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EVALUATION OF THE INTEGRATED HELMET OF THE AUTONOMOUS MODULE OF
SUSTAINABLE COOLING – MARS

Abstract

This research evaluates the development of the helmet that supports the Autonomous Module of Sustainable Cooling - MARS, a spacesuit to be used in the research station Habitat Marte, which is starting operations in December 2017. Habitat Marte works in the Nucleus of Research in Engineering, Science and Sustainability of the Semi-Arid (NUPECS) located in the city of Caiçara do Rio do Vento, Rio Grande do Norte State, Brazil. The Mars simulation mission was performed in 48 hours, consisting of intravehicular (IVA) and extravehicular (EVA) activities. Habitat Marte is the first Mars-like station to operate in South America. The Autonomous Module of Sustainable Cooling - MARS is a Portable Life Support System. The helmet is an important component that must present characteristics such as: allow adequate breathing; cooling; avoid the fog effect in the transparent display. The methodology of this research executed the various activities of production of the helmet prototype to support the Extravehicular Activities (EVA) in Habitat Marte. The helmet was developed in MarsLab - Laboratory of Applied Technologies to Mars and Semi-Arid, based in Universidade Federal do Rio Grande do Norte (UFRN) during the year 2017. As part of the methodology, all helmet development activities were documented, considering design, materials testing, construction, comfort, safety and recycling. In December 2017, the helmet was evaluated during Mission 1 on Habitat Marte. During the mission, at the end of the Extravehicular Activity (EVA) users were asked about various aspects related to the helmet. The main aspects evaluated were: design; comfort of shoulders and neck; feeling of safety; ergonomics; Weight; the operation of Extravehicular activity (EVA) with the equipment. Concepts were assigned from 1 to 5, according to Likert scale. The best evaluated aspects were: helmet design and weight. Also considered important: the comfort of the neck. The weaker aspects were the experience in walking and the safety provided by the helmet in the Extravehicular Activities (EVA). The helmet features a cooling characteristic, from the connection with the Cooling Module. There is an opportunity for improve the technology applied to the spacesuit equipment. Another prototype will be developed during 2018 with the use of the acrylic dome, which is expected to provide better visibility, visual comfort and safety.