30th IAA SYMPOSIUM ON SMALL SATELLITE MISSIONS (B4)
Interactive Presentations - 30th IAA SYMPOSIUM ON SMALL SATELLITE MISSIONS (IP)

Author: Ms. Aysha Alharam
National Space Science Agency (NSSA), Bahrain, aysha.alharam@nssa.gov.bh

Mr. Aaron Zucherman
Cornell University, United States, azucherman@gmail.com
Mr. Daniel Wischert
European Space Agency (ESA), The Netherlands, daniel.wischert@esa.int
Ms. Alison Waterman
DreamUp, PBC, United States, alison@dreamup.org
Mr. Gavin Furtado
Space Generation Advisory Council (SGAC), India, gavin98007@gmail.com
Mr. Lokesh kumar G
Space Generation Advisory Council (SGAC), India, lokeshlokii2112@gmail.com
Mr. Karthik R Varma
Space Generation Advisory Council (SGAC), India, karthikrvarmaijk@gmail.com
Mr. Liugi Marchese
Space Generation Advisory Council (SGAC), Italy, luigi.marchese.2021@gmail.com
Ms. Tan Huda
Space Generation Advisory Council (SGAC), United Kingdom, tanjin49@hotmail.it
Ms. Vatasta Koul
Space Generation Advisory Council (SGAC), India, vatastakoul@gmail.com
Mr. Alexander Hope Ferdinand Ferguson
Kwame Nkrumah University of Science and Technology, Ghana, ferdiferguson5@gmail.com

LESSONS LEARNED FROM THE FIRST GENERATION OF INTERPLANETARY SMALLSATS

Abstract

Small Satellites, or 'SmallSats,' are increasingly dominating the current era of space exploration and have opened a whole new set of scientific and space exploration opportunities. In particular, the CubeSat form factor has enabled hundreds of sustainable, low-cost, and simple missions over the last decade. However, SmallSats have just begun to operate in interplanetary space, potentially providing a low-cost alternative to traditional large satellite missions. An example of this potential was using CubeSats as secondary payloads on the Artemis I mission. However, interplanetary SmallSat missions face a range of technical and operational challenges due to their demanding operating environments and ambitious scientific goals. Additionally, there is a lack of suitable engineering processes and standards tailored for missions of this type. Thus, this study aims to present a set of common knowledge on the specific difficulties these missions face. This knowledge was gathered using several methods, including a developer summit, interviews with mission leaders, mission surveys, and an extensive literature review. In addition, first-hand accounts from mission developers on the specific challenges faced, and the solutions they recommended were recorded. The study also investigates the difficulties faced by missions of this type and their degree of impact on development compared to typical Earth-orbiting SmallSat missions. As a result, suggestions to lower the risk and costs for future missions are made. These range from development, operation, documentation, and review approaches to team composition, parts selection, qualification, and

shared tools and facilities. Moreover, the study creates a standard framework for preventing and overcoming many of the problems encountered by past missions. It outlines customized systems engineering and project management models and standards that can serve future missions in the development and operations phases. These focus on the system development approaches, resource management, hardware selection and qualification, risk management and mitigation and the technical standards for different subsystem design, testing and validation. The proposed models aim to ease the development cycle of future missions from both a systems management and technical perspective.