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TRANSFORMATION AND ADAPTATION OF A HABITAT FOR PARASTRONAUTS : A PARASTRONAUT FEASIBILITY STUDY ON AN EXISTING SPACE ANALOGUE HABITAT AND ITS IMPLICATIONS FOR MARS HABITATS

Abstract

With an average of 225 million of kilometers separating Earth from Mars, future manned space missions will require increased autonomy from the crew with Earth, as well as proper habitats and settlements to provide shields and better living conditions to carter for the long mission durations. The increased autonomy will be reflected in communication type, - with the time-delay between Earth and Mars varying between 4 and 20 minutes (one way), which in turn will be reflected in the emergency protocols as well as general procedures in spacecrafts, habitats and all science and logistics. A typical planification that will require modification, is the existing protocols and spacecraft logistics currently applied to astronauts: with newly selected parastronauts, as well as the increased probability of accidents on Mars and lack of quick-access hospitals, small and large injuries can become disabilities rapidly. The large range of potential disabilities requires thorough investigation, testing and planification to provide the correct habitat structure, communication types and protocols to reduce the danger that a disability might cause to an astronaut or parastronaut. This can be done using analogue space missions, simulations of space missions on Earth. In this study, the analogue space mission facility Habitat Marte, in Natal, Brazil, is being adapted to host parastronauts as well as a full parastronaut crew mission, and the resulting mission evaluated. To this effect, the characteristics of the habitat are being investigated, then modified (including sleeping quarters, laboratory, hygiene station). A flight plan is being developed using the feedback of each parastronaut regarding the extra time different tasks might require due to their disability, to adapt and provide a realistic timeline for the realization of the experiment load. The crew is planned to be composed of 4 parastronauts with 3 different disabilities, including a sensory disability. Existing protocols are being modified to carter to the limitations imposed by the disabilities of the crew as to maximize crew efficiency, comfort and mission success. To this end, protocols are also being assessed by the crew. The list of physical as well as written modifications will serve as a significant example for the adaptation of other habitats and for knowledge transfer to future Moon and Mars missions. Parameters such as costs, complexity for the modifications as well as crew and mission lead satisfaction will also be parameters, with questionnaires being sent to all crew members to provide overall results.