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INTERNATIONAL MISSIONS TO LUNAR VICINITY AND SURFACE - NEAR-TERM MISSION SCENARIO OF THE GLOBAL SPACE EXPLORATION ROADMAP

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The *International Space Exploration Coordination Group* (ISECG) was established in response to "*The Global Exploration Strategy: The Framework for Coordination*" developed by fourteen space agencies[1] and released in May 2007. This GES Framework Document recognizes that preparing for human space exploration is a stepwise process, starting with basic knowledge and culminating in a sustained human presence in space.

ISECG has published in August 2013 the 2nd iteration of the Global Exploration Roadmap[2] (GER) and space agencies' focus since then on expanding the definition of the near-term mission scenario (see IAC-13.B3.1,8x16946 and IAC-14,B3,1,10,x22313). Near-term missions in the time-frame up to 2030 target the lunar vicinity and lunar surface. The work of space agencies participating in ISECG focuses in particular on

[1] In alphabetical order: ASI (Italy), BNSC – now UKSA (United Kingdom), CNES (France), CNSA (China), CSA (Canada), CSIRO (Australia), DLR (Germany), ESA (European Space Agency), ISRO (India), JAXA (Japan), KARI (Republic of Korea), NASA (United States of America), NSAU (Ukraine), Roscosmos (Russia). "Space Agencies" refers to government organizations responsible for space activities.
[2] The GER is non-binding, but expected to serve as important input to individual agency decision making, enabling agencies to assess their near-term investments in view of their future role in and contribution to a long term global exploration endeavor. For more information on the ISECG please consult the ISECG website at www.globalspaceexploration.org or contact the ISECG Secretariat at: isecg@esa.int.

- Technical and programmatic definition of extended duration crew missions in lunar vicinity, enabled by an evolvable Deep Space Habitat (eDSH) deployed in lunar vicinity, starting early next decade. These missions are considered as a common strategic step towards enabling human lunar surface missions and preparing human missions to Mars.
- Defining innovative mission concepts leveraging on the presence of humans and a human-tended infrastructure in lunar vicinity and robotic elements on the surface of the Moon. These missions are driven by the goals to advance lunar exploration goals, to prepare for later human lunar surface exploration missions and to demonstrate technologies critical for the implementation of a Mars sample return mission.
- Engaging the global science community for articulating the unique value of humans for advancing exploration goals and identifying opportunities that are enabled by humans and the human-robotic partnership in space for advancing science.
- Coordinating agencies' and private sector driven efforts for increasing the knowledge about lunar volatiles and the use of planetary volatiles as in-situ resource for exploration.
- Assessing space agencies' technology development plans and roadmaps for identifying near-term technology gaps for implementation the near-term mission scenario as well as technology gaps related to the implementation of human Mars missions.

This paper will summarise the status of the definition of international Design Reference Missions (DRM's) targeting lunar vicinity and lunar surface. It will in particular highlight the value of these missions for advancing the implementation of the Global Exploration Roadmap and identify opportunities for international cooperation. The publication of the 3rd iteration of the GER is not planned before spring 2017, but this paper will provide early insights into envisaged updates of the GER.

INTRODUCTION

The mission scenario of the ISECG GER includes three different mission themes, all considered useful steps on the pathway to enabling human Mars exploration, the common long-term goal of the ISECG participating space agencies.

1. Exploration of a Near-Earth Asteroid – robotically deflecting an asteroid to enable its exploration in the lunar vicinity to demonstrate advanced electric propulsion, crew transportation and operation capabilities. This mission theme responds to a NASA initiative and includes opportunities for partnership.

2. **Extended Duration Crew Missions** – long-duration missions in the lunar vicinity for advancing deep space exploration capabilities and creating innovative opportunities for exploration of the Moon through a human robotic partnership. This mission theme represents a step which is achievable in the near-term and is critical for advancing the development and demonstration of capabilities for future exploration missions targeting the Moon and deep space. The interest in and potential to realise this mission theme is currently assessed within the ISS partnership.

