50th Student Conference

Held at the 73rd International Astronautical Congress
(IAC 2022)

Paris, France
18-22 September 2022

ISBN: 978-1-7138-7420-1

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.

International Astronautical Federation
100 Avenue de Suffren
75015 Paris
France

Phone: +33 1 45 67 42 60
Fax: +33 1 42 73 21 20

www.iafastro.org

Additional copies of this publication are available from:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: 845-758-0400
Fax: 845-758-2633
Email: curran@proceedings.com
Web: www.proceedings.com

TABLE OF CONTENTS

STUDENT CONFERENCE - PART 1

CLOWN: A New Tool for Cloud Detection with All-Sky Camera for Optimization of Space-Debris Surveys. 1
Luís Gonçalves, Ana Sousa

Design and Path Optimization of a Spacecraft for Space Debris Removal by Burning it into the Earth's Atmosphere 7
Abhijeet, Dipak Kumar Giri, Priyank Dubey

Detailed Design and Verification of a Wave Spring Self-Pressurized Tank for a Micro-Resistojet Thruster 21
Franco M. Marchese, Claudio Rapisarda

Development of an Improved Random Positioning Machine to Simulate Organic Growth in Microgravity 34
J. J. Moreno Perez, C. San Miguel Ortego, M. González Rodríguez

Numerically Efficient Methods for Low-Thrust Collision Avoidance Maneuvers Design in GEO Regime 41
Alexia Cantoni, Pierluigi Di Lizia, Andrea De Vittori, Roberto Armellin

On-Track Optimal Rendezvous and Docking of Spacecrafts Using Hybrid Coulomb Control 53
Gaurav Kumar, Dipak Kumar Giri, Shashi Ranjan Kumar, Arya Das

Performance Investigation of Vaporizing Liquid Micro-Resistojets and Low-Pressure Micro-Resistojets for the LUMIO Mission 68
Adriano Casablanca, Angelo Cervone

piNOAA: An Independent Daily Earth Observation Service Using a Raspbery Pi Data Processing Platform 80
Diogo P. Silva, José Eduardo

Simulating Melting-Solidification of Lunar Regolith Particles Using Coupled CFD Methods 85
Brendon A. Cavainolo, Andres Torres-Figueroa, Michael P. Kinzel

Starry Night, Starry Bright: The Value of Dark and Quiet Skies in an Age of Mega-Constellations 93
Kayla Taylor

The Optimal Fuel-Consumption Multi-Impulse Rendezvous Trajectory Design Using Whale Optimization Algorithm 101
Eun-Song Shim, Hae-Dong Kim

STUDENT CONFERENCE - PART 2

Controller Design for Launch Vehicles by Integrating Adaptive Control with Robust Control Based on Model Predictive Control 104
Emi Sakaoka

Earth-Moon Logistical Operations Utilizing Cislunar Periodic Orbits 111
Adam P. Wilmer, Robert A. Bettinger

Fuel-Optimal Formations for Telescope-Starshade Observatories in Lunar Space 120
Grace Genszler, Dmitry Savransky, Gabriel J. Soto, Jackson Kulik

Harvesting Geothermal Energy on Mars for Future Settlement 131
Sanmathi P. A. L. Devi, Ananya Nagireddy, Smruthi Srinivasan

Radiation Shielding for Interplanetary Missions Using Magnets 136
Alexandra M. Walser

OrbitSuite: A Fast Pipeline for Space Situational Awareness 142
S. Lane, C. P. Bridges

Origami-Inspired Deployable Space Habitats 155
Joe Defillion

On-Orbit Spacecraft Inertia Tensor Estimation 175
Atilla Saadat

Thermal Design of CASSTOR a Nanosatellite for High-Resolution UV Spectropolarimetry 188
Mina Konaka, Coralie Neiner, Vincent Lapeyrère, Boris Segret

Tip Shape, Height, and Thickness Influences on Nonlinear Acoustic Damping from Baffle Blades 195
Joseph Day

Sizing of a Propelled-Hopping System on the Moon 196
João Gambôa, Jasmine Rimani, Stéphanie Lizy-Destrez

