University of Zagreb, and an IVER2 AUV from the Technical University of Cartagena. In addition, the team from University of Cyprus was responsible for making predictions used to establish the routes to be followed by these vehicles.

In total, 20 people for 10 days took the first steps towards the project's main goal, namely ensuring that a fleet of vehicles operates in case of a possible oil spill.

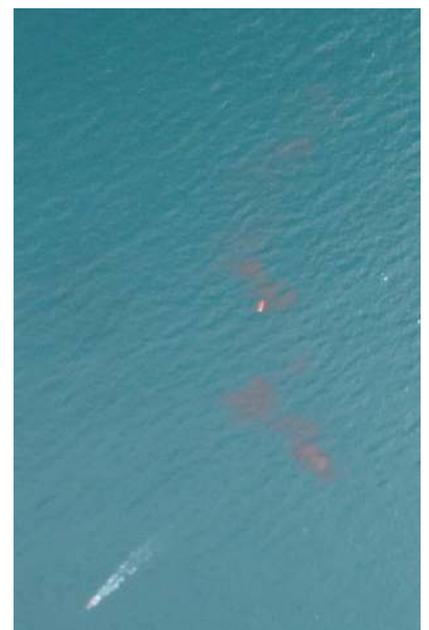
## AIMS OF THE EXPERIMENT

### Probes Integration Test

Integration of the probes in the vehicles was developed differently by each team, each choosing different sensor models. Therefore, one of the first goals was to verify that the integration was done correctly. For this purpose an intercalibration was performed, ensuring that the measurements between the probes were homogeneous.

### Communications between Vehicles and Ground Station.

Ensuring that the data from the resurfacing marine vehicles reached the land base was possible thanks to the coordination between them and the aerial equipment. The mission of the latter was not only to transfer that information but also from its privileged position, to make panoramic photos of the Rhodamine WT plume. In all cases, the goals were achieved.





### Command and Control Console (NEPTUS).

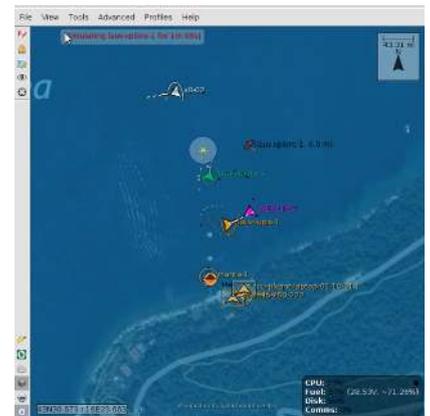
Knowing the position of each vehicle at any one time is crucial for the project's success. It is a key point for the actions to develop in a coordinated and accurate manner, and for the final goal to succeed.

To achieve this goal, a program of Command and Control called NEPTUS, which was developed in the LSTS was used. This software allowed verifying and checking the location of all the equipment to be done simultaneously and in real time, but also to enable to be collected and displayed collectively.

### Underwater Communications Test between USV, AUVs.

Between 5 and 10 seconds was the time interval that the vehicles took to send the information to the base station while being submerged.

Those in charge were two vehicles performing these functions differently: The Lupis and the Xplore.



### Test of Protocols for Communication.

Communication in any experiment is crucial, especially when it comes to vehicles that have to be perfectly coordinated with each other for the success of the mission. Before this test, each vehicle was developing and using its own protocol, but for the success of the mission a common one was set up for all of them.

### Test of Protocols for Operations.

Besides the communication based on facts, and on concrete actions, it is necessary to capture those ideas in written form. The White Paper gathers each step of the interventions to be performed, and specifically, in this experiment developed in Split, the formal functioning of the vehicles is improved, gathered in the so-called Concept of Operation (ConOp).



### Operational Test with Several Vehicles Deployed at a Time.



Ensuring vehicles are accurately directed to, and fulfill, a mission at a particular time and in a given place is relatively simple. But the real challenge was to solve it with all the teams working at the same time. For this, the detail of the operation must be very precise, as was done in this experiment. The elusive goal of operating with three AUVs responsible for measuring the Rhodamine WT under the water, one UAV responsible for transmitting data to the ground, and a USV responsible for collecting the data under the water was achieved.

## FIELD TEST



After achieving each of the previous steps successfully, the experiment had to go a step further and check that the entire set of actions mentioned previously were operating in a real situation.

To perform this last mission, and through a boat from the Croatian Navy, the whole team started working, in the first place, to replicate the supposed oil spill, using, for obvious reasons, Rhodamine WT (non-toxic dye). Although in the first moments the volume that would simulate a real spill was not achieved, which complicated the detection for the vehicles, later, by changing some variables, the necessary plume to replicate the situations in a realistic way was achieved.

The next stage was to gather information about which of the different sampling strategies of the vehicles was most appropriate in these emergencies. After a busy day, the achievement of the goals was a reality. Therefore it was possible firstly, to detect the plume under the water, secondly, to receive data in real time while the vehicles were submerged, thirdly, to synchronize all the vehicles with the onboard computer, and finally, to draw the data in NEPTUS, and know the position of each of the teams at any moment.



## Demonstrative experiment

The individual and collective effort of each of the people who participated in this experiment in Split made it possible to achieve the specified goal at the beginning of the test. Also, and as importantly, some improvements to be considered were detected which will be worked upon in the next meeting in Cartagena that will be held in 2015 where the ability of these vehicles in a hypothetical emergency will be demonstrated.

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