SYNTHETIC TEST & UNIFIED DEMONSTRATION SYSTEM
ORE/20/69

INVITATION TO TENDER

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SUBMISSION NO LATER THAN: 12:00:00 ON Monday 07 December 2020 [1]

Deadline dates and times are strict; late submissions will NOT be accepted unless a confirmed substantial technical issue with the e-procurement portal prevents submission.

Unsigned submissions will be regarded as a non-compliant application and therefore rejected.

Tenderers may also be rejected if they do not provide a complete response to the ITT.

Document History

Revision	Date	Prepared by	Checked by	Approved by	Revision History
1	29 Oct 2020	Katharine York / Hamish McDonald / Alan Wardlaw / Dan Hindmarsh	Gillian Sharp	Ben George	new

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1 Introduction and Background

1. Introduction

You are hereby invited by the Offshore Renewable Energy Catapult ("ORE Catapult") to tender to design, supply, deliver, install, configure, test and commission a Synthetic Test and Unified Demonstration System (the "Service"), as described in Section 4 – Scope of Work

This Invitation to Tender ("ITT") has been issued by ORE Catapult as part of a competitive procurement exercise in accordance with the "Open" procedure under the Public Contracts Regulations 2015 (as amended from time to time).

All personal information or personal data supplied in relation to this tender will be treated as confidential. It will also be subject to the General Data Protection Regulation [EU] 2016/679 ("GDPR"). ORE Catapult will request personal information or personal data for the purposes of this tender where we have a legitimate interest in doing so in order to assess whether the Tenderer meets the requirements.

2 Background

2.1 Catapults

The Catapults are elite technology and innovation centres established by the UK Government (through Innovate UK) in high growth industries and are designed to bridge the gap between Government, universities, research institutions and innovative businesses of all sizes. Their objective is to transform great research rapidly into commercial success to support the industry and to generate economic growth. Catapults represent a long-term strategic investment by Innovate UK in the UK's innovation capability.

2.2 Offshore Renewable Energy Catapult

ORE Catapult (https://ore.catapult.org.uk) is the UK's leading technology innovation and research centre for offshore renewable energy. Headquartered in Glasgow, it has world-leading test and demonstration facilities in Blyth, Northumberland and Fife, Scotland. The senior management team is split between Glasgow and Blyth, with extensive technical expertise and knowledge at both locations.

ORE Catapult's vision is to be the world's leading offshore renewable energy technology centre by 2030.

ORE Catapult will play a key role in delivering the UK's largest clean growth opportunity, through our mission to accelerate the creation and growth of UK companies in the offshore renewable energy sector. We will use our unique facilities and research and engineering capabilities to bring together industry and academia and drive innovation in renewable energy.

3 Project Background

3.1 The **Multi-Platform Inspection, Maintenance & Repair in extreme environments** ("MIMRee") project has been funded by Innovate UK and its aim is to provide a step-change in offshore wind farm Operations & Maintenance ("O&M") by removing the requirement for humans to travel to site for the inspection, maintenance and repair of offshore wind turbine blades. This will significantly reduce the costs and turbine downtime associated with these tasks, as well as mitigate the H&S risks of using rope access technicians.

3.2 Individual technologies are being developed by members within the project consortium for this objective. The robotic vehicles of the MIMRee system consist of a surface vessel, an aerial vehicle and a blade crawling robot. Overarching control will be performed by a common mission planning and human machine interface, which will coordinate the individual vehicles and allow for autonomous operations to be monitored from shore. Further information can be found on the project website (https://www.mimreesystem.co.uk).

3.3 In order to bridge the gap between the testing of individual physical technologies and the ambition of a fully-integrated collaborative system, the consortium has agreed to a revised scope of verification and validation. Ratification of the overall proof of concept of the associated robotic and digital technologies shall now be enabled through connection to a simulated representative test environment.

3.4 As the partner responsible for testing and demonstration within the project, ORE Catapult is seeking to procure a solution for a simulated testing environment, denoted as the Synthetic Test and Unified Demonstration System (STUDS).

3.5 ORE Catapult is seeking to engage with a partner to design, build and deliver a solution that satisfies the requirements of simulated testing of the hardware-in-the-loop for the MIMRee project. The Service shall consist of software (including associated firmware), initial support, and any hardware or hosting requirements identified within an agreed design.