3. Humans to the Lunar Surface – missions to the lunar surface providing opportunities to address lunar exploration objectives benefiting from human presence on the surface and advancing habitation, mobility and other planetary exploration capabilities. Many agencies consider Moon surface as a near-term destination for humans and consider such missions as an essential step in preparation for human Mars surface missions. Lunar missions have been studied individually and collectively by ISECG participating Agencies, for several years. Space agencies participating to ISECG are working on consolidating the definition of this mission theme.

The GER describes how these missions prepare for human Mars exploration through demonstration of critical capabilities, technologies, operational concepts as well as by driving enabling research on human health and performance in deep space.

An integrated interim status report on progress achieved in defining all three mission themes has been provided at the IAC 2014 [Ref. 1]. Since October 2014, significant progress has been achieved:

- By NASA in the definition of the Asteroid Redirect Mission (ARM) concept.
- By the ISS partnership in assessing optional implementation scenarios for realising the extended duration mission.
- By agencies participating in ISECG in assessing robotic and human lunar surface mission scenarios enabled by a habitat placed and operated in cis-lunar space.

This paper recalls briefly progress achieved in defining the first two mission themes and then provides a more articulated description of robotic and human lunar surface missions enabled by an eDSH.

ASTEROID REDIRECT MISSION

NASA continues the work to formulate the Asteroid Redirect Mission. This mission encompasses a robotic mission to rendezvous with a large asteroid in its native orbit and a follow-on human mission to explore the asteroid material. The robotic spacecraft will remove a large boulder from the surface of the asteroid. While in the vicinity of the asteroid, the robotic spacecraft will also collect data on the asteroid and test techniques which could be used in the future to deflect a large asteroid on a possibly dangerous near-Earth trajectory. The robotic spacecraft will transport the boulder to a stable orbit near the Moon. Soon after, an astronaut crew will visit the asteroid with Orion to explore, sample and return samples to Earth. The astronaut crew will also perform assessment of the resource potential of the asteroid material and therefore asteroids like it.

In the last year, NASA has significantly advanced mission formulation activities. NASA has completed a thorough assessment of robotic mission capture options and selected a preferred approach. This approach has been developed and its feasibility established through a Mission Concept Review. As a result, the project was given approval to proceed into Phase A.

Testing of mission concepts and hardware continues in order to reduce development program risk and uncertainty. For example, a capture module prototype has been constructed and is being evaluated.

A key objective of the Asteroid Redirect Mission is to demonstrate solar electric propulsion. Advances on the current state of the art have been demonstrated, towards the kind of system needed for human space exploration architectures. A ‘request for proposals’ associated with development of the solar electric propulsion system for the Asteroid Redirect Mission has been released.

NASA remains open to international and commercial partners interested in the mission and/or opportunities enabled by the mission. Discussions with potential international and commercial partners are ongoing.

The Asteroid Redirect Mission demonstrates how the availability of capabilities for human exploration beyond low-Earth orbit will provide the opportunity to address challenges faced by humanity. It also provides the chance to demonstrate and advance some of the technologies and techniques which will be required for implementing future missions depicted in the GER.

EXTENDED DURATION CREW MISSIONS IN LUNAR VICINITY

In this mission theme, extended crew presence in the lunar vicinity focuses on advancing the systems and techniques needed for exploration beyond the Earth-Moon system. As a community, we understand the risks of human operation in low-Earth orbit and we have demonstrated techniques for mitigating these risks. However, as humans venture further form Earth, the environment is different – harsh radiation environment, long distance from Earth and such. Long-duration missions of crew in the lunar vicinity provide an excellent opportunity for advancing deep space exploration capabilities and creating innovative opportunities for exploration of the Moon. These missions provide the opportunity to advance a human robotic exploration partnership through using the unique capabilities of humans and their infrastructure to advance robotic mission objectives. The missions also provide a platform for accessing the lunar surface in a manner similar to staging for future Mars exploration missions, therefore taking a concrete step towards preparing for human lunar surface access in a manner which is affordable and enables investments to inform future exploration systems in a long term program which is sustainable and affordable.

