



## European Platforms for Life-Support System development and validation

MELISSA WORKSHOP  
09/06/2016

I – Presentation of COMEX

II – The SHEE Self-deployable Habitat for Extreme Environments

III – The HYDROSPHERE as testing facility for manned or robotic missions to the Moon

## | – Presentation of Comex

## COMEX and its expertise

The *Compagnie Maritime d'Expertise* (COMEX) was founded in 1961 by Henri Germain Delauze (1929-2012). It became a worldwide pioneer in the development of technologies for human and robotic intervention in extreme environments.



Saturation dive 180m under ice (1969)



Astronaut EVA training (1990)



HYDRA-10 deep-diving record (1992)



REMORA2000 submarine (1995)



## COMEX and its expertise

### Marine Operations



- Research Vessels, ROV and submarines
- Interventions to 2500 m depth
- Activities in  
Survey  
Defence/Archeology / Biology  
Subsea mining  
Marine Renewables

### Hyperbaric Engineering



- Hyper- and hypobaric chambers for hospitals, research and industry
- Maintenance of hyper- and hypobaric systems
- Test of equipment in various pressure chambers

### Robotics and Vision



- Underwater 3D reconstruction
- Camera systems
- Subsea robotics

### Space and Innovations



- Underwater simulations of EVA / IVA
- Habitat development
- Life-Support Systems

## COMEX and its expertise

COMEX is involved in several space projects (financed by ESA, European Commission and industrial clients) in the field of

- Habitats and Life Support Systems

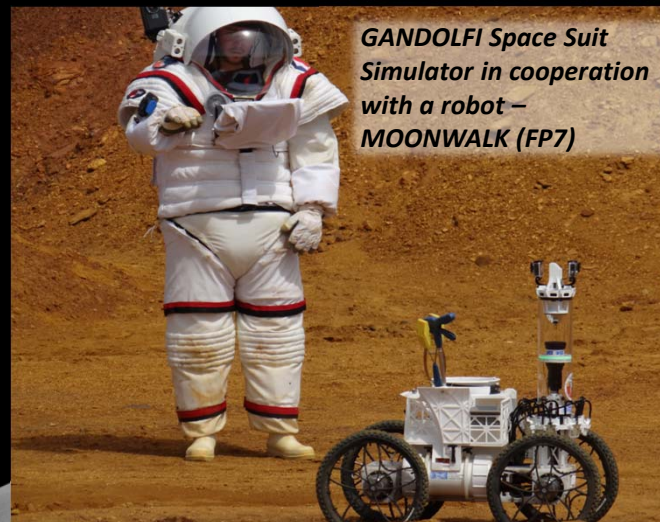


*SHEE space habitat simulator for a crew of two persons (FP7)*

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- Habitats and Life Support Systems
- EVA training methods

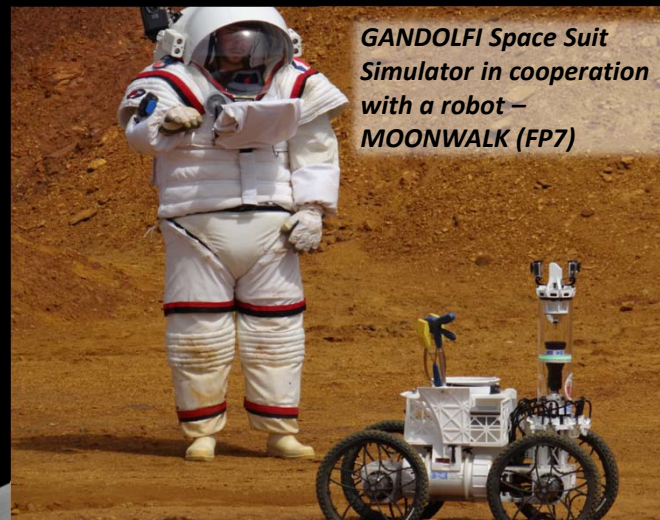
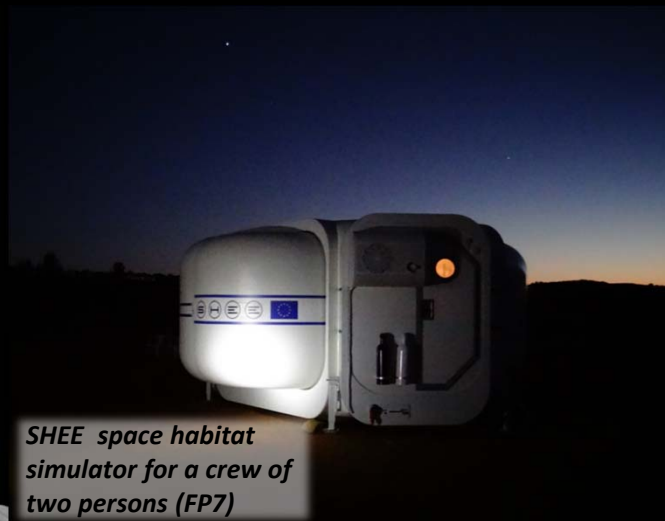




## COMEX and its expertise

COMEX is involved in several space projects (financed by ESA, European Commission and industrial clients) in the field of