STUDENT TEAM COMPETITION

3U CubeSat Mission to Assess Vegetation Hydration Status and Hydrological Instability Risk 211
Simone Calamia, Marianna Centrella, Tommaso Giovara, Luca De Pasquale, Alessandro Allegrini, Lorenzo Galante, Luisa Iossa, Alfredo Gili, Domenico Parrinello, Davide Cosenza, Nicolae Tabacaru, Niccolò Scolari, Filippo Vitucci, Luca Bartolucci, Vincenzo Saladino, Chiara Lughi, Emanuela La Bella, Leonardo Ferrari, Francesco Ferrario, Simone Bollattino, Alessio Taretto, Manuel Pecorilla, Cristiano Garino, Carmela Marika Accettura, Liborio Luca Mininni, Vincenzo Calabretta, Batuhan Ergun, Rafael Sofi-Zada

Biodomo Project: An Automated Aeroponic Hermetically Contained System to Grow Crops Under Harsh Environmental Conditions 227
Tania Ramírez-González, Facundo Mendoza-Solano, Carlos André-Bolaños, Darling Mora-Rojas, Sebastián Solano-Montero, Amanda Castro-Vargas, Steven Cornejo-Granados, Francini Mora-Chacón, Sebastián Vargas-Mesén, Rosmery Valle-Rodríguez, David Bolaños-Jiménez

Characterization of the Dampening of Liquid Sloshing with Foam-Like Materials..... 240
Loup Cordey, Maxime Roux, Benjamin Meunier, Giuliano Parma, Alain Girard, Florent Piton, Elyes Ben Chaabane

Breaking the Barriers: Implementation of Flight Software for University Small Satellite Missions 247
Nayana Tiwari, Caitlin Feldewerth, Elizabeth Hoerber, Pauline Faure

The Modulatory Effect of Altered Gravity on Drug Resistance in Human Ovarian Cancer Cells. 255
Agata Górska, Dawid Przystupski, Piotr Wawryka, Leszek Kogut

BUTCube – Road for CubeSat In-Orbit Solar Eclipse Observation Mission Utilizing 1U Demonstrator 256
Václav Lazar, Jaroslav Bartonek, Petr Malaník, Štepán Rydlo, Tomáš Láznicka, Robert Popela

Project Draco: Detection of Radiations in Cislunar Space Orbits 263
Adrien Legrand, Laura Hyest, Quentin Thibaud, Alexis Przybylak, Raphaël Fournon

Design and Validation of a Lab-Scale Methalox Fuel Plant for In-Situ Propellant Production on Mars 264
Dagan Schoen, Rhiannon Evans, Alyona Glazyrina, Joanne Han, Joya Yamagishi, Douglas Zhu, Hang Zou

Detailed Design of IonSat: A Station-Keeping Mission at Altitudes Below 300km 273
Jerome Hui, Kelyan Olichon, Thomas Bras, Amaury Autric, Hadir Taleb, Victor Deroo, Jules Sueiro, Jean-Loup Lemoine, Alexis Launois, Zayed Herma, Mohamed Ahmed Maloum, Muhammad Shadab Khan

Interpreting LRIT from GK2A Satellite: Communication for Everyone 283
Jeonghwa Heo, Jaeseok Ryu, Seokjin Kim, Woojin Jeong, Somyung Yun, Inhyeok Baek, Seunghyun Jeong, Inhoi Koo

Fundamental Research of Ferrofluids 297
Maximilian Speier, Iqbal Grewal, Tim Kinnunen, Mantas Staikunas, Mattias Olsson, Sven Molenkamp, Samuel Sonesson, Thea Lepage, Maja Renström, Erik Lidman, Femke Kranenbarg, Thea Jonsson, Oliver Jansson, Tim Magnusson, Tristan Edwards, Thomas Kuhn, Rene Laufer

Interferometric Baseline Enlargement with Passive Reflectors for Geosynchronous Orbit Determination Precision Enhancement 304
J. Nicolas-Alvarez, X. Carreño-Megias, M. Albert, J. Rodriguez, A. Aguasca, A. Broquetas

Low-Cost Attitude Determination and Control System of the Student-Built 3U+ CubeSat SOURCE 310
Nadim Maraqten, Paul J. Haufe, Martin Zietz, Alexander Wagner, Christopher Vogt, Luc Lauer, Nicolas A. Probsta, Justus Goll, Steffen Gaisser, Robin Schweigert, Sabine Klinkner