This set of missions relies on the delivery of the eDSH – a prototype habitat for the next generation of habitats which will be the core of human exploration spaceships, designed to explore beyond the Earth-Moon system including Mars. The habitat builds on ISS expertise, capabilities and lessons learned, so the ISS partners are developing concepts to enable these missions. These concepts deviate from ISS approaches to habitation systems. Where ISS focuses on a rack based habitation system, the next generation evolvable deep space habitat will accommodate easy 'plug and play' of evolved subsystems because of international standards associated with power and data interfaces. As systems such as CO_2 removal systems which are reliable and efficient are validated on the ISS, they will be delivered to the prototype evolvable deep space habitat for use beyond low-Earth orbit. In this way, next generation habitation layout and architecture considerations, as well as subsystem equipment, can be tested for the trials of long duration missions beyond the Earth Moon system.

A series of crewed missions to the eDSH are envisioned, starting early next decade. The Orion and a future Russian crew exploration system will provide the chance for crew to visit this prototype spaceship once or twice a year. While advancing habitation systems for missions beyond the Earth-Moon system, the crew will oversee the evolution of the spaceship to serve as a staging post for crew access to the lunar surface.

EDSH ENABLED LUNAR MISSIONS

The development, deployment and operations of the eDSH provide new and innovative opportunities for realising robotic and human lunar surface mission. A phased approach of an eDSH enabled robotic and then human lunar surface missions is described below. In the first phase surface robots would be tele-operated by crew based off the eDSH. Implementation of this mission would prepare the human lunar surface missions implemented in the second phase. These missions, with minimum required impact on the habitat design and concept of operations, strongly leverage on the existence of humans and a human infrastructure in cis-lunar space.

The GER mission scenario has been driven by the definition of common principles and goals. A whole chapter of the GER is dedicated to common goals and clear principles related to affordability, exploration value, international partnerships, capability evolution, human-robotic partnership, and robustness are articulated in the mission scenario chapter of the GER. The same approach has been applied for the definition of the lunar surface missions. Driving principles valid for both mission scenarios are listed below and mission specific principles and goals are described further below.

- Use the unique value of astronauts on the lunar surface and in lunar orbit for advancing goals of lunar, fundamental, and applied science.
- Optimise the role of robotic elements for achieving lunar exploration goals cost-effectively and ensuring safety of the astronauts.
- Limit lunar surface infrastructure to what is necessary to achieve priority lunar exploration goals.
- Prepare for Mars surface exploration and maximise synergies between lunar and Mars surface campaigns.
- Define a modular surface architecture which maximising opportunities for international partnership.
- Provide dissimilar redundancy for critical functions on the lunar surface.

The status of definition of the two mission phases is described below.

<u>Phase 1: Tele-Operated Surface Robots</u>

The definition of the phase-1 mission scenario has been driven by the following additional driving principles and mission goals agreed by ISECG participating agencies:

Driving Principles

- Achieve balance of the mission goals;
- Thrive for minimum complexity in the overall mission architecture ;
- Advance and demonstrate human-robotic partnership;
- Maximise cooperation opportunities building on previous investments of partners;
- Provide opportunities for private sector services.

Mission Goals

- Prepare human lunar surface exploration.
- Provide unprecedented opportunities for knowledge gain in science and exploration
- Identify opportunities to prepare future missions to return samples from Mars

ISECG participating agencies, led by ESA, have initiated in 2014 the Human Enhanced Robotic Architecture and Capability for Lunar Exploration and Science (HERACLES) study process with the ambition of defining a common Design Reference Mission for these phases. The study focuses on designing a system of elements (“system of systems”), an operational concept, and a campaign of multiple robotic missions to the lunar surface.

