



LONGOPS RESEARCH & DEVELOPMENT OPPORTUNITIES

Supplier Engagement Event – 24th June 2021

UK Atomic Energy Authority

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Haptic Manipulators Technology Development

Budget	Estimate Tender Publication	Estimate Contract Duration
£100k – £200k	July 2021	September 2021 – July 2022

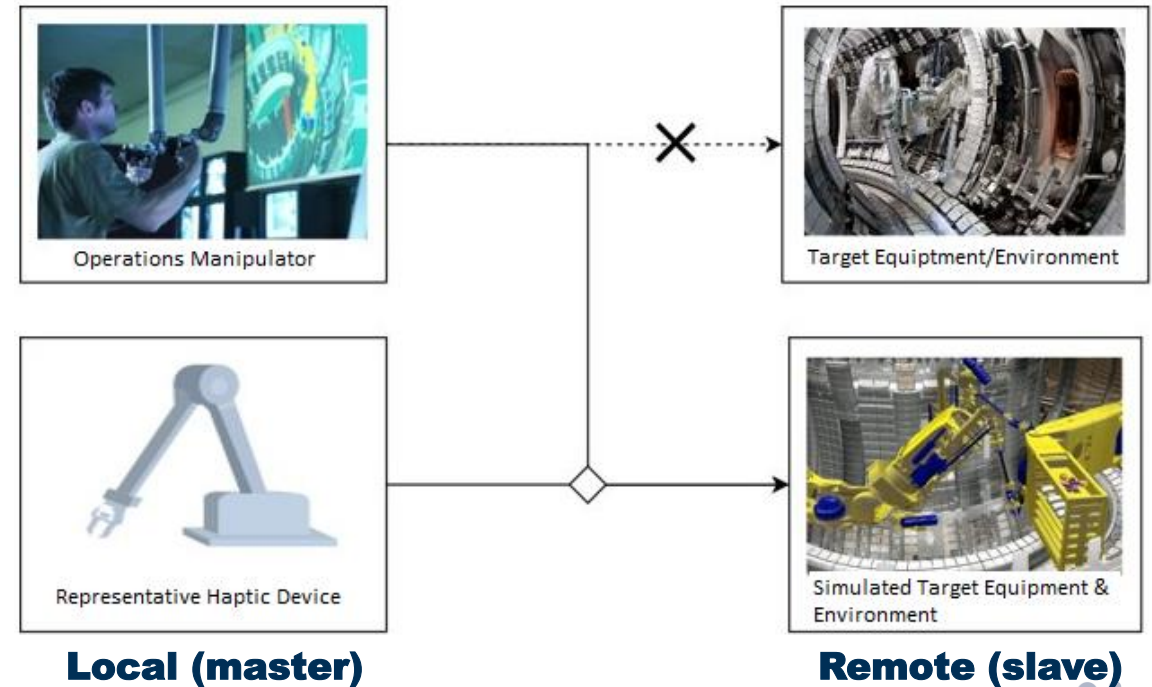
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**For any questions please email:
enquiries@longops.race.ukaea.uk**

WP3.4 – Development of Haptic Manipulators And Haptic User Interfaces

3.4.2

- This work package aims at developing a virtual haptic-enabled (force feedback) platform for training, assessment, development and improvement of tasks commonly conducted in the nuclear industry.
- We also expect to deliver novel and reliable techniques for incorporating haptics on the manipulation of non-rigid, flexible items such as cabling, soft plastics, and any other soft components.
- Innovative developments in training and mock-up capabilities, tailored to maximise benefits to the proposed training are expected.



WP3.4.2 – Development, supply, install, commissioning of a haptic training simulator system and/or components

Background to WP:

- Approaches to remote operations involve humans coupled to a remote manipulator, at least partially, through haptically enabled local manipulators
- Real nuclear telerobotic devices and physical mock-ups are highly expensive and typically unavailable due to high demand, tight maintenance schedules, etc.

Primary WP output:

- A simulation / mock-up, compatible with a dual-armed haptic device, which provides a platform to allow operator training and task development.

