COMMERCIAL APPLICATIONS OF SPACE-ENABLED ROBOTICS: HEALTH & SAFETY USE-CASES

Prepared by	ESA
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1. INTRODUCTION

This document lists the use cases to be used as part of the *Health & Safety* thematic area of the 'Commercial Applications of Space-Enabled Robotics' thematic call for proposals.

The use cases presented result from the cooperation between the European Space Agency (ESA) and key stakeholders in the health and safety sector. It aims to support the study and demonstration of services enabled by robotics and satellite technologies that are uniquely positioned to solve issues in these sectors.

When writing the initial proposal (APQ/Outline proposal), the applicant will make clear what use case(s) their solution will address.

2. HEALTH & SAFETY USE CASES

ESA and aforementioned key stakeholders have identified the below focus areas and use-cases within which space-enabled robotics may add value. Prospective bidders to this thematic call for proposals are invited to submit proposals addressing the below use-cases, or to submit alternative ideas based on their own research and knowledge.

2.1. European Emergency Number Association

EENA, the European Emergency Number Association, is a non-governmental organisation with the mission to contribute to improving the safety and security of the people. How can citizens get the best help possible if they find themselves in an emergency? This is the question EENA continuously tries to answer. As of writing, the EENA community includes 1500+ emergency services representatives from over 80 countries worldwide, 100+ solution providers, 100+ researchers and other stakeholders.

EENA have identified a series of areas of interest related to emergency services and Public Safety Answering Points (PSAPs) that may benefit from synergies between robotics and space technology/data. A Public-Safety Access Point (PSAP) is a specific call centre where the citizen's emergency communications are received and handled. The organisation of PSAPs

and first responders in each country are different and depending on the organisational structure and the type of each incident, the appropriate first responders are notified or dispatched. The overarching objective of each use-case is to enhance emergency response efficacy and efficiency to significantly improve response times, decision-making processes, and overall community resilience.

2.1.1. Real-Time Hazard Mapping and Evacuation Routing

During emergencies, such as floods and wildfires, there is a need for dynamic hazard maps to provide real-time situational awareness to first responders and information on safe evacuation routes for citizens and emergency personnel, alike. A combination of satellite data with ground-based sensors may enable the provision of data pertaining to hazard progression in given locations (e.g. flood levels, fire spread…). Such information would need to be shared with affected personnel through appropriate means such as personal devices and public displays, as applicable. Robotic systems could be deployed to aid in evacuation efforts by supporting mapping capabilities, especially in regions where human access is too risky or untenable.

2.1.2. Integrated Communication Networks for Emergency Response

There is a need to establish resilient, integrated communications networks to ensure available, uninterrupted communications during emergencies. This use-case foresees the deployment of satellite communications systems to back-up and augment terrestrial networks overwhelmed or rendered inoperable by disasters. This is to ensure that PSAPs remain in constant communication with emergency responders, government agencies, and the public, facilitating coordinated response efforts and disseminating critical information in real-time. Robotics may support such efforts through a cell-on-wheels or aerial cell tower concept. Equipped with satellite and mobile connectivity equipment, robotic systems could support in the automatic, temporary establishment of a ground-based or airborne cellular communications link when terrestrial connectivity infrastructure has been disrupted by disasters or saturation. Such robotic systems would leverage satellite communications for backhauling of data.

2.1.3. Smart Triage and Medical Assistance

During disasters and emergencies, robotic systems could be deployed to support preliminary triage and response efforts prior to the arrival of first responders on the scene. Further assistance from robotics could be beneficial, particularly to support those injured in areas that are dangerous and/or difficult to reach by first responders. This could come in the form of provision of relevant supplies to aid victims, and a means of communications (telemedicine) with remote medical personnel. The use of GNSS (Global Navigation Satellite Systems) and/or satellite communications would support tracking of the robotics solutions and transmission/reception of relevant data pertaining to the operational context.

2.1.4. Automated Emergency Dispatch and Management

This use-case is oriented around improving the efficacy and efficiency of detection and response to emergencies. Satellite data can aid in rapid detection of incidents (e.g. accidents, natural disasters) which can alert the nearest PSAP and help the PSAP operators assess if emergency response forces should be dispatched to the scene. This could lead to the PSAP considering automated dispatching options of drones for initial assessments and robotics for preliminary assistance, as needed. The goal is to enable a faster, more coordinated emergency response, minimising negative impacts on affected individuals and infrastructure.

2.2. Plug and Play U.K.

Plug and Play U.K. support leading corporations to explore and build innovation ecosystems in the UK and internationally. Through open innovation principles they expose their partners to the best most applicable startups and scale-ups with the goal to bring new technologies and business models into production. A number of key market drivers and trends have been identified by Plug and Play in the area of Robotics in Health, as per the below.

2.2.1. Patient Care and Rehabilitation

Increasingly elderly populations drive an increased demand for systems that can assist with daily living activities, enabling safer independence for those that require it. Robotics can assist with mobility, companionship, and medication management. Robotics are also currently in use to help with physical therapy and movement exercises in people living with chronic conditions

such as stroke, Parkinson's disease, and spinal cord injuries. AI-powered robots are able to offer personalised rehabilitation programs, adapting and learning from individual patient needs and responses, thus assisting more effective recovery.

2.2.2. Healthcare Logistics and Facility Management

Robotic workers can offer increased efficiency and automation of repetitive, time-consuming tasks such as medication dispensing, sterilisation, and transportation of medical supplies. Automated systems can also track inventory and order supplies, thus reducing shortages and waste. Finally, robots are being employed in certain areas to support staff and assist in facility maintenance, including site upkeep, cleaning and disinfection, improving hygiene, and reducing overall risk of healthcare-associated infections, which can significantly impact recovery times.

2.2.3. Remote Healthcare and AI Integration

AI can have a significant impact upon improving access to healthcare, particularly to remote and underserved areas, via the expansion of telemedicine, assisting in remote consultations, and diagnostics. AI-driven robots can automate diagnostic processes such as image analysis and medical record data, providing significantly faster and more accurate data analysis for healthcare professionals to assist them in rapid decision making. Additionally, AI-equipped robotic systems in home healthcare can provide continuous monitoring, assist with daily tasks, and offer emergency alerts, improving patient care and reducing hospital readmissions.