In this architecture, the robotic landing elements are launched towards cis-lunar space, potentially assembled, landed on the lunar surface (tele-operated or automated), and then tele-controlled by crew from the eDSH. For the optional return of samples it is foreseen to deliver them to the eDSH, so that they can return to the Earth on board the crewed vehicle that also carried the tele-operating crew to the eDSH. After the return to Earth, the automated ascent stage and the surface robotic rover are reused for follow-on missions, for which a new landing stage is required (see Figure 1 for mission profile).

The architecture includes the following key elements:

- A Lunar Ascent Element (LAE) controlling the descent and providing propulsion for ascent, transfer, and docking with eDSH.
- A Lunar Descent Element (LDE) providing propulsion for descent and payload capacity for a robotic rover or user-driven research.

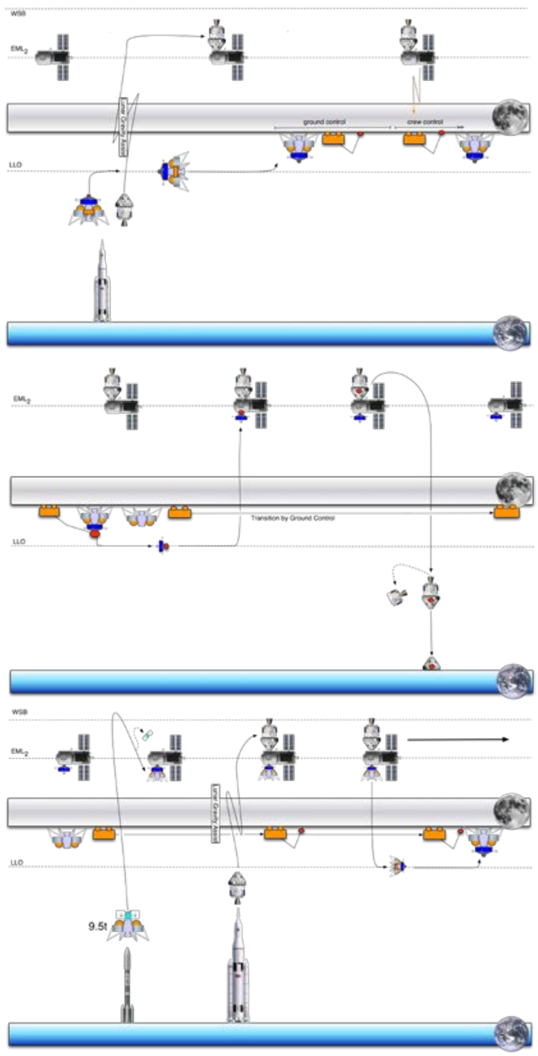


Figure 1: Mission profile for establishing recurring, reusable, tele-operated surface capability. The sequence of launch, landing, surface sampling, ascent, to return followed by assembly and reuse is shown left to right top to bottom.

- A Surface Mobility Element (SME, "rover") providing mobility and robotic dexterity on the surface, as well as payload capacity for user-driven research.
- An In-Space Sample Preservation Element (ISSPE, “sample container”) providing mechanical, thermal, environment, contamination protection for samples.
- A SerVice Module (SVM, “tug”) providing orbital and attitude control for replacement descent stages.
- A Tele-Operations Element (TOE) providing operational capability to control the rover and lander on the lunar surface.
- A remote manipulator system providing robotic support for vehicle berthing and assembly.

Together the LAE, LDE, SME, and ISSPE form the surface element that was sized to a wet mass of 10,000 kg considering launch options on a future European mid-sized launcher or as co-manifest on the NASA Space Launch System. In the dedicated launch scenario long duration weak stability boundary transfers are exploited in order to maximise the payload mass, while the co-manifest launch assumes a direct transfer with Lunar Orbit Insertion (LOI) to Low Lunar Orbit (LLO).