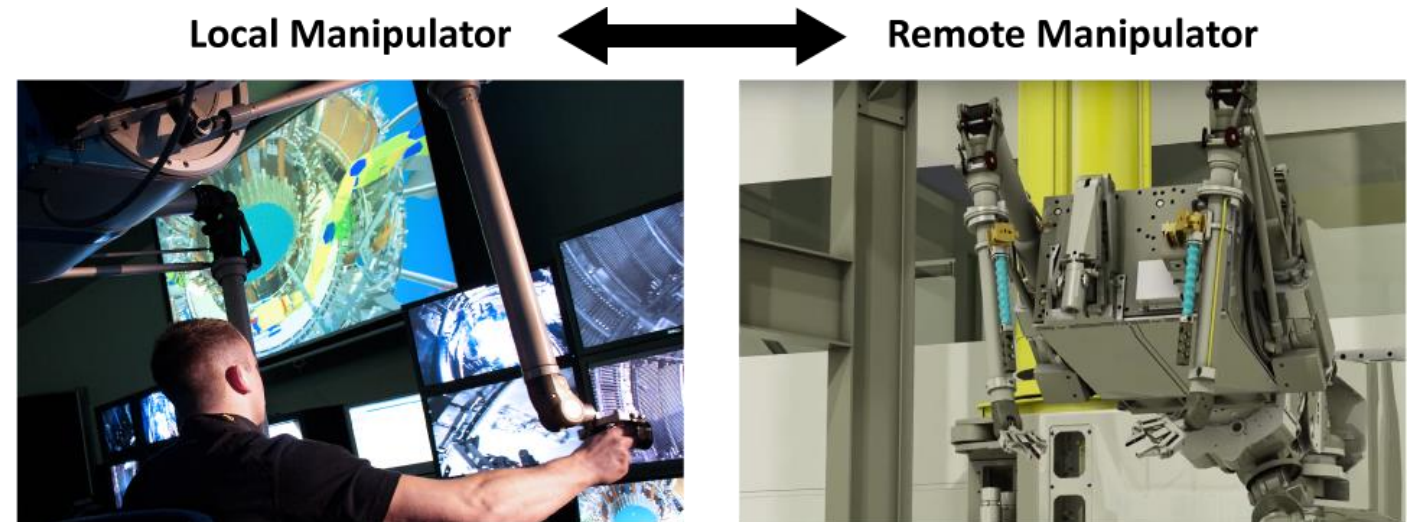


Fig: Bilateral coupling between local and remote manipulator

WP3.4.2 – Development, supply, install, commissioning of a haptic training simulator system and/or components

Use cases to be replicated in the haptic training simulator consist of several trivial and challenging tasks. Through support from academic research, the simulator is expected to be demonstrated the following tasks:

Basic haptic tasks

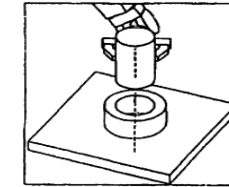
- Stacking / Packing / Manipulation

Complex haptics tasks *(expected challenges)*

- Rod in tube
 - *Simulation of jamming*
- Bolting
 - *Cross-threading, variable required torque*
- Mechanical device assembly
 - *Connection of components, pipes, power connectors, etc.*
- Cable handling
 - *Manipulation of non-rigid bodies*
- Cutting / welding / other powered tooling
- Collaboration with a hoist



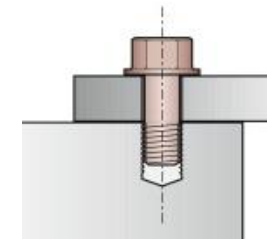
Stacking



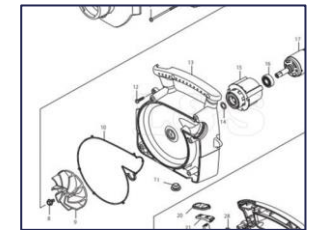
Peg in Hole /
Rod in Tube



Packing



Bolting



Mechanical Device
Assembly

Additional realistic representative tasks from the LongOps use cases are expected to be demonstrated

WP3.4.2 – Development, supply, install, commissioning of a haptic training simulator system and/or components

Desired Skills

- Haptic rendering
- Physics simulation
- Virtual environment development
- Teleoperation
- Robotics

A portfolio of successful projects and achievements is expected from potential bidders.

Outputs

1. A virtual training / mock-up platform comprising simulated remote operations and haptic rendering.
2. A demonstration system comprising the virtual training / mock-up platform interfaced with a haptic physical device and visualisation of the simulated system.