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Human Robotic Partnerships for Exploration (04)
Human Robotic Exploration Partnership (1)

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A HUMAN-ROBOTIC PARTNERSHIP ASSESSMENT FOR THE GLOBAL EXPLORATION STRATEGY

Abstract

To advance the Global Exploration Strategy, the International Space Exploration Coordination Group (ISECG) has released a roadmap that articulates the perspectives of participating agencies on exploration goals and objectives. This roadmap proposes two exploration scenarios, and features a step by step build-up of deep space and lunar exploration infrastructure and capabilities, with the goal of ultimately landing humans on Mars. The scenarios have been defined at a very high level, and currently, the International Architecture Working Group (IAWG), working under the direction of the ISECG, is preparing a more detailed version of the scenarios, eventually leading to a clearly defined sequence of Design Reference Missions (DRMs).

To support this IAWG work, an international team of robotics and servicing specialists – the RSWG - has been created to advise the IAWG on the potential benefits of, and uses for, robotic technologies within the scope of this international exploration endeavour. One of the aspects to be considered is the tradeoff and benefit of using robotic and servicing technologies to enhance the capabilities of humans, and in particular, how, when and where to best take advantage of the synergies between human capabilities and corresponding robotic technologies. This paper presents the methodology selected by the team to conduct the human-robotic partnership benefit analysis.

The team chose to make the assessment through a detailed mapping process of robotic functionalities or tasks in the various phases (both manned and unmanned) of the international exploration scenarios. A set of basic robotic functionalities was identified and evaluated by focusing on their potential to facilitate or even enable the activity, to support crew, and to reduce crew involvement in preparatory, servicing or risky tasks at a specific stage of the exploration scenarios. Using the evaluation scheme, the team performed an in-depth analysis of all functions at each stage of the exploration scenarios. The resulting analysis allows to compile and to rank the merit of the robotics application across all stages of the scenarios to determine the key functions for which the robotic and servicing technologies promise the most significant benefits to the human exploration of space. The paper provides an in-depth view of the RSWG working methods along with preliminary results in support and preparation of the international architecture and mission scenarios for the second iteration of the Global Exploration Roadmap.