

SYMPOSIUM ON BUILDING BLOCKS FOR FUTURE SPACE EXPLORATION AND  
DEVELOPMENT (D3)

Strategies & Architectures as the Framework for Future Building Blocks in Space Exploration and  
Development (1)

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PROMETHEUS: A NOVEL HUMAN SETTLEMENT DESIGN FOR MARS

**Abstract**

The need for a sustainable and self-sufficient settlement system for humans on Earth-like planets, especially Mars, is the main area of focus in the field of space exploration in current times. Various leading space agencies are holding competitions in search for innovative designs for the same and also education the masses on such topics. Prometheus has been designed to meet the criteria set by NASA's RASCAL competition.

This paper focusses on introducing a novel method for establishing a properly designed human settlement base for 20-40 people on Mars. Set inside a crater called Crivitz, this settlement consists of three main control hubs that control everything inside the settlements and 12 housing structures. The main design of the housing structure, in which humans will live, is in the shape of a cupcake. The upper hemispherical portion is used for housing purposes, and the bottom trapezoidal portion is used for storage, pipeline connectivity and others. Each housing is designed to accommodate 2 persons each and is furnished with two bedroom, two bathroom, open concept kitchen, living room and basement cum storage room equipped with emergency supplies. There are three main hubs around which the settlement is designed. The first hub is used for storing processed and unprocessed food, human suits and other backup materials or equipment required. The second for controlling the air circulation, temperature levels, the water used and waste generated per day and the third hub contains all the equipment used to generate and store electricity as backup for emergency cases along with the equipment for generation of oxygen and water as a by-product of waste.

The main advantages of this system is: 1.The cupcake design has not been used in any previous literature work. This design gives us the option of building houses on crater slopes too. 2.Since all the connections are in the bottom trapezoidal section, thus protecting them from the harsh Martian conditions. 3.Spread over an area 150m<sup>2</sup>-per-housing plus the docking area, this design gives the smallest area when compared with designs from literature. 4.The housing module is so designed, in case of an emergency like fire or electrical problem, the module can be detached completely from the whole system, repaired and then connected back. Thus safeguarding the remaining modules. 5.The overall cost of the settlement is \$290,000 for setting up two separate colonies.

Keywords: Human settlement design, housing, solar panels, Mars.