- Habitats and Life Support Systems
- EVA training methods
- Test and validation





## II – The SHEE Self-deployable Habitat for Extreme Environments

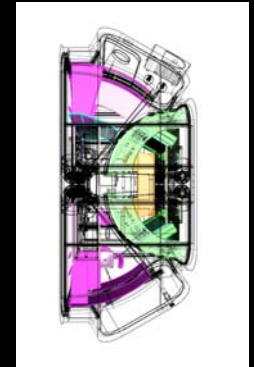
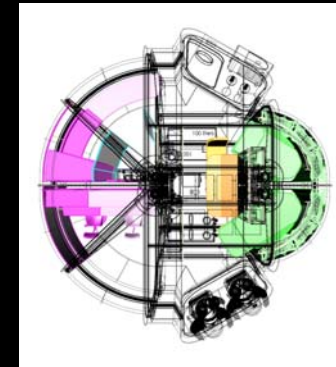


The main objective of the SHEE project was to develop a robotically-deployable habitat design.  
**The purpose of SHEE is to develop in Europe a deployable infrastructure for space mission simulations.**

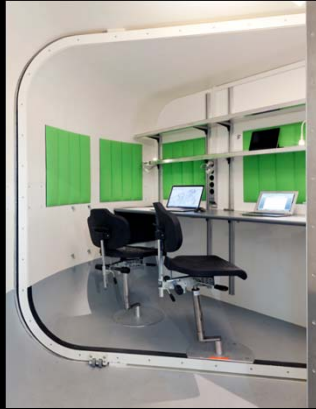
Participant Organization Name	Participant Short Name	Country
International Space University	ISU	France
LIQUIFER Systems Group GmbH	LSG	Austria
Space Applications Services N.V./S.A.	SAS	Belgium
Institute of Technology, University of Tartu	UT	Estonia
COMEX S.A.	CO	France
Sobriety s.r.o.	SO	Czech Republic
Space Innovations, v.o.s.	SI	Czech Republic

Project Budget: 2.28 Mio € (EC)  
 Project Duration: 3 years  
 (January 2013 – December 2015)

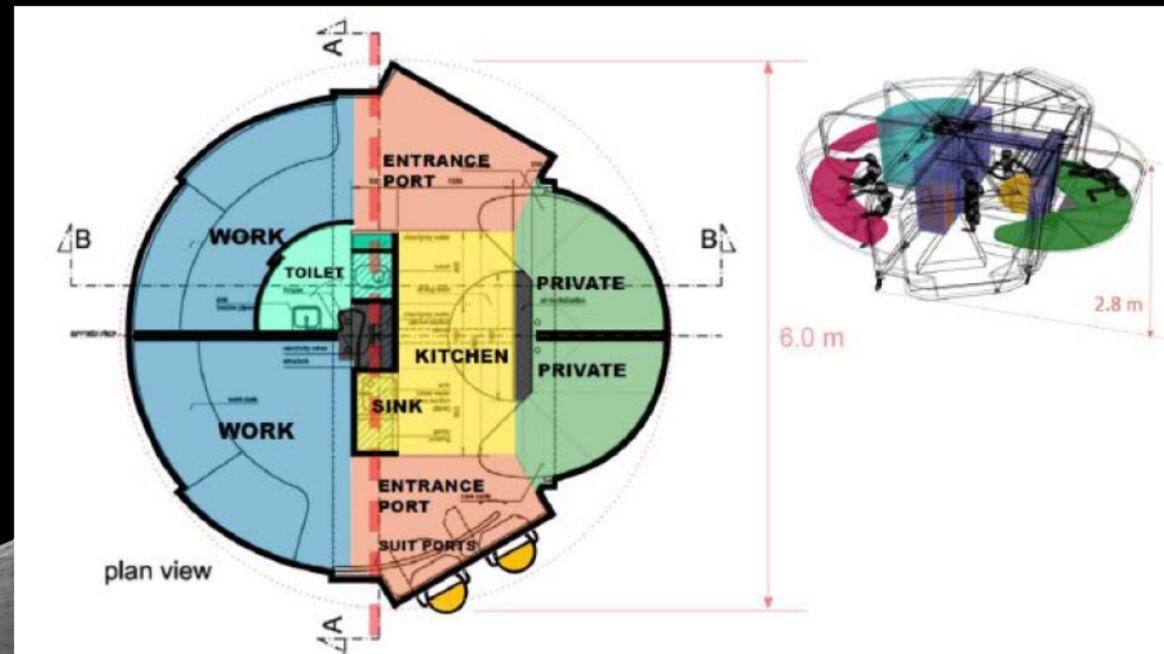
COMEX was in charge of the Life Support System and the Final Integration in Marseilles.







