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ARCHITECTURAL DESIGN PROPOSAL FOR A MARTIAN BASE TO CONTINUE NASA MARS DESIGN REFERENCE MISSION

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The issue of extraterrestrial bases has recently been a very vivid one. There are orbital stations currently existing and humans will travel to Mars around 2030. They will need stations established there, which will provide them the proper living conditions. Firstly, it might be a small module brought from Earth (e.g. NASA Mars Design Reference Mission module (DRM)), in later stages equivalents of Earth houses may be built from local resources.

The goal of this paper is to propose an architectural design for an intermediate stage — for a larger habitable unit transported from Earth. It is inspired by terrestrial portable architecture ideas. A pneumatic structure requires small volume during transportation. However, it provides large habitable space after deployment. It is designed for transport by DRM transportation module and its deployment is considerable easy and brief. An architectural solution analogous to a terrestrial house with a studio and a workshop was assumed. Its form was a result of technical and environmental limitations, and the need for an ergonomic interior. The spatial placement of following zones was carefully considered: residential, agricultural and science, as well as a garage with a workshop, transportation routes, and a control and communication center. The issues of Life Support System, energy, food, water and waste recycling were also discussed. This Martian base was designed to be crewed by a team of eight people to stay on Mars for at least 1.5 year. An Open Plan architectural solution was assumed in pneumatic modules, with a high level of modularity. Walls of standardized sizes with zip-fasteners allow free rearrangement of the interior to adapt to a new situation (e.g. damage of one of the pneumatic modules or a psychological „need of a change”).

The architectural design focuses on ergonomic and psychological aspects of longer stay in hostile Martian environment. This solution provides Martian crew with a comfortable habitable space larger than DRM modules. It is proposed to send this base in a DRM transportation module after the first successful human mission. The author of this paper hopes that this, or other similar Martian base designs will help establishing a permanent presence of humans on Mars.