LAE

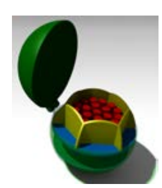
- Lander avionics “brain”
- 6kN ascent engine
- Reusable
- 610 kg system dry mass
- 25 kg up-mass capability

LDE

- 30 kN high-thrust descent propulsion
- Volume for 500 kg user payload/SME
- 3,500 kg landed mass
- 1,500 kg system dry mass

SME

- More than 1y life
- ~ 100km range
- 5 km h-1 speed
- Optimised as tele-operated exploration tool
- 500 kg system dry mass



ISSPE

- Optimised for sample quality and preservation
- Similarity to Mars sample return
- 1 kg cryo sample capability
- 2h of autonomous operations

Figure 2: Surface elements of the tele-operated architecture.

Another part of the study addresses the definition of candidate surface activities that address the mission goals and objectives. For the purpose of defining further these activities, an example campaign was defined that addresses the top-priority lunar exploration science objectives (NRC, 2007) based on detailed work by D. Kring et al., (2015) and Foing et al., (2015). The reader should note that the architecture is capable of supporting other mission campaigns than the one described below, globally on the lunar surface.

The tentative campaign of four HERACLES missions to the lunar surface comprises of four landings, three of which to occur along a 238 km long traverse of the SME in the Schrödinger basin, and one in the South polar region with a landing in Amundsen crater.

In the four missions, the architecture elements described above are operated in a manner mimicking a human mission, so that relevant technology and operations elements (propulsion system, GNC, rendezvous, surface mobility operations, surface sampling operations) can be flight tested prior to implementation in the human architecture of phase 2. The returned samples (between 4 and 40 kg depending on the level of preservation requirements for the samples) serve multiple objectives:

1. Laboratory analysis of well-selected samples yields data on lunar and solar system chronology, geochemistry, and geophysics.
2. The resource potential of pyroclastic deposits and potentially volatile content can be characterised.
3. Samples can act as test agents to certify lunar surface systems for long duration operations.

Due to the similarity of operations and technologies of the HERACLES architecture with systems that are foreseen for returning samples from Mars, the use of these systems provides lessons learned for the design of these missions in the form of technology advancement (GNC, propulsion), operations (rendezvous, sample handling), and infrastructure (sample curation).

In summary, the benefits of the architecture as studied are:

- Preparation of human exploration of the Moon (technology, concept of operations, reusability, and partnership);
- Opportunity to create path of system evolution from unmanned to crewed system (ascent stage, descent stage, and rover);
- Re-use of elements in human lunar surface architecture (LDE as cargo lander, SME as scouting rover);
- Knowledge gain in science and exploration addressing the priority objectives of lunar science [Ref. 2, Ref. 3];
- Recurring, global access to lunar surface: 500 kg down-mass for user-driven payloads, 25 kg up-mass to eDSH.
- Additional utilisation scenario for eDSH.

Phase 2: Human Lunar Surface Missions

ISECG participating agencies have already studied since some years DRM's for human lunar surface missions. Starting in 2013, work focused on defining a transportation architecture using the eDSH as a staging post. Ref. 1 reported the perceived benefits of such staged transportation architecture, the trade-space analysed as well as shared principles driving the work on a human lunar surface campaign. Current study activities are driven by the goal to narrow down the large trade space focusing on:

- **eDSH Location:** the GER mission scenario foresees a staged transportation architecture for human lunar surface exploration with the eDSH acting as staging post. Six possible eDSH locations have been considered, namely low lunar orbit (LLO), Earth-Moon Lagrange point 1 (EML1), Earth-Moon Lagrange pint 2

(EML2), Lunar Distant Retrograde Orbit (DRO), Lunar Near-Rectilinear Orbit (NRO) and high Lunar orbit (HLO). The different locations were traded against the necessity to be reachable by the Orion already with the first missions, the need to reduce as much as possible the orbit maintenance and the attitude control manoeuvres, and increase the affordability of the overall transportation architecture (e.g. enabling a 4 crew lunar lander to be launched and transferred to the e-DSH using a single SLS cargo launcher, facilitating a multiple-agency participation to the transportation architecture).

