ROSM – Robotic Oil Spill Mitigation

Project Partners

ISEP – Instituto Superior de Engenharia do Porto
INESC TEC - Institute for Systems and Computer Engineering, Technology and Science
CIIMAR – Centro Interdisciplinar de Investigação Marinha e Ambiental

ABSTRACT

The ROSM project addresses the development of an innovative solution based on heterogeneous autonomous vehicles to tackle maritime pollution (in particular oil spills). The on native microbial consortia with bioremediation capacity, and the adaptation of vehicles for in-situ release of autochthonous microorganisms (bioaugmentation) and nutrients (biostimulation). Field tests have been performed in Leixões Harbour in Porto and Medas, Portugal, with a simulated oil spill and validated the decentralized coordinated task between the UAV and an ASV ROAZ II.

Introduction

Marine oil spills have a large economic and ecologic impact in the ecosystem of marine life. Incidents with oil spills occur with some regularity during the exploration, production, and transport of petroleum products. **Between 2010 and 2018**, were registered 59 spills with 7 tonnes or more, resulting in a total of **163.000 tonnes of oil spills in the environment**.


The ROSM - Robotic Oil Spill Mitigation project proposes to development of autonomous and coordinated actions able to increase the efficiency of the bioremediation process, by deploying microorganisms and nutrients in oil spill detected areas with a team of heterogeneous robots with different levels of intervention.

Approach for Oil Spill Mitigation

➔ **Bioremediation Containers and Release System**

  ✓ Development of a container and release system able to be integrate in (Air/water/underwater vehicles).
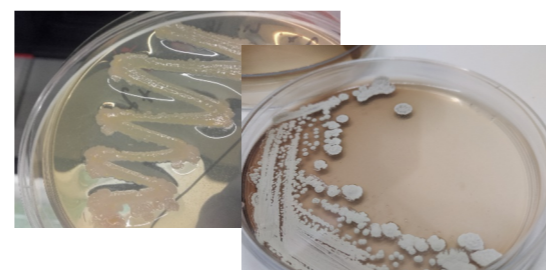
➔ **Multi-Robot Cooperative Actions**

  ✓ Cooperative perception, combine information from different sensors;

  ✓ Cooperative path planning in order to maximize the efficiency (maximum overlap of bacteria-oil area).

➔ **ASV**: Contour the oil spill area while spraying the bacterias mixed with water

  Approach: ASV Oil Spill Combat based Artificial Potential Field (APF) + Normal Vectors)

