

Mars Exploration (3)
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AUREA REGIO - AN ENGINEERING AND DESIGN VISION FOR HUMAN LIFE ON MARS

Abstract

Mars is the next frontier in human exploration of deep space and a potential place for human settlement. With such ambitious plans come the associated scientific, engineering and architectural challenges. Putting the safety and comfort of the crew at the center of this research project, it is recognised that solving for Mars requires a comprehensive multidisciplinary approach (for instance, looking into how to combine radiation protection and architectural choices). The presented work focuses on building habitats and the first Martian city, making a vision for human life on Mars. It outlines the challenges and proposes solutions to provide a "recipe" that Mars city designers may want to explore.

The main areas considered in this recipe are transportation challenges, In-Situ Resource Utilisation (ISRU), protection from radiation, power supply, economic viability, and socio-cultural heritage. All these elements were developed incrementally against the city's growth rate. Several considerations were made on a per person basis, thus allowing to upscale the design according to the needs and assess its feasibility, in a comparatively straightforward fashion.

This work also presents Aurea Regio, a model example of a Martian city of 1 million inhabitants, based on the guidelines presented in the recipe. This population is based on the requirements of the 2020 Mars City Design Competition organised by the Mars Society, which was the initial prompt for this paper. The model example also provides ample visual resources, displaying the building blocks that the city consists of, as well as depictions of life in this Martian city. This example also explores the life of inhabitants beyond the visuals, by contemplating the existence of a Mars University as a core Martian institution, the education of new generations, and the Martian job system along with the division of labour. The city presented in the model example is located in the Valles Marineris, in the ravines of the prolonged part of Louros Valles near south-western Melas Chasma.

As a result, the paper not only presents solutions to challenges faced by settlers on Mars, but also demonstrates their application and interoperability in the aforementioned model example.