3.6 The capabilities of the STUDS can be summarised to:

a Enable and verify timely and effective communication to each of the sub-system components;

b Provide a common simulated "environment" (with appropriate physical world simulation) with scenarios that can interact with, stimulate and record responses in connected sub-systems;

c Enable sub-system validation;

d Provide a growth path that enables the simultaneous connection of all the robotic subsystems to a common "end-to-end" simulation that can validate the decision-making at each of the interfaces (take off/landing of the aerial vehicle, drop-off/collection of the blade crawling robot) in different environmental and operational conditions.

~~3.7~~ Utilising results of the testing in the STUDS, ORE Catapult will provide feedback to the project partners to advance their technology development and system interoperability.

3.8 The outcomes of the Service shall be capable of interacting with the following systems and subsystems:

a Autonomous Surface Vessel (ASV) and Moving Wind Turbine Blade Inspection System (MWTBIS) developed by Thales (MIMRee consortium partner)

b Unmanned Aerial Vehicle (UAV) developed by University of Bristol (MIMRee consortium partner)

c Blade crawling robot deployment mechanism – developed by University of Manchester (MIMRee consortium partner)

d Mission control software developed by Royal Holloway University of London (MIMRee consortium partner)

e Blade crawling robot developed by BladeBug (MIMRee consortium subcontractor)

f Repair module for blade crawling robot developed by Royal College of Art (MIMRee consortium partner)

g Blade surface characterisation techniques developed by Wootzano (MIMRee consortium partner)

3.9 In order to verify the capability of these individual components the Service will need to communicate with systems developed by the partners. Thales' ASV was commercially available prior to the project inception and uses its own proprietary control and user interface. The other robotic vehicles and subsystems are being developed by the partners specifically for the project. Robot Operating System (ROS) is being utilised as the software framework for these prototypes. An overview on the system integration of the Mission Control Software (developed by Royal Holloway University London) with the UAV and ASV is provided in the top left corner of Figure 1. Examples of the input/outputs between the separate assets are detailed in the discretely numbered boxes in the other corners of the figure.

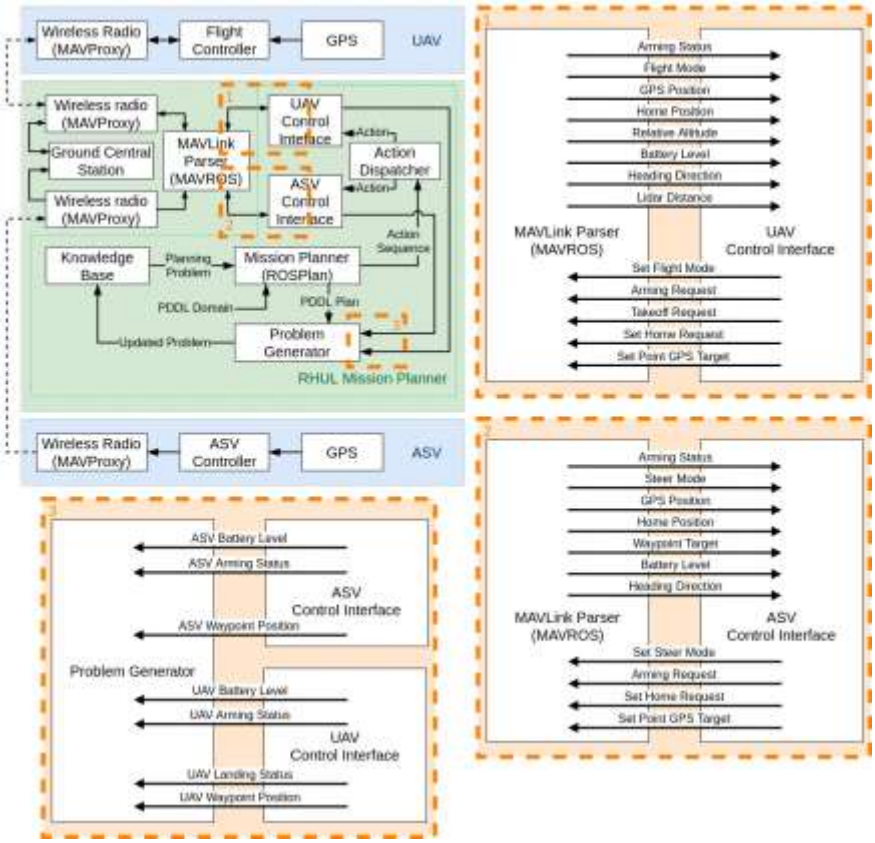

Figure 1 – Example system integration diagram of the UAV and ASV with the overarching mission control software.

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