➔ **UAV**: Spread the powder with optimal coverage

  Approach: Axis-parallel "zig-zag" algorithm
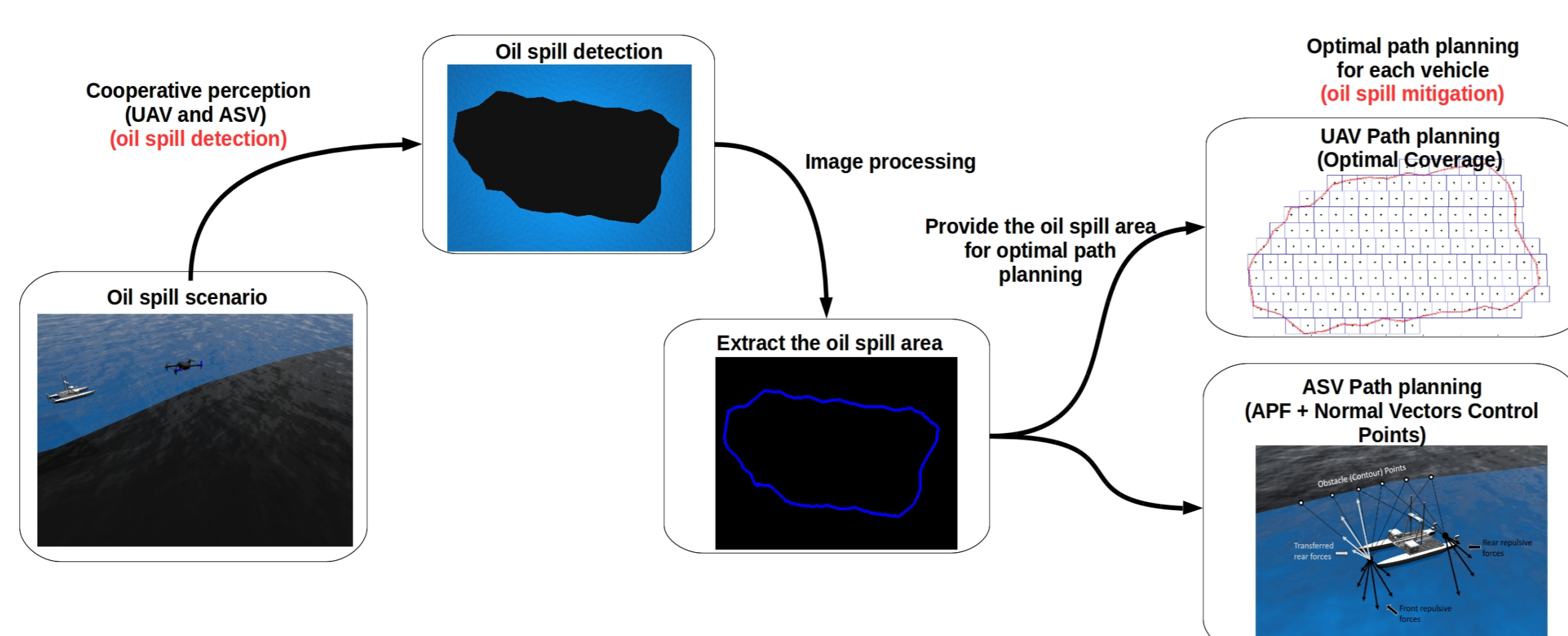
Vehicles

The ASV ROAZ II and the UAV STORK are the autonomous vehicles that have been adapted to support the for oil spill combat. Both vehicle carry has payload the bioremediation containers and the release systems.

