Paper ID: 57932
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31st IAA SYMPOSIUM ON SPACE AND SOCIETY (E5)
Is Space R&D Truly Fostering A Better World For Our Future? (2)

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FEASIBILITY STUDY OF USING APPLICABLE SPACE ASSETS FOR DISASTER MANAGEMENT AND MITIGATION IN JAPAN

Abstract

This study was launched as part of the Japan Aerospace Exploration Agency (JAXA) - Space Innovation through Partnership and Co-creation (J-SPARC). Japan is a disaster-prone country, has faced natural disasters, including earthquakes and typhoons before, and will have in the future. Many strategies have been developed to minimize damage resulting from natural disasters in Japan, including disaster prevention systems, risk mitigation plans, and post-disaster provision of adequate physical and psychological healthcare to evacuees. However, further efforts still have to be created in Japan. For instance, evacuees are constrained to live in post-disaster shelters with almost no privacy and other habitability needs for a prolonged period of time, making it an uncomfortable environment. The present work aims to find solutions to fill the gap by investigating valid knowledge, technologies, and strategies that applied in terrestrial extreme environments and in space. Such assets seem promising to improve safety, operational efficiency, and overall comfort in post-disaster shelters. The methodology used in this study consists of the following three steps: (i) Comparative analysis of extreme environments considering influencing factors; (ii) Selection and organization of potentially applicable resources; (iii) Feasibility study on the selected assets. The comparative analysis first explored post-disaster shelters in Japan. Then, other extreme environments were considered: on Earth, such as Mt. Everest Base Camp and Japanese research station in Antarctica; and in space, such as Space Shuttles, the International Space Station (ISS), the proposed Gateway station, and Moon/Mars bases. Harshness of each environment was scored based on influencing factors classified into eight major categories, including environmental conditions and habitability. The comprehensive survey clarified differences and similarities between extreme environments and provided an insight into key issues and solution approaches for disaster management and mitigation in Japan. The paper concludes with some possible design strategies with a focus on inspiration from applicable space assets.