- Crew of two persons
- Internal elements adapted to a folded habitat

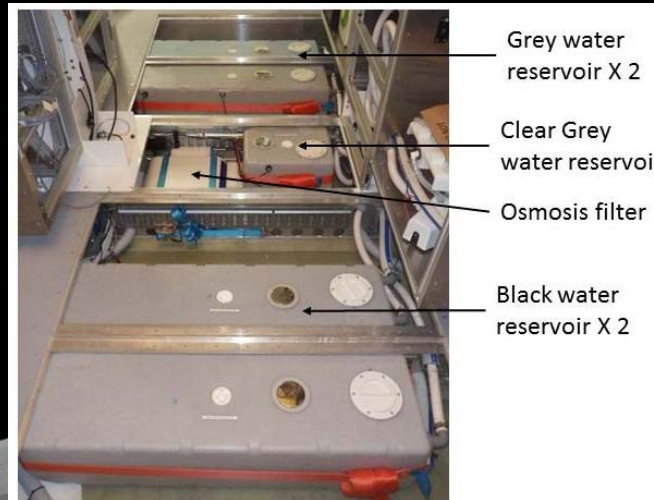




Credit: SHEE consortium, photos: LIQUIFER Systems Group, 2015



- Water recycling system (grey waters) based on osmosis filters
- Environment monitoring (internal and external)
- Thermal control
- Transportable by truck



### III – The HYDROSPHERE testing facility for manned or robotic missions to the Moon



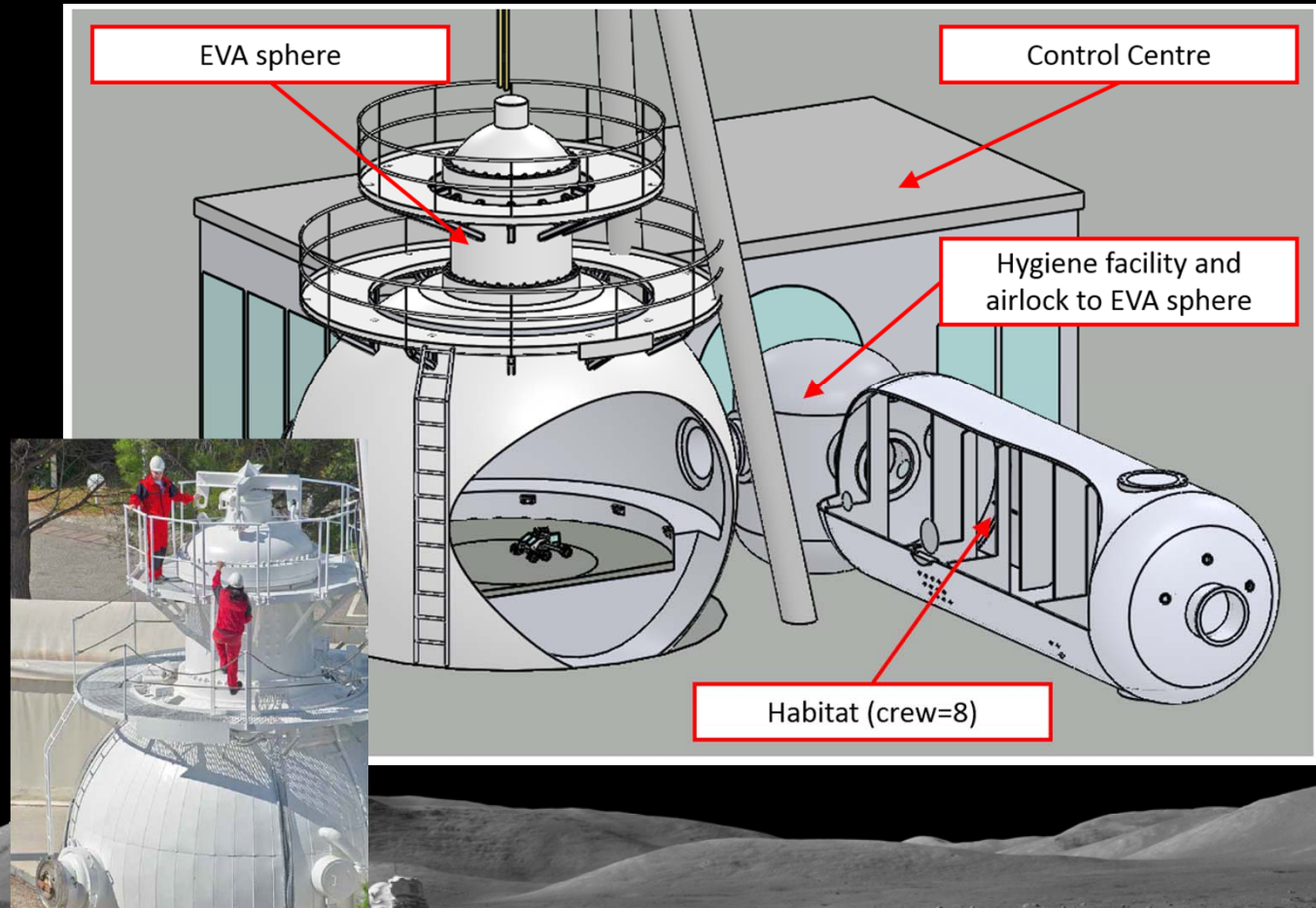


- Located in Marseille, Southern France
- Facility initially developed for deep-sea offshore diving simulations
- Pressures up to 450bar – 4500m and down to 11mbar
- Used for mission simulations such as the COMEX-EVEREST campaign
- Today dedicated to space mission simulations