ASV ROAZ II

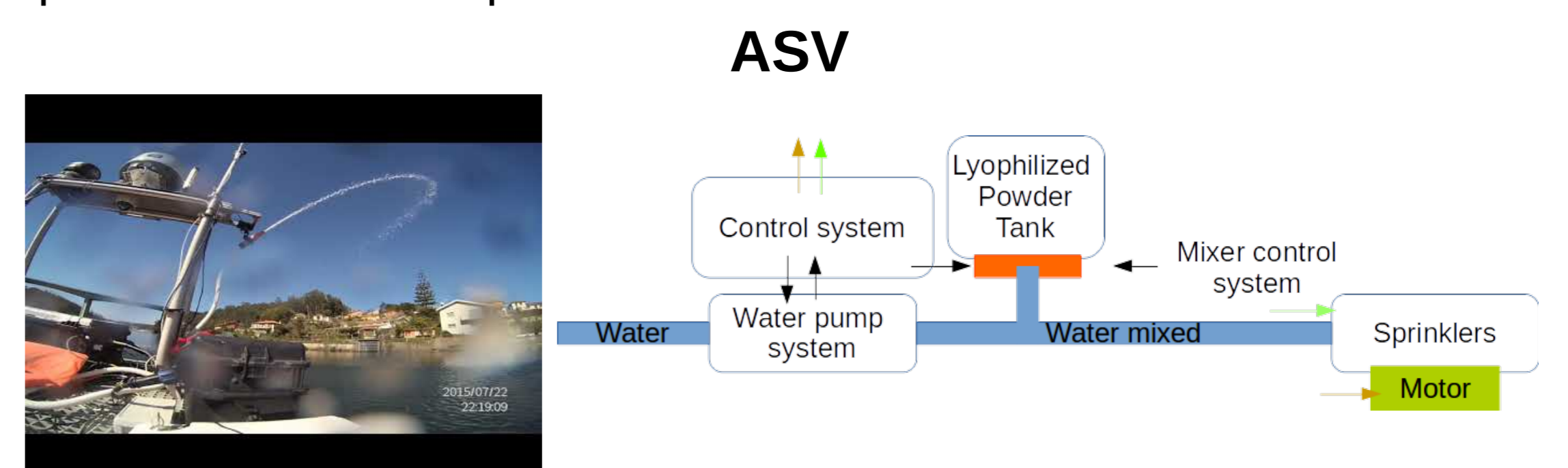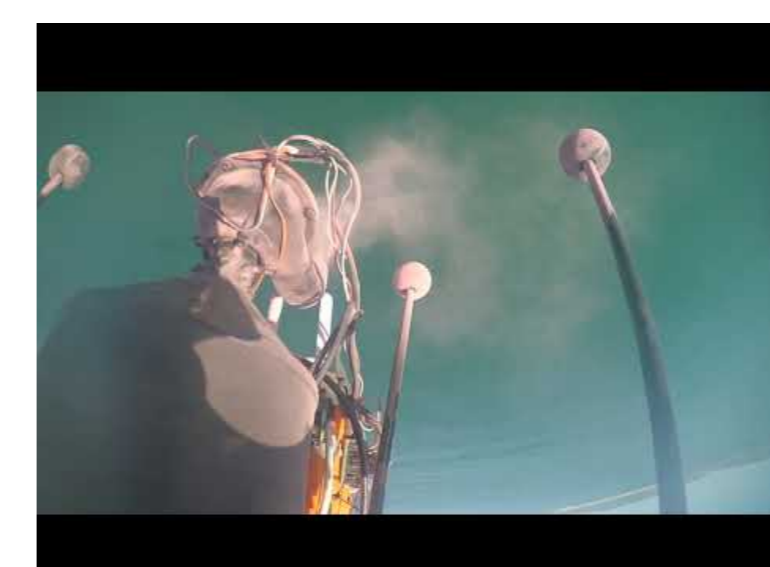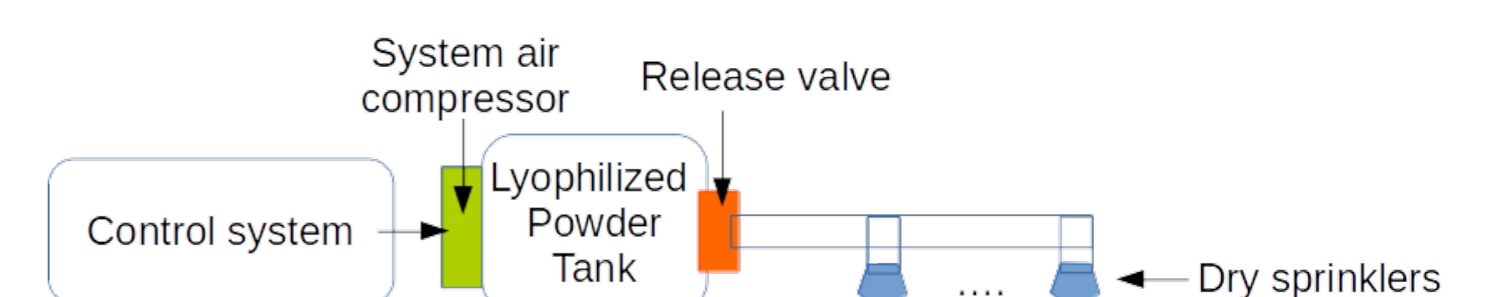**UAV STORK**