Modular Portable Ecosystems: A Sustainable and Scalable Food Production Model 324
Daniela Lomelí Mejía, Jose G. Mora-Almanza, Ivonne M. L. López, Katherine S. L. Abundis, Kerry A. B. González, Jesus A. Peralta Lopez, María J. Y. Gutiérrez Guerrero, Rebeca Janeth Muñoz Galán, Miguel A. Sosa Gonzalez, Montserrat Avelar, Paula J. Romero Tavera, Alan S. Aguilar Segundo, Daniela S. Brion Escobedo, Jose L. Montoya Corral

Preliminary Design of Lunar Vehicle for Astronauts Transportation 336
T. Simon, C. Loneux, A. Duchene, A. Faure-Gignoux, P. Vignaud, B. Vinière, F. Fillol, A. Lafontan, T. Gres, J. Aubert

STRATHcube: A CubeSat Against Space Debris 351
Lewis Gray, Ewan Leitch, Julie Graham, Andrew R. Wilson, Massimiliano Vasile

Stratos IV: Development of a Student Sounding Rocket Capable of Launching to 100 km Altitude 364
Krijn de Kievit, Eoghan Gilleran, Klaas Burger, Rolf Wubben

Wanka - A Mission to Measure Stratospheric Aerosols Concentration Using Low-Cost Commercial Sensors Onboard a High-Altitude Balloon 378
Ramiro Tintaya, Julver Marrufo, Martin Salazar, David Arrustico, Antony Davila, Germain Rosadio, Lucas Taipe, Maria Muñoz, Anibal Esquiembre, Giusep Baca, Dario Huanca, George Fajardo, Miguel Morales, Luis Suarez-Salas

EDUCATIONAL PICO AND NANO SATELLITES

Power Subsystem of KuauhtliSat, a TubeSat-Type Nanosatellite, Using TrisolX Solar Cells Arrays 384
Antonio López, Jose A. Ramirez Aguilar, Rafael G. Chavez Moreno, Carlos Romo Fuentes

An Overview of Thermal Tests for CubeSats 390
Stéphanie Fiore

An International Hands-On Cooperative Nanosatellite Project for Students and Young Professionals in Emerging Space Countries 414
Tensae Ali, Matias Campos, Niki Sajjad

Design of a Low-Cost Net Capture CubeSat for Space Debris Removal 416
Minghe Shan, Lingling Shi, Yajie Cheng, Yong Lin

Design, Verification, and Validation of the Communication System of an Undergraduate CubeSat Mission 421
Alex Jurgutis, August Lear, Matt Murray, Kieron von Buchstab, Hooman Jazebizadeh, Bruce Burlton

HanseSat - Wireless CubeSat Payload Technology Demonstrator from Germany and Poland 430
Adam Dabrowski, Szymon Krawczuk

Implementation of a Tailored Mission Analysis Framework for the FRAMSAT-1 CubeSat Mission 431
Jarle Steinberg, Håkon Kindem

K'OTO Project, Mexican Nanosatellite for Training Human Talent 436
Xochitl Veronica Silvestre Gutierrez, Rafael-Guadalupe Chávez-Moreno, Eduardo Muñoz Arredondo, Sergio Rios Rabadan, Edgar Iván Chávez Aparicio, Guadalupe Ortega Ontiveros, Saúl Zamora Hernández, Saul Perez Elizondo

Mission Design of On-Orbit Educational Nanosatellite Platform Using Radiation Hardened Raspberry Pi-Based Digital Video Transmitter, with Echo Mode. 444
Dhruva Anantha Datta

Morazán MRZ-SAT CubeSat: Thermal Modeling and Analysis Guide for Academic CubeSat Missions 454
Fernando José Zorto-Aguilera, Jefrey René Hipp-Méndez, Valeria Sanchez-Varela, Reynel Josué Galindo-Rosales

Strategies Developed to Establish a Nanosatellite Thermal Testing Plan for the SC-ODIN Student Project 469
Sarra Boussoukaya

Validation of Viscoelastic Multi-Layered Deployable Solar Panel Module for 6U CubeSat of STEP Cube Lab-II 474
Jae-Seop Choi, Jae-Hyeon Park, Ji-Seong Go, Hyun-Ung Oh

Author Index