- EVA sphere : 5m-diameter sphere for EVA simulations or robot testbed
- Habitat: 33 cubic meters habitat that can host a crew of 8
- Hygiene facilities: WC and shower for the crew
- Control center for tele-science or remote control
- Inner airlocks: two airlocks between the Habitat and the EVA sphere





Variable light spectra

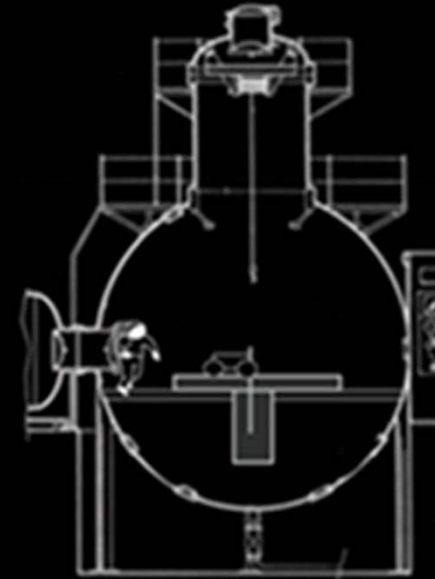
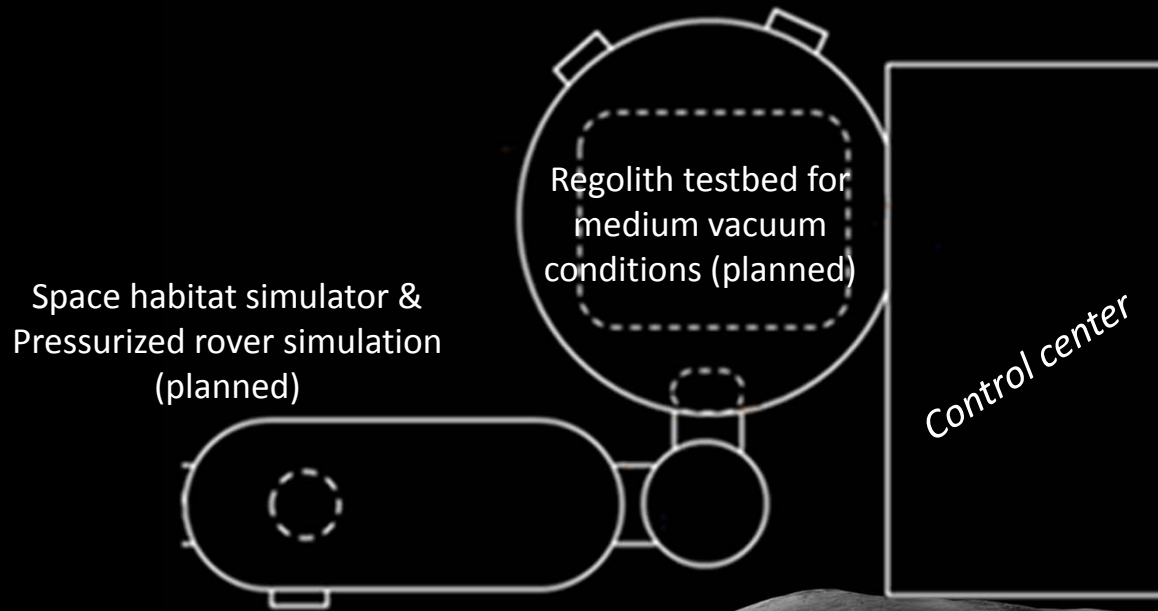


Forward hatch of the habitat



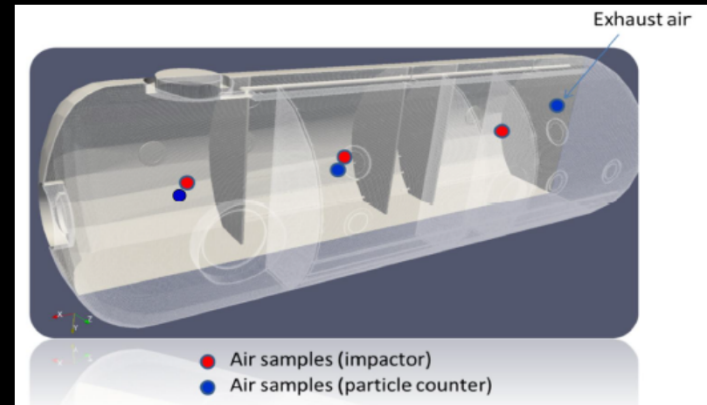
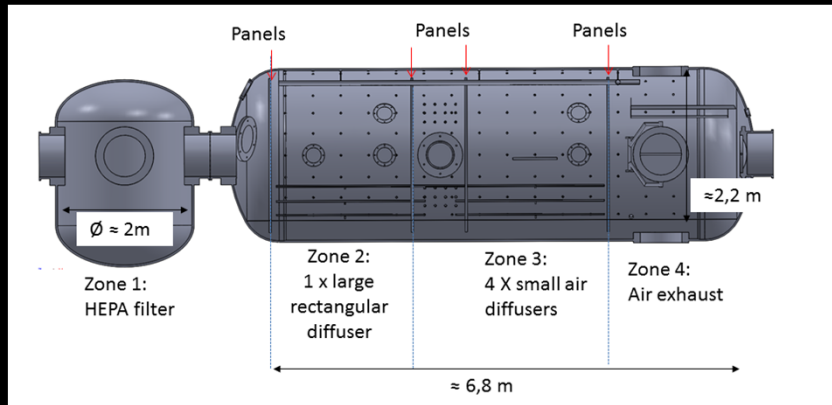
Exterior view of the habitat

