

# **General Aviation**

Papers Presented at the AIAA Aviation Forum 2023

San Diego, California, USA  
12-16 June 2023

ISBN: 978-1-7138-7866-7

**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

## **ADVANCED REGIONAL AIR MOBILITY**

Regulatory Considerations for Future Regional Air Mobility Aircraft.....	1
<i>Nicholas K. Borer, Nathaniel J. Blaesser, Michael D. Patterson</i>	
The Business Case for Regional Air Mobility at Scale .....	17
<i>Ian Villa, Laura A. Morejon Ramirez, Mark Moore</i>	

## **CONCEPTS FOR ADVANCED REGIONAL AIR MOBILITY**

Distributed Sensing and Reasoning for Advanced Air Mobility Health Management and Mission Assurance .....	42
<i>George E. Gorospe, Corey A. Ippolito, Kelley E. Hashemi</i>	
Network Level Performance of In-Flight Recharge for Hybrid-Electric Regional Aircraft .....	50
<i>Michael A. Fredricks, Cedric Y. Justin, Dimitri N. Mavris</i>	
Design and Evaluation of Novel General Aviation Aircraft Concepts with a Fully Integrated Power Train for Regional Air Mobility .....	76
<i>Florian Will, Felix Ladwein, Thomas Zill</i>	
Distributed Electric Propulsion and Vehicle Integration with Ducted Fans .....	91
<i>Devon Jedamski, Vineet Ahuja, Eduardo J. Alvarez, Vinod K. Lakshminarayan, Mark Moore</i>	
Unlocking Low-Cost Regional Air Mobility Through Whisper Aero-Propulsive Coupling .....	117
<i>Mark Moore, Xiaofan Fei, Devon Jedamski, Aaron Perry, Laura A. Morejon Ramirez, Ian Villa, Vinod K. Lakshminarayan</i>	

## **ADVANCED AIR MOBILITY OPERATIONS**

MROPort for Airworthiness Checks of VTOLs in a Future-Proof Environment .....	154
<i>Jil Eltgen, Thorsten Schüppstuhl</i>	
Optimized Capacity Allocation in a UAM Vertiport Network Utilizing Efficient Ride Matching.....	164
<i>Majed Swaid, Jan Pertz, Malte Niklaß, Florian Linke</i>	
Rotorcraft Takeoff Analysis and Classification to Detect Outlier Operations that Could Present a Safety Risk .....	179
<i>Gabriel Achour, Ricardo F. Silva, Alexia P. Payan, Charles C. Johnson, Dimitri N. Mavris</i>	
Ranking Model for Identifying Critical Blockage of Airspace Leading to Significant Airfield Inefficiency.....	199
<i>Huang Feng, Yu Zhang</i>	

## **IMPROVED CERTIFICATION AND SAFETY ASSURANCE APPROACHES FOR EXISTING OR NEW CONCEPTS**

Revisiting "Critical-Engine-Inoperative" Conditions for Distributed Hybrid-Electric Aircraft .....	206
<i>Jiacheng Xie, Mayank V. Bendarkar, Yu Cai, Dimitri N. Mavris</i>	

Investigation of Energy Reserve Requirements for eCTOL Aircraft Using a Trajectory Energy Management Simulation.....	233
<i>Johannes Verberne, Yoonjae Lee, Cedric Y. Justin, Dimitri N. Mavris</i>	
Automated Identification of Phase of Flight Via Probabilistic Clustering for General Aviation Operations .....	261
<i>Georgios Georgalis, Nicoletta Fala</i>	
An Extended MBSE Framework for Regulatory Analysis of Aircraft Architectures .....	272
<i>Mayank V. Bendarkar, Evan Harrison, Taylor M. Fields, Stephen Glinski, Elena Garcia, Dimitri N. Mavris</i>	
Designing eVTOL and UAM Aircraft for Flight Safety, EMP, EMI and HIRF Resistance, FAA Certification, Insurability, Ground Safety and Community Acceptance.....	287
<i>Ronald M. Barrett-Gonzalez, Mason Denneler, Zach Schwab, Micaela Crispin</i>	
Safety Implications of Pilot Incapacitation Occurrences for Future Single Pilot Operations.....	301
<i>Alexander Somerville, Timothy Lynar, Graham Wild</i>	

### **ANALYSES FOR INCREASED AVIATION SAFETY AND/OR THROUGHPUT**

Exploration of General Aviation Aircraft Ride Comfort Related to Turbulence.....	312
<i>Linda K. Kliment, Kamran Rokhsaz, Melvin Rafi</i>	
Integration of Drones with 5G Connectivity to Airfields for Enhancing Mission Readiness and Structural Health Monitoring.....	324
<i>Brenden Herkenhoff, Anastasia Zagrai, Andrei Zagrai, Mostafa Hassanalain</i>	
Physics-Based Modeling for Autonomous Operation of Unmanned Aerial Systems in Extreme Gusts.....	332
<i>Behdad Davoudi, Karthikeyan Duraisamy, Ella M. Atkins, Peter Gaskell, Maximilian Krogius</i>	

### **X-57 MAXWELL LESSONS LEARNED**

Development of the Mod II X-57 Piloted Simulator and Flying Qualities Predictions .....	372
<i>Ryan D. Wallace, James Reynolds, J. Dana McMinn, Michael Frederick, Nicholas K. Borer, David Cox</i>	
X-57 Cockpit Display System Development and Features.....	390
<i>Sean C. Clarke, Adam Curry, Aamod Samuel</i>	

### **Author Index**