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APPROACHES AND SOLUTIONS FOR MARTIAN SPACESUIT DESIGN

**Abstract**

Mars exploration mission is one of the most discussed, but at the same time this project requires many efforts in planning, preparation and analysis from different scientific aspects. Decades of scientific explorations related to Mars recorded data on environment of the planet, including geological aspects, atmospheric composition, life aspects, and helped to create a foundation defining main hazards and security risk assessment. Based on this information, scientists all over the world started the planning of human missions to Mars, which included as milestones preliminary stages of the design of the future spacecraft, on-site habitat(s) and of course equipment for Extravehicular Activities (EVAs), including spacesuit design for the Mars exploration. Every stage was designed on analysis of possible hazards and perspective solutions in design and operation. EVAs will play a crucial role in any mission long or short term as human participation in it is an essential step in the future. In a short term mission EVAs will allow to collect additional data about the planet and its environment, to run external experiments, to work on setting up a part of future habitats if needed etc. In the long term mission EVAs will help to run maintenance activities supporting the whole operation of the habitat or station and continue all needed scientific activities. Previous works related to the logical and physical level of model of knowledge database for automated control system of the “artificial lungs” equipment helped to define basic conditions of human in this mission, dependence on psychophysiological state and needed level of preliminary testing. Previous studies were dedicated to the analysis of possible hazards for the habitat, station and spacesuit. The most relevant hazards for the spacesuit design were defined including structural failures, power, thermal control and life support systems off-nominal situations (ONS), communication problems, loss in

data management and problems related with humans in the crew. Potential solutions for these ONS will be discussed in this paper in greater details. This paper will examine past experience in spacesuit design and its restrictions including aspects of mobility and operability, the conditions they are created to work in and its applicability in Mars conditions. Special attentions will be paid to materials which could be used in the spacesuit design, possible electronics and combination of life support systems required for the spacesuit.