

SPACE EXPLORATION SYMPOSIUM (A3)
Space Exploration Overview (1)

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INCREASING SYNERGIES BETWEEN HUMAN AND ROBOTIC EXPLORATION MISSIONS AS
ENVISIONED IN THE GLOBAL EXPLORATION ROADMAP**Abstract**

Human exploration of the solar system will proceed in a step-wise manner that builds on the capabilities supporting ongoing human spaceflight programs such as the International Space Station and the Chinese space program. Exploration missions will allow agencies to advance their capabilities to meet individual and common goals and objectives. Space exploration goals and objectives reflect the reasons why we choose to explore space with humans, bringing benefits to people on Earth. Robotic capabilities not only prepare the way for future human missions, but maximize the impact of human explorers. Building on this natural synergy is important and was strongly supported by government representatives at the International Space Exploration Forum, held 9 January 2014 in Washington, DC. In its updated Global Exploration Roadmap (GER), the participating agencies of the International Space Exploration Coordination Group (ISECG) demonstrate their commitment to defining and implementing meaningful steps towards advancing human and robotic mission integration.

In the work planned in 2014, ISECG has established several priorities for increasing synergies between human and robotic missions. Participating agencies continue their human spaceflight road-mapping activity with particular focus on advancing the definition of the near-term missions in the lunar vicinity and concepts for accessing the lunar surface. The three mission themes each provide concrete opportunities for human and robotic collaboration: (1) Exploration of a Near-Earth Asteroid, (2) Extended Duration Crew Missions and (3) Humans to the Lunar Surface. This paper will describe work to advance the definition of each mission theme and focus on the roles of and approaches for robotic and manned activities. Agencies hope that collaborative discussions within ISECG contribute to the realization of these opportunities. Among the concepts to be discussed are:

- Human-assisted sample return: using the presence of crew in the lunar vicinity to return samples of asteroids, the Moon and Mars;
- Expanding the global understanding of the nature, distribution and usability of lunar polar volatiles;

In addition to the technical work of ISECG, the paper will discuss the importance of increasing human and robotic mission synergies in order to win government support and funding to advance space

exploration goals. Lastly, the paper will also take the opportunity to share the status of space agencies' stakeholder engagement activities and an outlook for future update of the GER.