

Small Satellite Missions and Mission Concepts

Papers Presented at the AIAA SciTech Forum and Exposition
2024

Orlando, Florida, USA
8 – 12 January 2024

ISBN: 979-8-3313-0455-3

Printed from e-media with permission by:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571



Some format issues inherent in the e-media version may also appear in this print version.

The contents of this work are copyrighted and additional reproduction in whole or in part are expressly prohibited without the prior written permission of the Publisher or copyright holder. The resale of the entire proceeding as received from CURRAN is permitted.

For reprint permission, please contact AIAA's Business Manager, Technical Papers. Contact by phone at 703-264-7500; fax at 703-264-7551 or by mail at 34922 Uwytkug'Xcmg{'Ftkxg.'Uwky'422, Reston, VA 20191, USA.

TABLE OF CONTENTS

SMALL SATELLITE MISSIONS AND MISSION CONCEPTS

Shadow Watcher: An Economical Smallsat Constellation Dependent on Servicing	1
<i>Andrew E. Turner</i>	
Venus Radio Occultation Observation Mission (VROOM): Pioneering Atmospheric Analysis with CubeSat Constellations.....	10
<i>Rohan Chandratre, Jack Adams, Sara Aldawood, Tanner Allen, Emma Esquivel, Erin Levesque, Anushree Manwatkar, Caitlin Martinez, Nikhil Punshi, Eric Reuter, Raphael Vicol, Daniil Voloshin, Alex Wittbrodt, Nicolas Polimeni, Rishika Jandhyala, Jiasheng Tang, Panagiotis Vergados, Tatiana Bocanegra-Bahamon, David Sweeney</i>	
MECO: Mission Concept dEvelopment of a CubeSat for Lunar Observation	86
<i>Melanie Rivera, Jacob Mesley, Kadin Caldwell, Krista Sahadeo, Keelin Weaver, Hector Del Castillo, Paula do Vale Pereira</i>	
Shining a Light on Student-Led Mission Operations: Lessons Learned from the Lunar Flashlight Project.....	110
<i>Mason Starr, Michael Hauge, E Glenn Lightsey</i>	

CUBESATS BEFORE COLLEGE: EXPANDING THE STEM PATHWAY

CubeSatVR-Studio: A Virtual Reality Application for Small Satellite Education.....	131
<i>Dylan Kiesling, Kevin Simmons</i>	
Legislating for the Florida Aerospace Workforce of the Future	139
<i>Michael Mikati, Shawna Christenson, Kevin Simmons</i>	

SMALL SATELLITE GUIDANCE, NAVIGATION AND CONTROL

Cold Gas Thruster and Controller Development for Satellite Attitude Control.....	146
<i>Huda Sedaki, Emre Koyuncu, Mustafa A. Karabeyoglu, Ahmet Gurer, Ahmet T. Cetin</i>	
Affordable Ranging and Clock Synchronization Device - Development and the Field Communication / Function Experiment.....	153
<i>Junichiro Kawaguchi, Shingo Nishimoto, Saki Komachi, Hayato Kokubo, Kohei Takeda, Shinya Fujita, Yuji Sakamoto</i>	
Model-Based Control of a Novel Outrunner Reaction Wheel for CubeSats and SmallSats.....	169
<i>Rhimas Van de Putte, Mikel Samson, Laila Kazemi, Tjorven Delabie</i>	
Stochastic Modeling of the Star Tracker Measurement Process to Assess Accuracy and Precision from Perturbation Propagation	193
<i>Gagandeep S. Thapar, Leonardo A. Torres</i>	
Hardware-In-The-Loop Experiments of an Attitude Fusing Library for CubeSat Star Trackers.....	217
<i>Mikel R. Samson, Laila Kazemi, Rhimas Van de Putte, Tjorven Delabie, Brecht De Vuyt</i>	
Fast Satellite Circumnavigation Via Continuous Control.....	235
<i>Andres M. Gonzalez</i>	

SMALL SATELLITE DEPLOYABLE STRUCTURES

The KIHM-9: A Self-Deploying Picosat Holographic Metasurface Antenna (HMA) Design.....	247
<i>Nathan Coleman, Mitchel Skinner, Collin Ynchausti, Akash Biswas, Constantinos Zekios, Stavros Georgakopoulos, Spencer Magleby, Larry Howell</i>	
Development of a 6-Meter Crossed Dipole Antenna Deployment Mechanism for CubeSat Applications.....	261
<i>Evan Hilgemann, Adarsh Rajguru, Jonathan F. Sauder, Savannah Suárez, James Smith</i>	
Space Demonstration of Two-Layer Deployable Membrane Reflectarray Antenna with PopUp Book Mechanism	277
<i>Hiraku Sakamoto, Takashi Tomura, Atsuki Ochi, Kazuki Nagai, Motoki Moritani, Gen Nakayama, Taichi Oshino</i>	
Strain Energy Storing, Self-Deployable Hinges for Multi-Material Monolithic Space Structures.....	287
<i>Colin S. Hunter, Avinkrishnan A. Vijayachandran, Anthony Waas</i>	
Investigation of Structural Architectures for the PowerCube Origami-Inspired Solar Array	298
<i>Laura K. Schmitz, Antonio Pedivellano, Joachim Schmidt, Ambre Rabanel, Thomas Sinn</i>	

SMALL SATELLITE AUTONOMY AND SOFTWARE

Preferential Autonomy-Based Ground Operations for Small Satellite Constellations in CisLunar Space	318
<i>Mohammed I. Rashed, Hyochoong Bang</i>	
The QuickSAT/SHERLOCK-MD System, an AI Architecture for in Situ Vehicle Monitoring and Support for Space Vehicle On-Orbit Servicing, Assembly and Manufacturing.....	354
<i>Andrew D. Santangelo, Greg Falco</i>	
An Open-Source Python-Based Framework of Real-Time Controls as Flight Software of CubeSats	363
<i>Paula do Vale Pereira, Felipe J. Depine, Roberto Bucher</i>	
Designing a Bare-Metal Flight Software Architecture for the Academic SWARM-EX CubeSat Constellation.....	372
<i>David J. Fitzpatrick, Nicholas Rainville, Scott E. Palo, Tom Woods</i>	

SMALL SATELLITE PROPULSION

Leveraging Phase Change for CubeSat Propellant Positioning	390
<i>Samuel Hart, E Glenn Lightsey, Alvaro Romero-Calvo</i>	
HyPer - The On-Orbit Campaign of a Green Monopropellant for Small Satellite Propulsion	401
<i>Madison Galvin, Jennifer Smolke, Denise Burrell, Alexander Harpenau, David Hinkley, Brandie L. Rhodes</i>	
Firing Tests in Relevant Environment of a 500 mN HTP Thruster for CubeSat Applications	417
<i>Angelo Pasini, Elia Puccinelli, Stefano Calatafimi, Carlos M. Moya, Thomas Searle, Juliusz Saryczew</i>	
Experimental Assessment of the Pulse Mode Propulsive Performance of Small Chemical Thrusters	439
<i>Elia Puccinelli, Stefano Calatafimi, Angelo Pasini</i>	

Author Index