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Space Architecture: technical aspects, design, engineering, concepts and mission planning (1)

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AN ENVIRONMENT OF MULTI-SENSORIAL AND TRANSPARENT TECHNOLOGIES ENABLING
POSITIVE AND CREATIVE INTERACTIONS IN DEEP SPACE MISSIONS**Abstract**

Human deep space missions require a shift in the way that the socio-psychological impact on the crew is studied and integrated in the overall mission architecture. Due to prolonged cohabitation in small groups under extreme conditions of confinement and isolation, the astronauts will miss terrestrial stimuli and face unprecedented levels of stress. On the other hand, being the new millennium pioneers of deep space exploration will generate a unique energy and stimulate creativity and imagination at the highest levels. This will drive positive interactions and strengthen the crew's ability to operate safely in hostile conditions. In this context, the current paper explores the development of an environment of multi-sensorial and transparent technologies to be integrated into the mission design. While technologies embedded in the spacecraft have so far played only a functional role, in future long duration missions, they will also need to stimulate senses, nurture creative activities, and catalyse unexpected Earth-space interactions.

This study proposes a set of innovative solutions, such as playing music with extemporary instruments, activating a library of odours and, by using thermochromic materials, modifying crew areas and the whole sensual space. Furthermore, technologies such as tactile, sonic and video interfaces, printers of fragrances, and several interconnected devices are also discussed since they can be integrated in the Life Support System without being invasive. As a result, the crew members will be free to reinvent their relationship with the architecture, and to transform any element or situation of the mission into a musical, fragrant, tactile or visual instrument. Beyond the astronaut-habitat interaction, the scope of such an environment of multi-sensorial and transparent technologies would encourage artist-astronaut collaborations. Through these ones, vivid and vital experiences such as unpredictable events and surprising hacking practices may arise, developing new links among the astronauts and opening alternative communication modes between the spacecraft and the Earth. In order to contribute to the creation of a new social and temporal territory for deep space mission, further research and development on such technologies is encouraged along with their first testing in space analogue environments.