CENTRO DE ASTROBIOLOGÍA
ASOCIADO AL NASA ASTROBIOLOGY INSTITUTE

SEVENTH FRAMEWORK PROGRAMME

The Moonwalk Project: Preparing for Human Supported Science on Mars and the Moon

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Abstract

The final goal of the Global Exploration Roadmap from the International Space Exploration Coordination Group is the development of sustainable human missions to explore other planets and moons. While current rover missions are greatly expanding our knowledge on Mars habitability, manned exploration will provide unprecedented opportunities for in-situ science and sample retrieval. MOONWALK is a project funded by the European Union FP7 programme (Grant Agreement 607346) with the aim of creating in Europe the capability of simulating EVA Activities, as well as studying scenarios for Astronaut – Astronaut and Astronaut – Robot cooperation for surface exploration. All this technology will be tested and validated by field campaign simulations for low gravity (under sea water in Marseille, France) and a full astrobiological campaign to the Rio Tinto (southwestern Spain) Mars analogue. We have designed several scenarios that could occur in an actual manned mission to Mars. The scientific operations will include geomineralogical mapping and in-situ surveys by robot-portable Raman spectroscope, and EVA tasks will be carried out by cooperation between an astronaut and a robot assistant. Samples will be taken back to a planetary habitat simulator to be analyzed by a life detection instrument platform (Signs Of Life Detector, SOLID). The integration of geomineralogical and astrobiological data, together with orbital signatures, will allow the scientific team to formulate hypotheses on the past and present habitability of the selected sites, and determine the best candidates for a hypothetical sample return to Earth for further analysis.