- **Crew Size**: different crew sizes (2, 3, and 4) were traded against the necessity of attaining technically and scientifically meaningful surface exploration missions, increasing opportunities for astronauts from all partner countries to engage in exploration, and maximizing the return on investment of the surface exploration campaign.

- **Launch Vehicles**: affordability considerations led to the conceptualization of a lunar lander capable to be launched and transferred to the e-DSH using a single SLS cargo launcher. In addition, the e-DSH location has been traded in order to facilitate international cooperation on transportation architecture (i.e. allowing logistic services using non-heavy lift launchers).

- **Lunar Surface Mission Duration:** different mission durations (7, 14 and 28 days) have been evaluated in light of the lunar surface mission goals and the necessary infrastructure to be deployed in order to sustain the human presence on the Moon.

- **Lunar Surface Infrastructure**: the concurrent need to advance lunar exploration objectives, demonstrate Mars-forward capabilities, and maintain the surface campaign affordable, led to investigations of different surface infrastructure solutions (i.e. un-pressurized rovers, pressurized rovers, movable outpost, and fixed outpost)

- **Lunar Lander Technical Solutions**: technical aspects like type of propulsion (e.g. storable bipropellants, LO2-CH4, LO2-LH2) or stage solutions (i.e. one, two, and three stage landers) have been analysed in order to satisfy the previously mentioned constraints and maximize the lunar surface payload delivery capability.

- **Operational Aspects:** aspects such as reusability, in-space operations (i.e. refuelling or spacecraft assembly), spacecraft delivery strategies, and in-orbit maintenance are currently investigated to better quantify the benefits of the selected staged architecture.

The presently selected reference architectures, satisfying the previously mentioned strategic considerations, can be briefly summarised as follows:

<u>Transportation Architecture</u>: The staged architecture envisions the e-DSH orbiting a NRO around the Moon and a dual stage lunar lander capable to land on the Moon surface with a crew of four astronauts. The storable lunar lander ascent stage will be reused multiple times via maintenance and refuelling, while the LOX-CH4 Descent Stage will be disposed after every mission and replaced by a new element delivered by an SLS Block 1B launcher.

<u>Surface Architecture</u>: 5 surface missions targeting different locations and having a duration of 28 days are envisioned to demonstrate habitation capabilities and maximize scientific return. Pressurized rovers capable to autonomously relocate (or be relocated) during un-inhabited periods are selected to sustain the human presence on the Moon and validate extended mobility

capabilities needed during future Mars missions.

Figure 3 provides a notional overview of the mission profile. Other options are also considered (e.g. launch of human-rated lander as an integrated stack and separate delivery of logistics).