65m<sup>3</sup> volume  
for ECLSS/ISRU  
integration

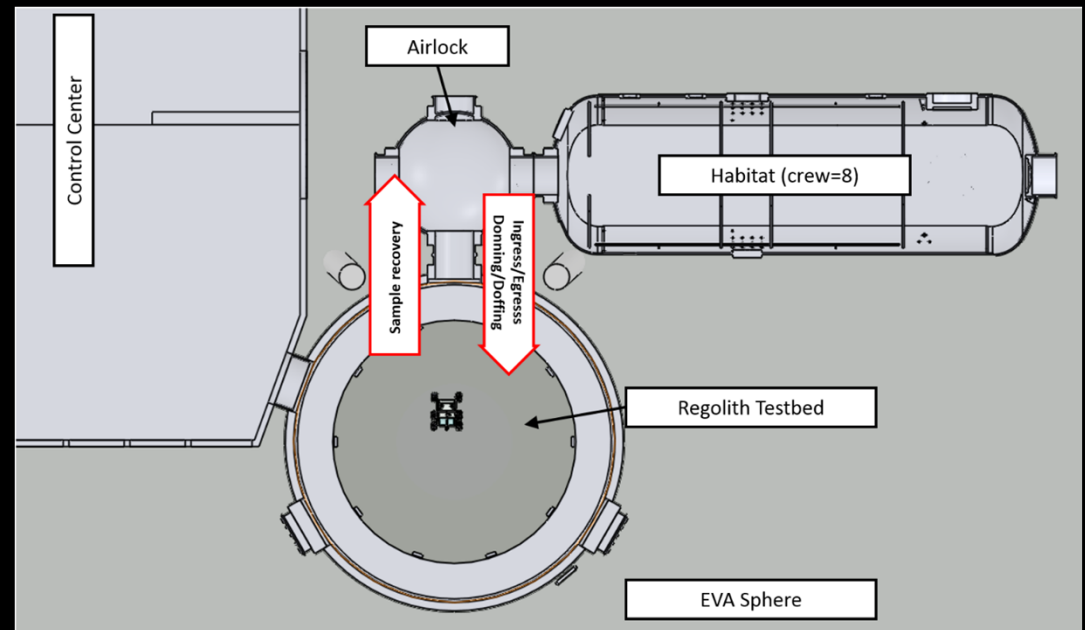
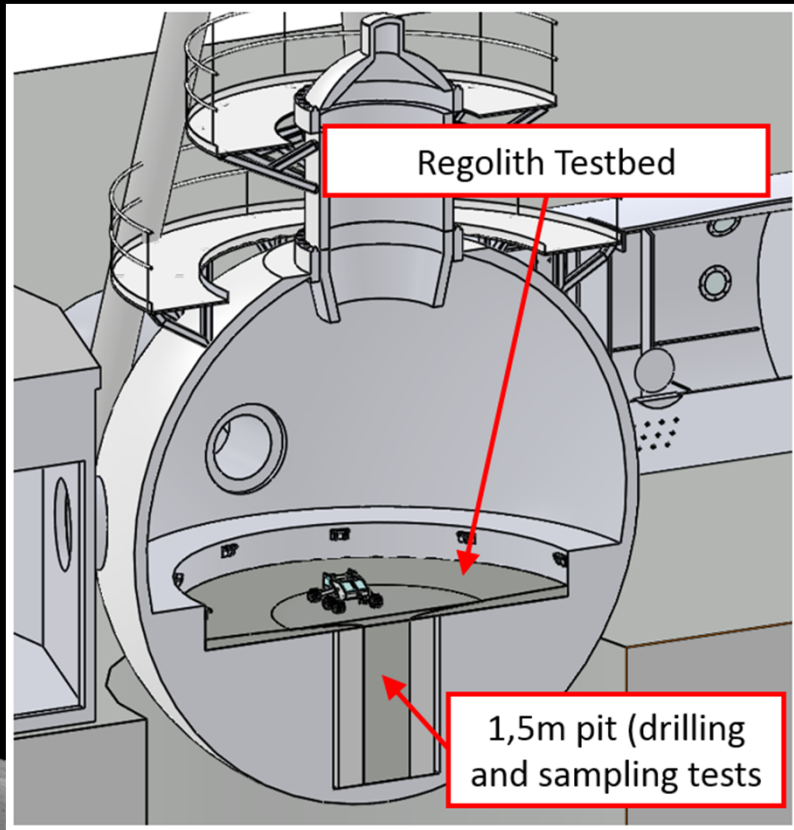




The facility (habitat part) was used for the ESA "BIOMODEXO" project which has as objective to model bio-contamination processes in spacecraft and manned vehicles (ESA contract AO/1-7603/13/NL/RA)