Localizations

Subsea Marseilles lunar analogue site
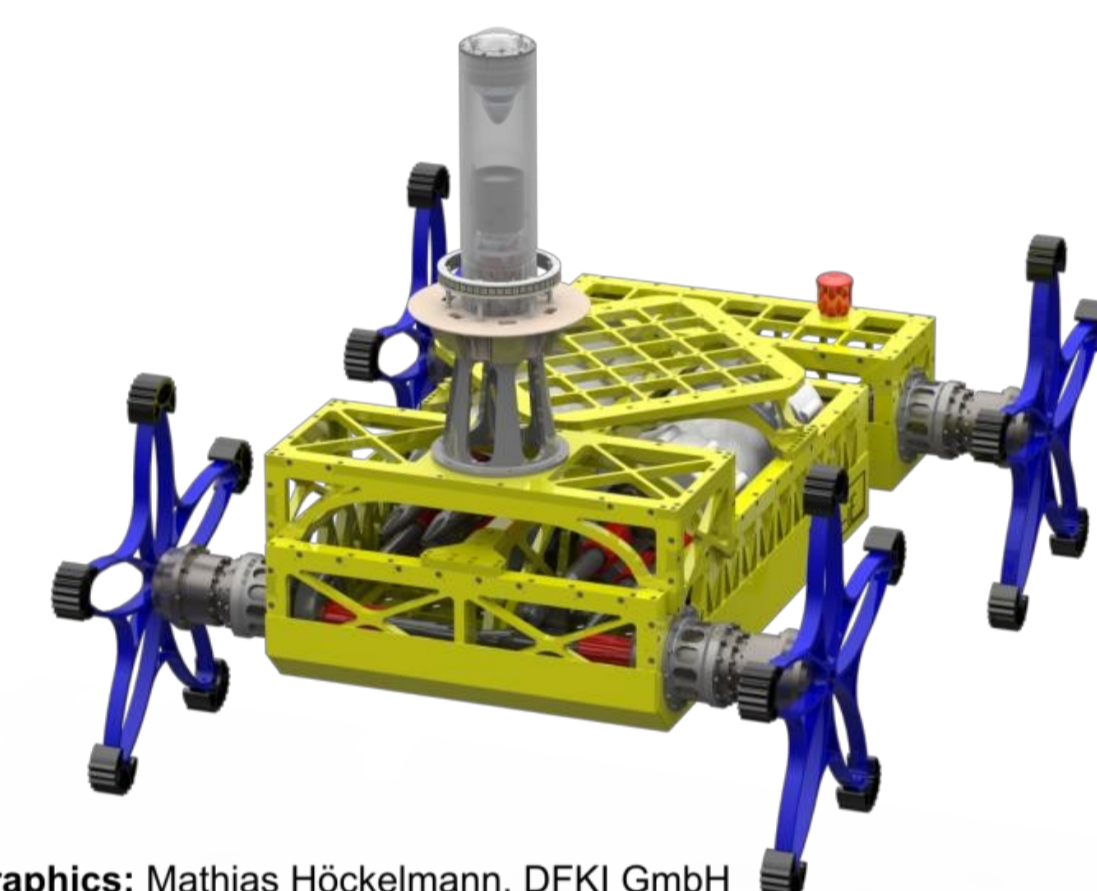EVA simulation in reduced gravity (1/6 th G) on a sediment plain.
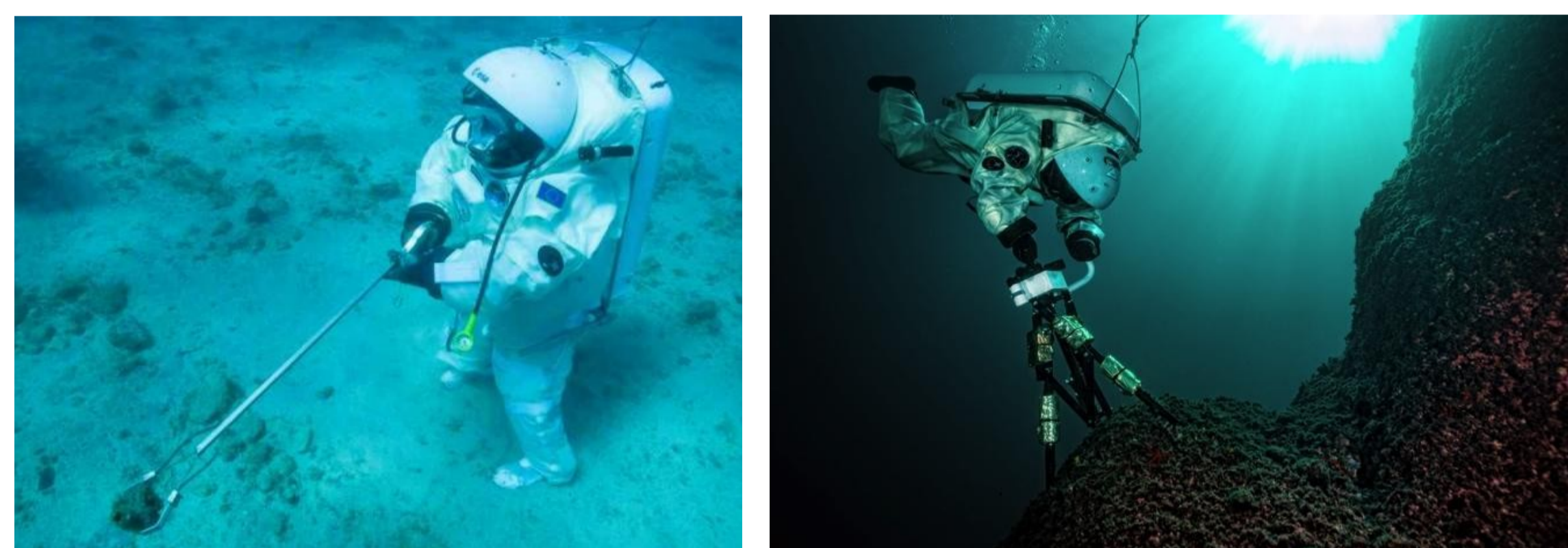
Rio Tinto Mars analogue site
Rugged terrain and landscape as analogue for Mars.
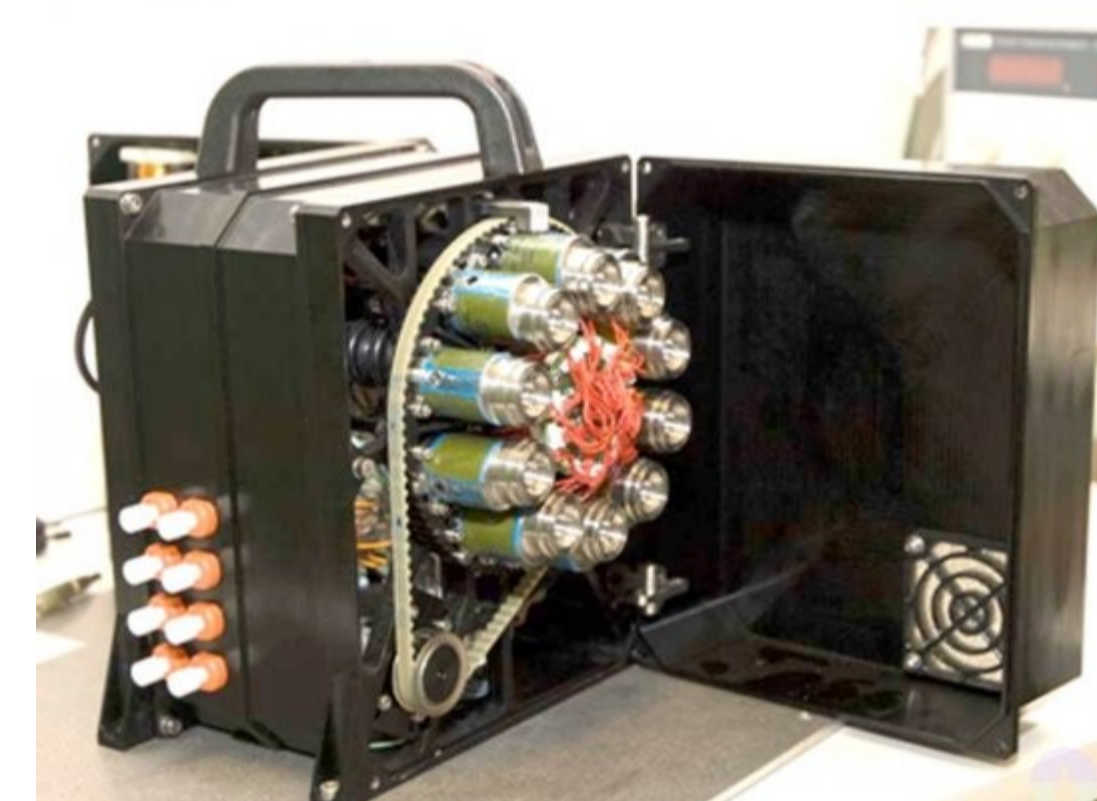