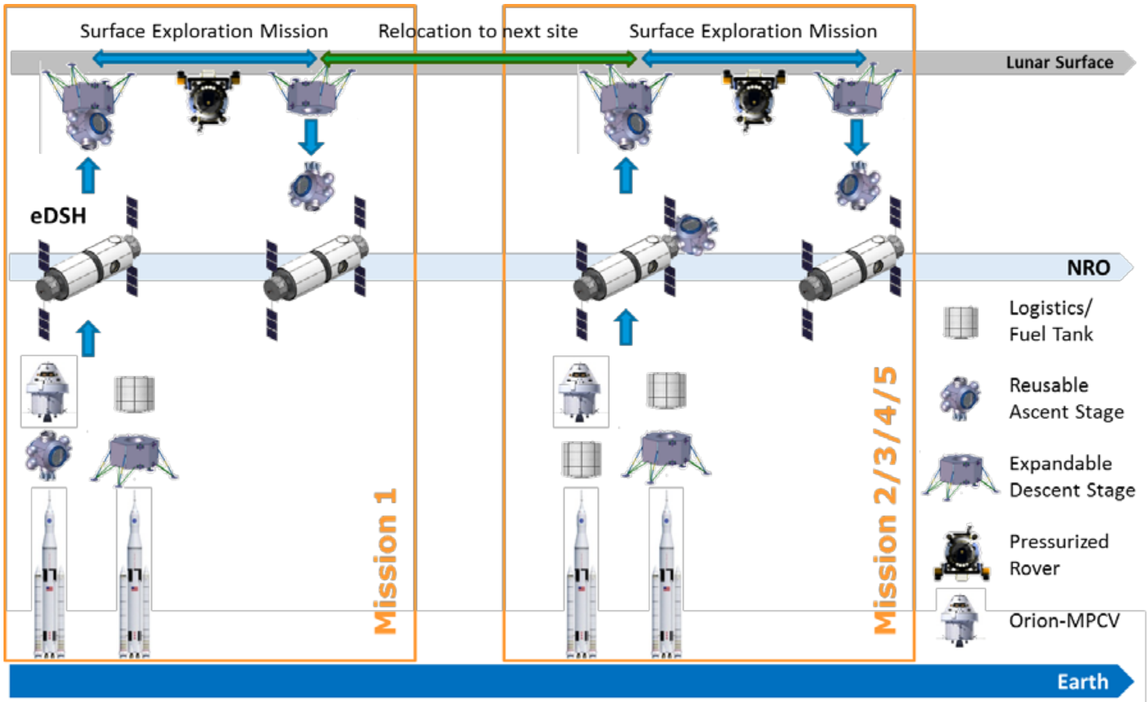


Figure 3 – Notional Profile for Human Lunar Surface Missions

Key architecture elements' characteristics are summarized below.

Human Lander

Dual stage spacecraft having a total mass of about 40 t and made by:

Reusable Ascent Stage

- Capable to sustain a crew of 4 astronauts for 5 days;
- Capable to perform the ascent and rendezvous and docking manoeuvres with the eDSH ;
- Reusable up to 5 times via maintenance and refuelling;
- Storable, bi-propellant propulsion system ;
- Designed to be launched by an SLS heavy lift launcher.

Expandable Descent Stage

- Capable to autonomously perform descent phase and propulsive soft landing on the lunar surface carrying a payload of about 12 to 13 t;
- LO2-CH4 propulsion system;
- Designed to be launched by an SLS heavy lift launcher.

Pressurised Rovers

- Each capable to support 2 crew members for up to 28 days;
- Capable to autonomously relocate (or be relocated) from a landing site to the next during un-inhabited periods;
- Designed to be softly landed on the lunar surface by the Expandable Descent Stage;
- ECLSS Open loop with partial regeneration of resources (i.e. CO_2).

<u>Notional surface campaign</u>
Taking into account several Exploration themes: science, Mars forward, living off the land, and public engagement and partnerships, several strategies for a surface campaign were considered in order to satisfy key common, and at times, competing objectives.

In addressing the question of affordability, it was determined that a feasible approach to maximise the use of surface assets would include relocating them to various landing sites. This approach focused on early exploration of the South-pole region and expanding the exploration distance with each subsequent mission.

To understand the implications of such a strategy, five proposed sites (shown in Fig. 4) of diverse scientific interest were identified:

1. Malapert Massif (85.99°S, 2.93°W)
2. South Pole (89.3°S, 130.0°W)
3. Schrödinger Basin (75.40°S, 138.77°E)
4. Antoniadi Crater (69.7°S, 172.0°W)
5. South Pole Aitken Basin Interior (60.0°S, 159.9°W)

