

Space Operations and Support

Papers Presented at the AIAA SciTech Forum and Exposition
2023

National Harbor, Maryland, USA and Online
23-27 January 2023

ISBN: 978-1-7138-7598-7

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

ON-ORBIT SERVICING I

A Comparison of Control Strategies for Contact Force Manipulation During Simulated On-Orbit Contact Events.....	1
<i>Thomas A. Battista, Michael Andonian, Jake Singh, Ashtin K. Cheng, Kevin Chow</i>	
Robot Guided Emergency Evacuation from a Simulated Space Station	25
<i>Brett Sheeran, Alan R. Wagner, Colin Holbrook, Daniel Holman</i>	
Adaptive Detumbling of Uncontrolled Planar Spacecraft using Finite Module Deposition.....	39
<i>Ian Down, Manoranjan Majji</i>	
Using Small Satellites to Construct an In-Space Test Platform for Risk Reduction.....	51
<i>Elozor Plotke, Peter C. Lai, Roberta M. Ewart</i>	

FLIGHT TEST, HISTORY, SOCIETY AND SPACE OPERATIONS

A Data-Driven Approach to Analyze the Development of the United States Air Traffic Management System	62
<i>Junqiang Wan, Yan Xu, Honghai Zhang, Yifei Zhao</i>	
Design, Performance-Based Optimization (PBO), and Actual Development of Unmanned High-Speed Aerial Vehicle.....	70
<i>Ali Abbas, Imran Mir, Syed M. Abbas, Faiza Gul</i>	
Gasdynamic Techniques for Producing Sustained High-Temperature Gas Flows: An Overview	82
<i>Pejman Akbari, Craig T. Johansen, Colin Copeland, Stefan Tüchler</i>	
Future Space Propulsion Technologies with Prospects in Africa.....	112
<i>Ngunan Ikpaya, Jemila Ibrahim, Grace C. Nwokike, Lilian Osawemwenze, Ugochukwu R. Josiah, Fadilat S. Aliu, Samuel Fabiyi, Annabel Gondina</i>	
The Post Mission Disposal Analysis of PSLV Debris at De-Orbited Altitude.....	128
<i>Roshan Sah, Raunak Srivastava, Kaushik Das</i>	

ON-ORBIT SERVICING II

Simple Optimization of Inclination changes for On-orbit Servicing at GEO.....	142
<i>Alexander C. Urban, Bryan D. Little, Bruce Cox</i>	
Model Predictive Control of Floating Space Robots for Close Proximity On-Orbit Operations.....	157
<i>Raunak Srivastava, Roshan Sah, Kaushik Das</i>	
A Novel Mechanism for Orbital AI-based Autonomous Refuelling.....	169
<i>Lei He, Duarte Rondao, Nabil Aouf</i>	
Touchless Space Debris Management and Security of Space Technology	181
<i>Sirapat Lookrak, Phunika Jianudomdet, Anol Paisal</i>	

Voronoi Diagram based Strategies for Assessment of Threat Perception in the GEO Orbital Belt	188
<i>Shivshankar S, Debasish Ghose</i>	

AUTOMATION, AUTONOMY, AND ARTIFICIAL INTELLIGENCE

Impact of Intra-class Variance on YOLOv5 Model Performance for Autonomous Navigation around Non-Cooperative Targets.....	205
<i>Trupti Mahendrakar, Monty N. Attzs, Ashley L. Tisaranni, Josseanne M. Duarte, Ryan T. White, Markus Wilde</i>	

A Combined Machine Learning and Physics-Based Tool for Anomaly Identification in Propulsion Systems.....	216
<i>Samuel R. Darr, Sean Engelstad, Talbot Knighton, Matthew E. Taliaferro, Vinay K. Goyal</i>	

Application of Reinforcement Learning Agents to Space Habitat Resource Management	233
<i>Matthew R. Rines, Michael G. Balchanos, Dimitri N. Mavris</i>	

ORBITAL COLLISION AND DEBRIS MITIGATION OF RISK

Decision-Making and Optimization Framework for the Design of Emerging Satellite Constellations	254
<i>Marc A. Koerschner, Kavya Navaneetha Krishnan, Alexia P. Payan, Dimitri N. Mavris</i>	

Optimal Active Debris Removal Mission Design Using Low-thrust Trajectory	268
<i>DongUk Lee, Jaemyung Ahn</i>	

OPERATIONS INCLUDING ON ORBIT SERVICING, FINANCE, AND REUSABLE LAUNCH VEHICLES

Commercial Potential Evaluation of Scramjet Powered Vehicles for Access-to-Space	277
<i>Lachlan McTaggart, Tristan Vanyai</i>	

A Bibliometric Approach to Characterizing Technology Readiness Levels Using Machine Learning	291
<i>Jehan Dastoor, Heying Zhang, Michael G. Balchanos, Dimitri N. Mavris</i>	

Developing a Roadmap for an On-Orbit Satellite Factory Concept.....	309
<i>Jacob Rome, Matthew Obenchain, Christopher Hartney, Kelvin Chen, Arianna Villegas, Vinay K. Goyal, Jon Strizzi</i>	

Author Index