Instrumentation

Graphics: Mathias Höckelmann, DFKI GmbH

Moonwalk Rover

EVA training suit
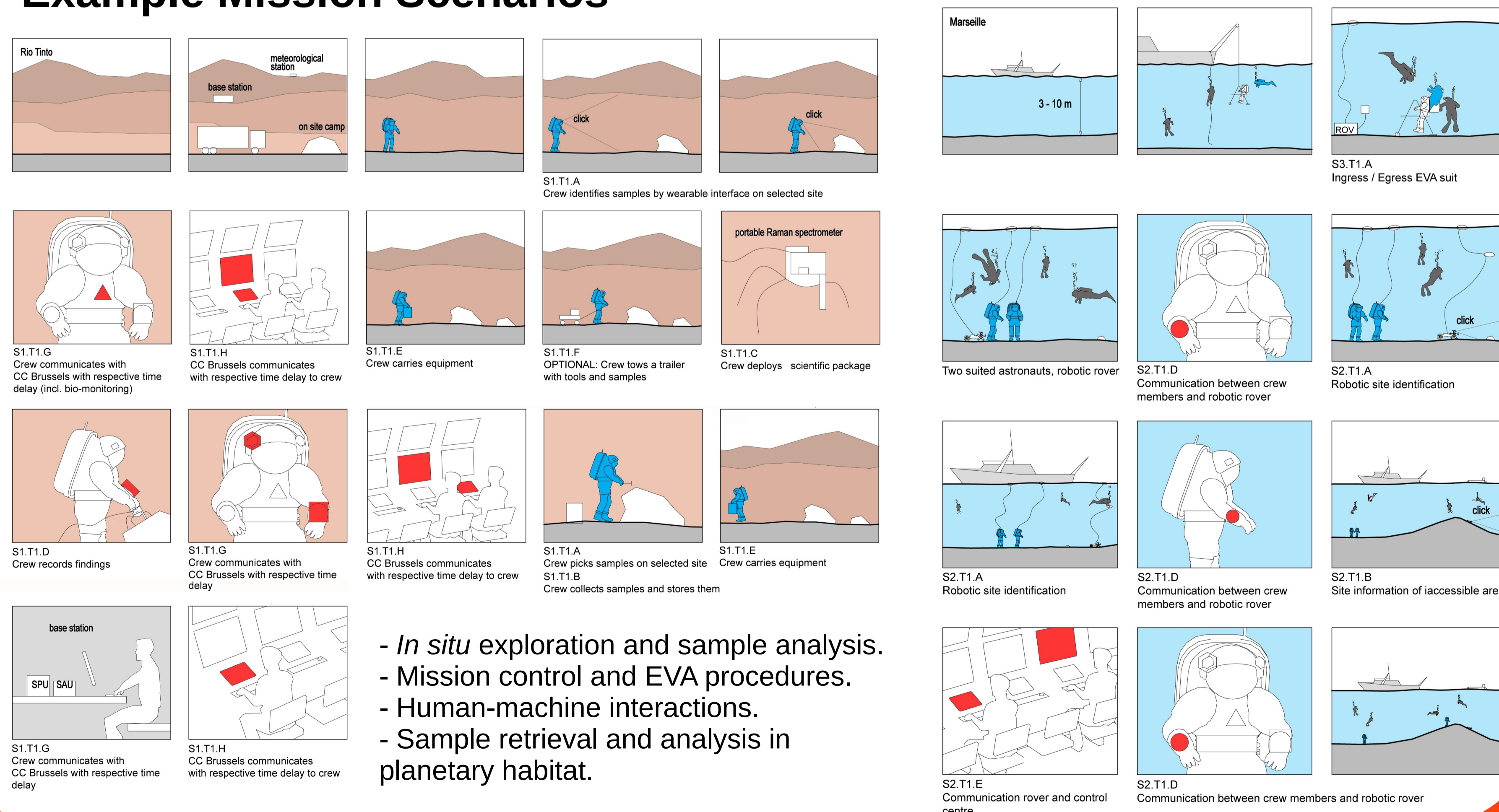
Raman Integrable Device