Bioremediation Release System

ROAZ II is equipped with a system that allows it to pump water from the ocean, mix it with the bioremediation microorganism powder and spread it over the oil plume.
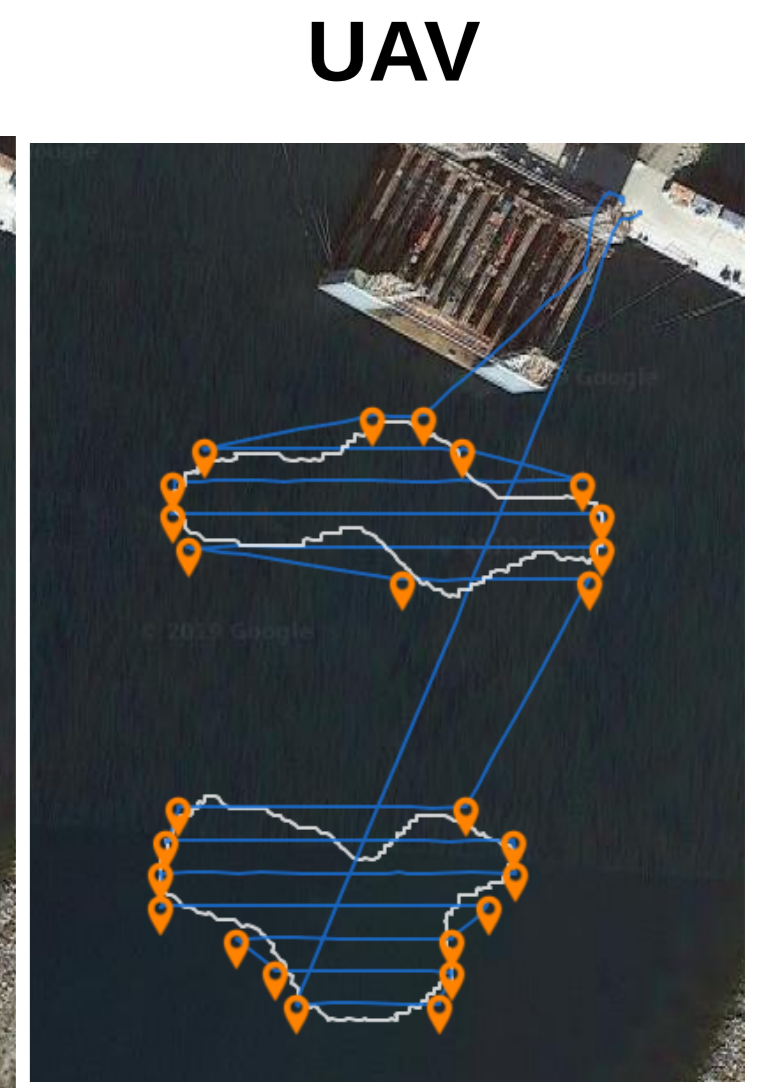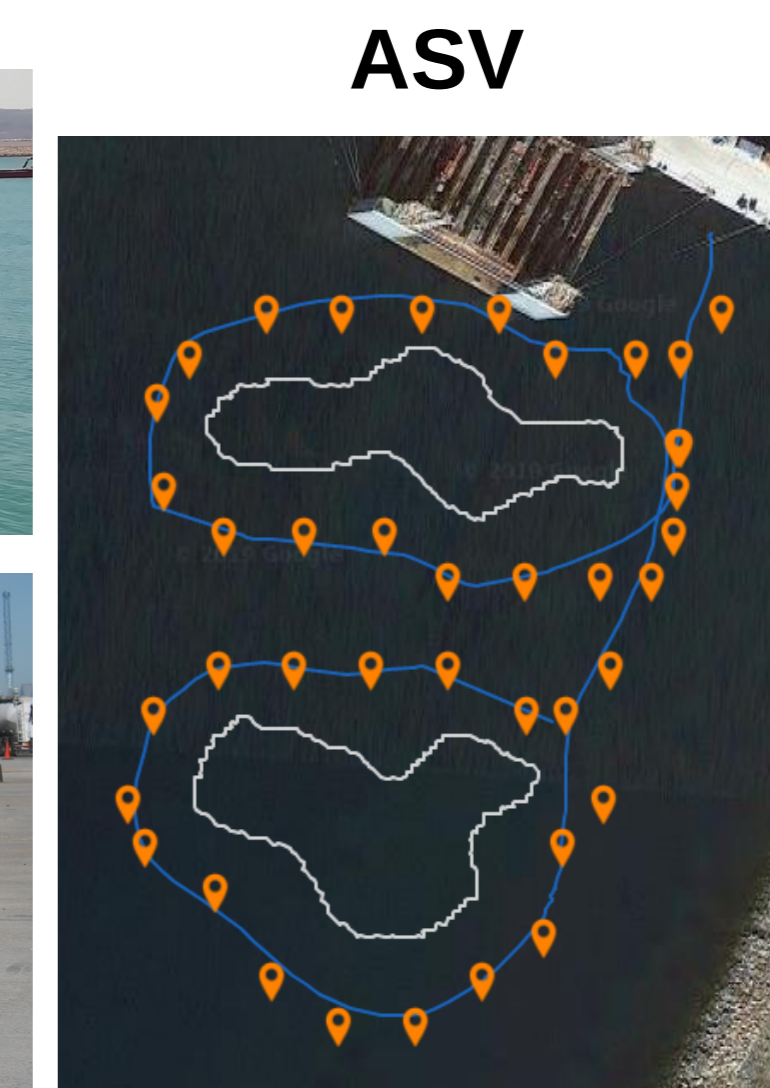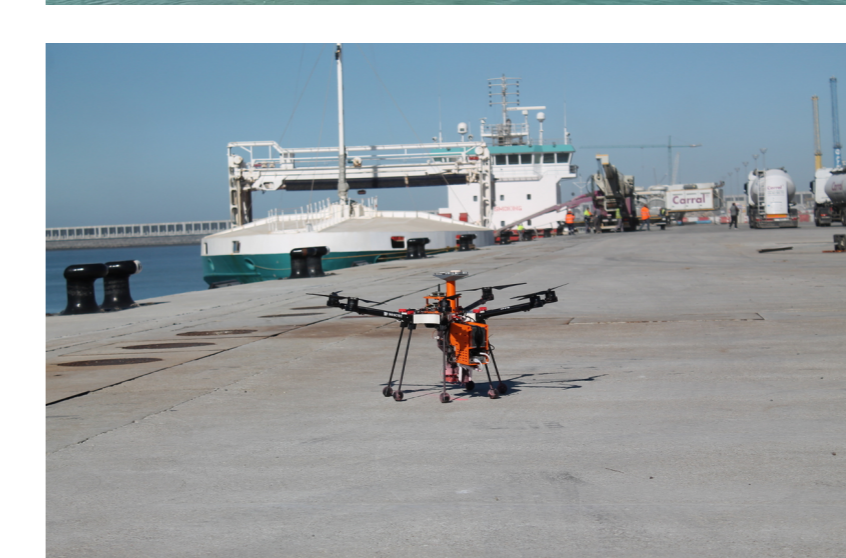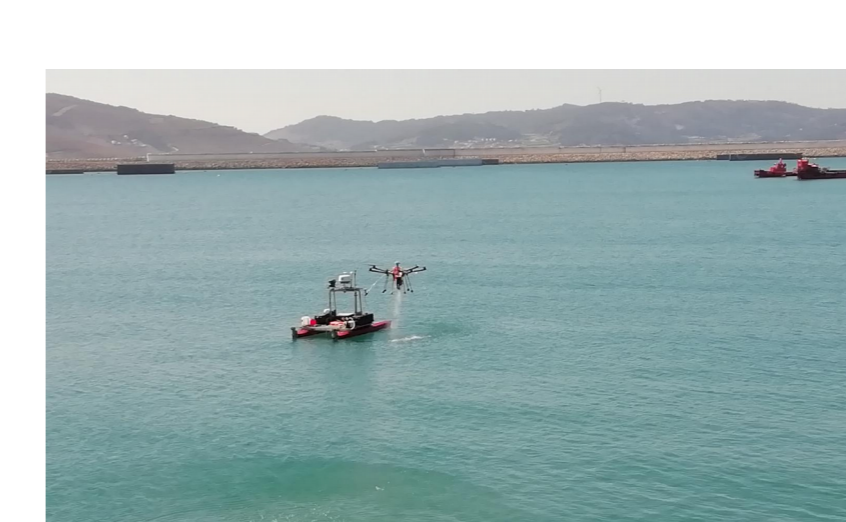
ASV

The UAV release system is composed by a payload attached to the vehicle that contains a tank a release system to spread the lyophilized powder.

UAV

Field Tests

Field tests have been performed with both autonomous vehicles in Leixões Harbour in Porto, Portugal, Coruña, Spain and during the REX 2019 at Base Naval Alfeite.

ASV   **UAV**

Acknowledgment