

The early missions such as Apollo or Skylab were very short duration missions and the necessity of an awareness of the importance of human subsystems was not given so much - in contrast to **nowadays** where the most human spaceflight missions are long-duration missions. Thus a paradigm shift has taken place and the human sub-systems need to be given high importance and probably a new understanding has to be defined including the education and inclusion of specialists such as psychologists, sociologists, architects, designers, anthropologists, cultural theorists and others.



Film Still from Space Odyssey 2001; a film by Stanley Kubrick and Arthur C. Clarke

The basic instinct of a human being is to explore, first for food and shelter and then eventually for new territories, horizons and new space. Exploration is a component of the human nature and thus an imperative to cultivate. When we as architects imagine exploring outer space we immediately are drawn to the basic human needs, which constitutes his or her existence. Looking at the closest human environment and the space surrounding the human body we realize that it needs to adapt to fit the implications of zero-gravity or partial gravity on Moon or Mars. Investigation into these matters inevitably draw our attention to the technologies needed and to the physiological and psychological strategies and their spatial implications required to cope with these extreme environments.



RAMA (as tribute to Arthur C. Clarke and his RAMA Chronicles) – Rover for Advanced Mission Applications, under a contract from the European Space Agency, LSG 2008

When we will set foot on Mars in 2045 our resources will be limited. We will have developed re-generative life-support systems to recycle air, water and waste, which will sustain ourselves throughout the long time of a 6-month travel back and forth plus a 500 day stay on the surface. But we will still need to look at the resources of the Martian ground upon descent. Hence, we will have to start living off the land. We will have to develop in-situ resource utilisation technologies (e.g. gaining propellant from the Martian atmosphere) which will probably also be able serve our comfort on Earth in spin-off-applications.



ExoMars Rover design version of 2004 (LSG), under a contract from the European Space Agency (launch 2016)

Exploration can get architects involved into the integration and management of project and hardware parts and they can help designing a sustainable mission scenario including interfaces and hardware, which shall lead to a holistic approach of such an endeavour. Architects and designers can additionally support the teams to assure that the cultural component, its implementation and communication to the public, can be perceived by a broad public.



FIPES – Facility of Integrated Planetary Exploration Simulation, under a contract from the European Space Agency, LSG 2006

LIQUIFER Systems Group is a collaborative of currently eight people* with disciplines ranging from science, engineering, architecture, design to project development and management. Each collaborator pursues his/her own curriculum outside the platform but everybody gets together on project call.

We do not believe that there is a dividing line to be drawn between Earth and outer space. We are convinced that there is a continuum from the surface we move around right to the infinite space surrounding the spaceship we travel on.

When developing architectural and design projects for Earth, zero-gravity or other celestial bodies like Moon or Mars the focus of our interest lies in the common dominators, the synergies and differences between (built) habitats in a terrestrial and extra-terrestrial context. Our exploration continues to open new operational fields for architects.