SOLID Signs of Life Detector

Example Mission Scenarios

Rio Tinto

S1.T1.A
Crew identifies samples by wearable interface on selected site

S1.T1.G
Crew communicates with CC Brussels with respective time delay (incl. bio-monitoring)

S1.T1.H
CC Brussels communicates with respective time delay to crew

S1.T1.E
Crew carries equipment

S1.T1.F
OPTIONAL: Crew tows a trailer with tools and samples

S1.T1.C
Crew deploys scientific package

S1.T1.D
Crew records findings

S1.T1.H
Crew communicates with CC Brussels with respective time delay

S1.T1.H
CC Brussels communicates with respective time delay to crew

S1.T1.A
Crew picks samples on selected site

S1.T1.B
Crew collects samples and stores them

S1.T1.E
Crew carries equipment

S1.T1.G
Crew communicates with CC Brussels with respective time delay

S1.T1.H
CC Brussels communicates with respective time delay to crew

- *In situ* exploration and sample analysis.
- Mission control and EVA procedures.
- Human-machine interactions.
- Sample retrieval and analysis in planetary habitat.

Marseille

S3.T1.A
Ingress / Egress EVA suit

Two suited astronauts, robotic rover

S2.T1.A
Communication between crew members and robotic rover

S2.T1.A
Robotic site identification

S2.T1.A
Robotic site identification

S2.T1.D
Communication between crew members and robotic rover

S2.T1.B
Site information of iaccessible areas

S2.T1.E
Communication rover and control centre

S2.T1.D
Communication between crew members and robotic rover

Announcement of opportunity

- **Open call for experiment proposals** in association to the Rio Tinto and SubSea Marseille simulations (http://www.projectmoonwalk.net/moonwalk/wp-content/uploads/2013/11/2015-05-04_MOONWALK_AO4-final_v6.pdf).

- Proposed experiments should be focused on **human and/or robotic exploration** of the Moon and Mars.

- The Moonwalk AO provides researchers with:

- An opportunity to study the behaviour of equipment, involving **simultaneous usage of instruments** by a human astronaut fitted with EVA suit.

- A **platform for testing** various hardware, tools and techniques for scouting, imaging, monitoring, mapping, analysing and sampling the terrain.

- The possibility to study **iron-sulphate containing minerals** (jarosite, hematite) and rocks as a model for their Martian counterparts.

- The possibility to test **EVA procedures and operations** in reduced gravity conditions (neutral buoyancy).

- A platform for **testing support teams** in a remote location.

- Submissions must reach moonwalk@liquifer.com via email not later than 31 October 2015.

Deutsches Forschungszentrum für Künstliche Intelligenz GmbH

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