IAF SPACE EXPLORATION SYMPOSIUM (A3)
Mars Exploration – missions current and future (3A)

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MARS EXPLORATION: AN APPROACH FOR INTERNATIONAL PARTNERSHIPS WITH EMERGING SPACE NATIONS

Abstract

NASA, ESA and JAXA have a strong history of successfully collaborating with other countries in space science and exploration. Payload science teams often offer opportunities for international members, and the established agencies regularly contribute instruments and subsystems to each other's missions. These partnerships can enhance scientific outcomes, promote interoperability, and leverage global capabilities. For emerging space exploration nations such as Australia, designing and conceptualizing an end-to-end exploration mission is currently out of reach, and identifying suitable partnership models with established agencies to lower the barrier to entry can be challenging.

However, many emerging space nations, including Australia, have identified specific technological strengths that could meaningfully contribute to international space science and exploration efforts. In 2018, Australia's national science agency, CSIRO identified several key technologies from terrestrial sectors that could be applied to planetary missions, including resource characterization and manipulation, and autonomous systems. Through the International Mars Exploration Working Group (IMEWG), CSIRO has worked to demonstrate these technological strengths to NASA, ESA and JAXA and collaborate on their applicability to space exploration.

In order to effectively utilize these technologies and focus future developments, a reference mission architecture was required to provide a strategic framework with high-priority Mars science objectives. In response to this need, teams from CSIRO, NASA, ESA, and JAXA collaboratively developed a process based on design reference missions (DRMs) to identify the underlying science and engineering required to drive coordinated efforts toward a coherent and specific space application. The paper describes the key steps in this process, which include:

1. Identification of national technology strengths in an Australian context
2. Interaction with established agencies to align technologies with science and exploration goals
3. Results of the DRM study performed in collaboration with Team-X at NASA JPL

For emerging space nations, collaboration can bring Mars exploration closer. The methodology represents an innovative approach to fostering meaningful partnerships between established and emerging agencies to achieve significant scientific impact in future planetary missions.