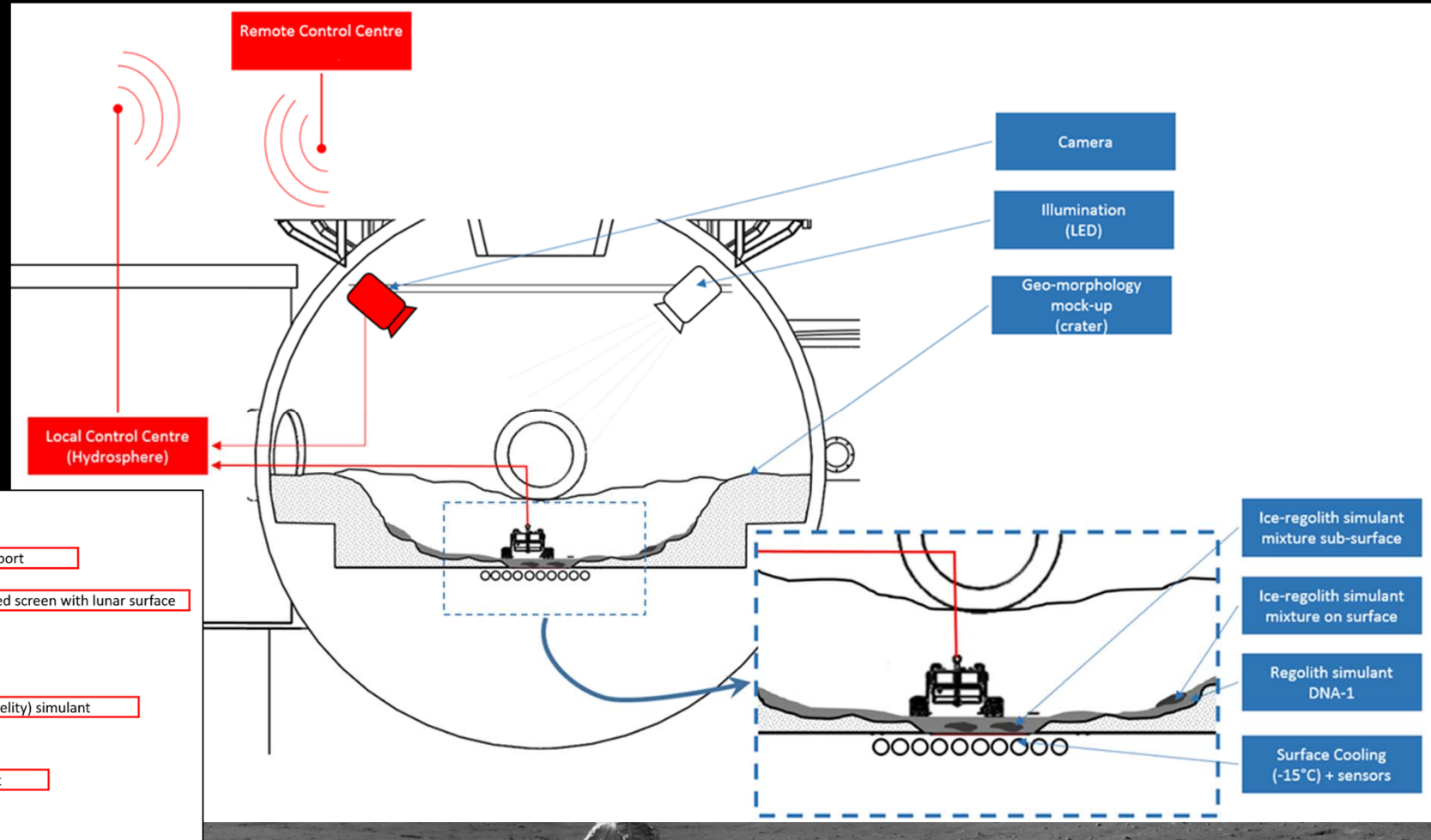


## Potential applications and simulation possibilities

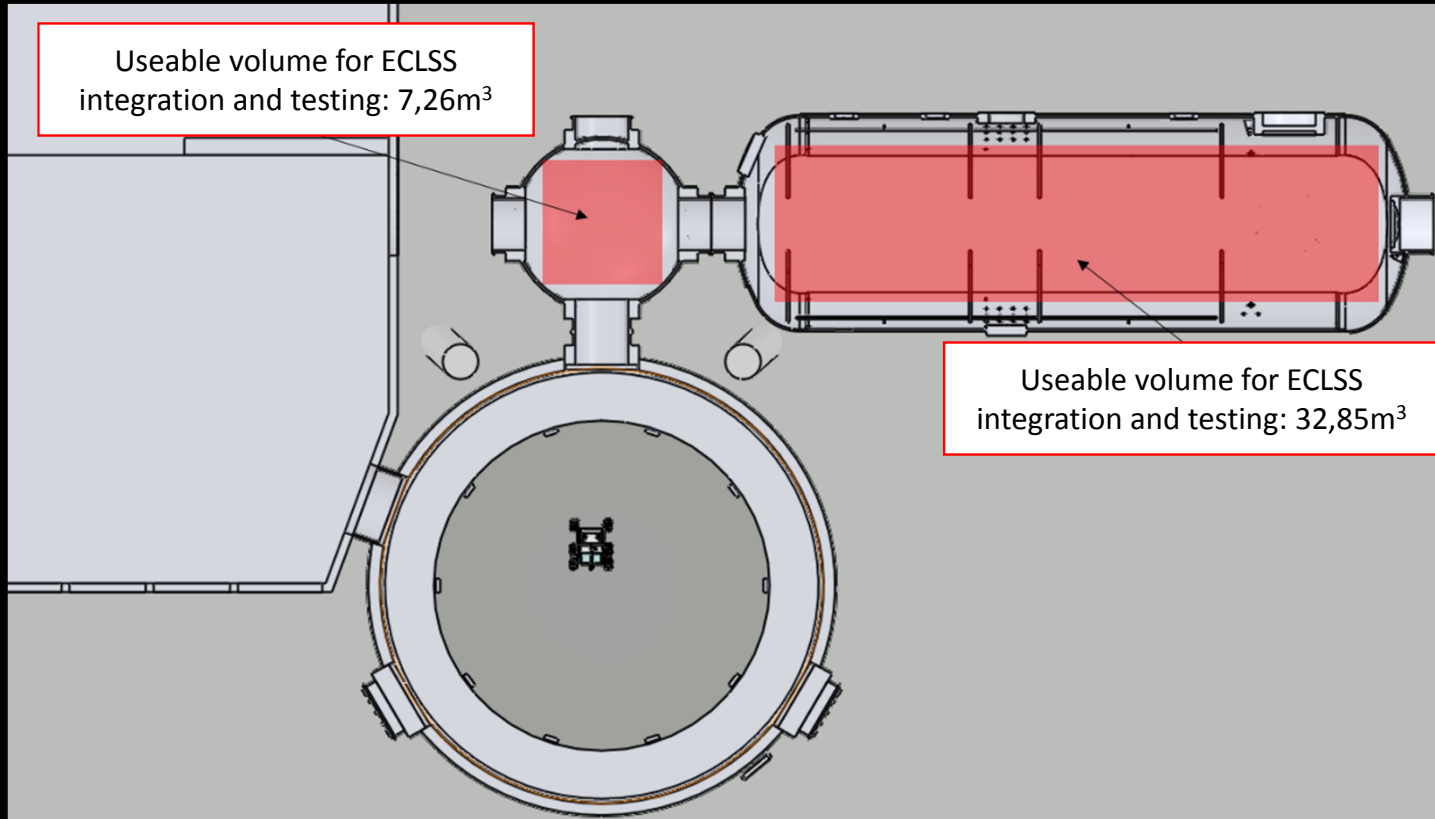