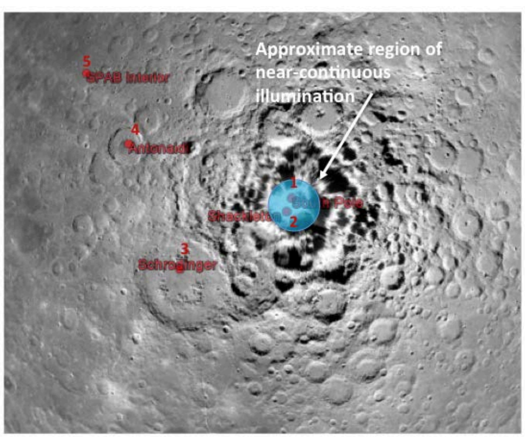


Figure 4: Notional Selection of Landing Sites for Human Missions

The vast majority of the lunar surface will experience typical lunar day/night cycles (~14 days of illumination followed by ~14 days of eclipse). However two of our sites receive far more than 50% illumination, thus enabling surface exploration. Similarly our sites are located close to multiple locations that are permanently shadowed, and could contain volatiles, a potential resource. Site 1, Malapert Massif, is a local topographic high that results in enhanced amounts of illumination around midsummer. Site 2, located on a ridge emanating from Shackleton crater, near the South Pole, contains several of the most illuminated locations on the Moon. Studies show that modest mobility would permit experiencing constant illumination lasting several months during the lunar summer. Sites 3-5 will experience the typical ~14 day cycles, but site 3, Schrödinger basin, contains multiple small craters that are permanently shadowed.

In addition to the elements/capabilities describe previously, the following were identified as being required for 28 day missions to all 5 sites:

- Large power storage or non-solar power generation;
- Thermal kits for SPRs;
- Updated EVA suit (thermal) for eclipse operations
- External lighting for EVA assistance.

While this strategy has been identified as feasible and potentially balanced way to satisfy multiple objective and constraints, it will continue to be refined as the GER roadmapping continues.

KEY TECHNOLOGY GAPS

Key technology gaps in relation to extended duration crew missions in lunar vicinity and the robotic and human lunar surface missions, include, but are not limited to:

- Autonomous Vehicle Systems Management;
- Crew Autonomy beyond LEO;
- Dust Mitigation;
- Fire Prevention, Detection & Suppression (reduced pressure);

- High Reliability Life Support Systems;
- Low Temperature Mechanisms
- LOX/Liquid Methane Cryogenic Propulsion System ;
- Lunar Surface Space Suit (Block 2);
- Precision Landing & Hazard Avoidance;
- Space Radiation Protection – Galactic Cosmic Rays (GCR);
- Space Radiation Protection – Solar Particle Events (SPE);

ISECG participating agencies have initiated a focused technical exchange addressing the domain of dust mitigation and LOX/Liquid methane cryogenic propulsion system. The goal of this exchange is to assess the technical gaps in more detail and identify opportunities for cooperation for closing these gaps.

FORWARD WORK

ISECG participating agencies will further advance the definition of the DRM's described above with the goal to include a high-level description of these DRM's into the next iteration of the GER. This 3rd iteration is planned to be published in spring 2017. For advancing this work, special attention will be paid to the

- Feedback received from the global science community on opportunities for advancing science objectives through these mission scenarios;
- The role of these mission for fostering multi-lateral partnership for space exploration, including institutional and private sector entities. And allowing partner to play consistent roles on the pathway to Mars.
- Optimisation of the DRM's with a view to contributing to advancing toward the common long-term goal of human Mars exploration.
- Any other feedback received from the global stakeholder community.

CONCLUSIONS

ISECG participating agencies continue their common road-mapping activity and progress is made toward the definition of common DRM's. While the next iteration of the GER is not expected before spring 2017, opportunities will exist in the 2015 and 2016 for stakeholder communities to get engaged with ISECG participating agencies to contribute to further refining a sustainable path towards human exploration. For following the work of ISECG and related stakeholder engagement opportunities please consult the ISECG website at http://www.globalspaceexploration.org/wordpress/.

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