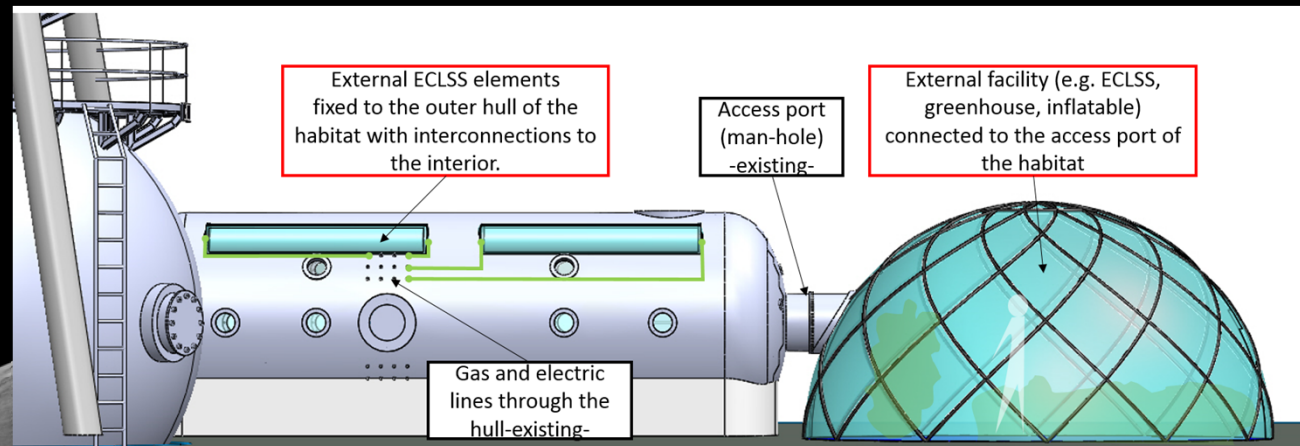
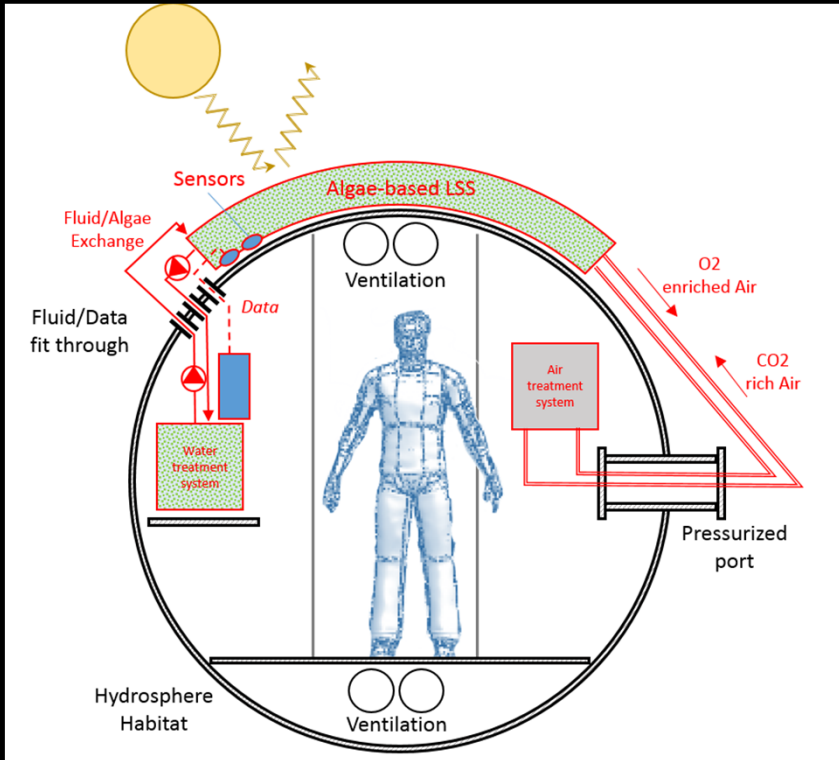
Examples of test configurations:

- Cold spots for PSC exploration
- Drilling and sampling tests
- ISRU validations
- Suit and suitport tests
- Sample exchange devices

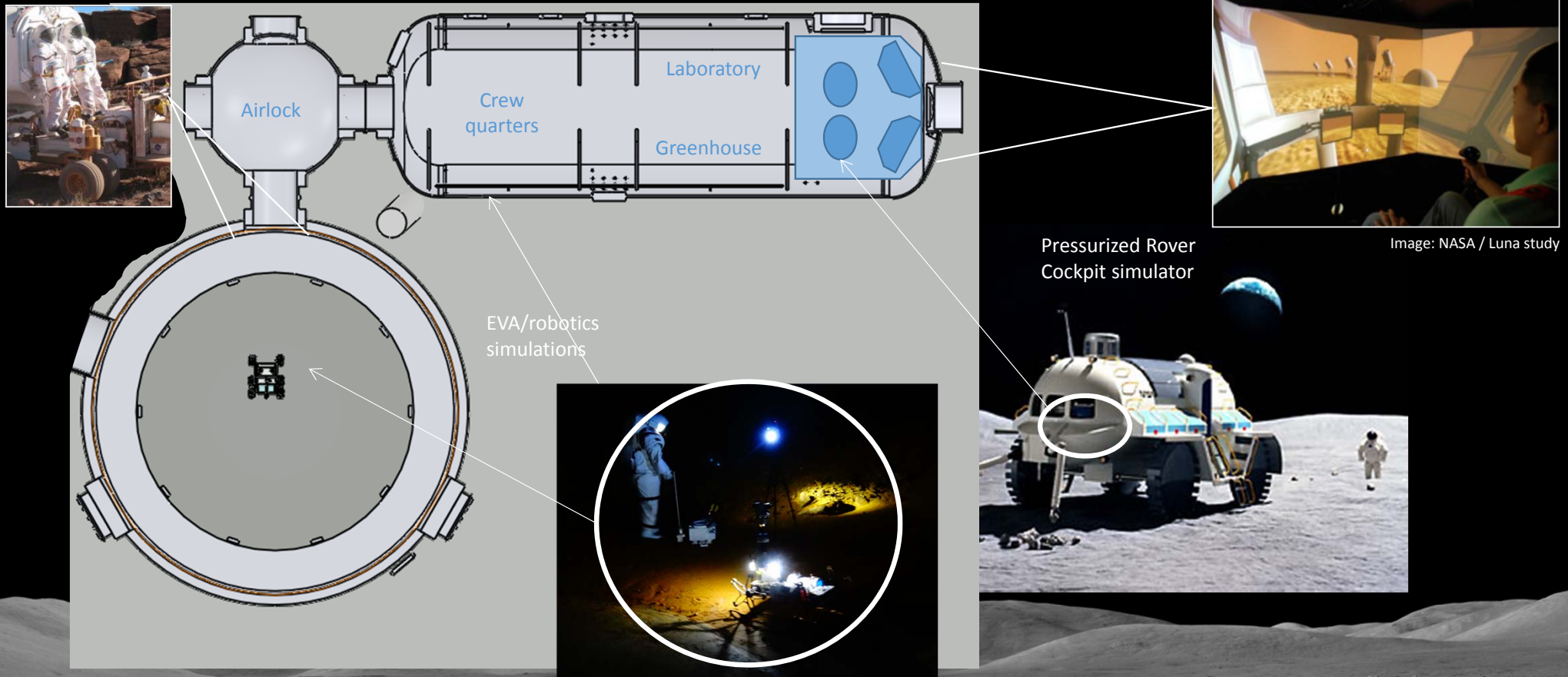








Pressurized Rover simulation test-bed



Airlock

Crew quarters

Laboratory

Greenhouse

EVA/robotics simulations

Pressurized Rover Cockpit simulator

Image: NASA / Luna study



# Thank you !

