

# **AIAA Modeling and Simulation Technologies Conference 2018**

Held at the AIAA Aviation Forum 2018

Atlanta, Georgia, USA  
25 - 29 June 2018

ISBN: 978-1-5108-6888-5

**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

## MST-01: HUMAN FACTORS, PERCEPTION, AND CUEING

<b>Objective Motion Cueing Criteria for Commercial Transport Simulators (AIAA 2018-2935)</b> .....	1
<i>Peter Zaal, Jeffery A. Schroeder, William W. Chung</i>	
<b>Time-Varying Manual Control Identification in a Stall Recovery Task under Different Simulator Motion Conditions (AIAA 2018-2936)</b> .....	25
<i>Alexandru Popovici, Peter Zaal, Marc A. Pieters</i>	
<b>Post-stall Flight Model Fidelity Effects on Full Stall Recovery Training (AIAA 2018-2937)</b> .....	49
<i>Peter R. Grant, Gregory J. Moszczynski, Jeffery A. Schroeder</i>	
<b>Human-in-the-Loop Study on Angle-of-Attack Indicator Effectiveness for Transport Category Airplanes (AIAA 2018-2938)</b> .....	73
<i>Angela Campbell, Somil Shah, Mark Reisweber, Lisa R. Le Vie</i>	
<b>Evaluation of Augmented Reality Tools for the provision of Tower Air Traffic Control using An Ecological Interface Design (AIAA 2018-2939)</b> .....	88
<i>Mohamed Ellejmi, Sara Bagassi, Alfredo Persiani, Sergio Piastra</i>	

## MST-02: MODELING AND SIMULATION OF AIR VEHICLE DYNAMICS AND ENVIRONMENTS I

<b>Modeling of a 6 DOF Very Flexible Unmanned Aerial Vehicle (AIAA 2018-3255)</b> .....	98
<i>Rajeev Chandramohan</i>	
<b>Design, Development and Validation of a Cessna Citation X Aerodynamic Model using OpenVSP Software (AIAA 2018-3256)</b> .....	108
<i>Marine M. Segui, Georges Ghazi, Ruxandra M. Botez, Emily M. Thompson</i>	
<b>Adaptive Nonlinear Flight Control of STOL-Aircraft Based on Incremental Nonlinear Dynamic Inversion (AIAA 2018-3257)</b> .....	117
<i>Yannic Beyer, Alexander Kuzolap, Meiko Steen, Jobst H. Diekmann, Nicolas Fezans</i>	
<b>Analytical Determination of a Helicopter Height-Velocity Curve (AIAA 2018-3258)</b> .....	133
<i>M. J. Harris, Donald L. Kunz, Joshua A. Hess</i>	

## MST-03: SIMULATION ARCHITECTURES AND TECHNOLOGIES

<b>Managing Multi-protocol Network Definitions in Aircraft Simulation and Test (AIAA 2018-3430)</b> .....	151
<i>Brian Hale</i>	
<b>An Investigation of Parallel Programming Techniques Applied to Monte Carlo Simulations for Post-Flight Reconstruction of Spacecraft Trajectory (AIAA 2018-3431)</b> .....	156
<i>Robert A. Williams, Justin Green</i>	
<b>Parallelization of a Six Degree of Freedom Entry Vehicle Trajectory Simulation Using OpenMP and OpenACC (AIAA 2018-3432)</b> .....	165
<i>Justin Green, Robert A. Williams, Julian Gutierrez</i>	

## MST-04: MODELING AND SIMULATION OF AIR VEHICLE DYNAMICS AND ENVIRONMENTS II

<b>Verifying Implementation of the Dryden Turbulence Model and MIL-F-8785 Gust Gradient (AIAA 2018-3580)</b> .....	181
<i>Michael M. Madden</i>	
<b>Development of Advanced Aerodynamic Data Fusion Techniques for Flight Simulation Database Construction (AIAA 2018-3581)</b> .....	199
<i>Maxim Tyan, Mukyeom Kim, Vinh Pham, Cheol Kyun Choi, Thang L. Nguyen, Jae-Woo Lee</i>	
<b>Characterizing Effects of Aircraft Dynamics on Airborne Antenna Arrays by Generating In-Flight Deformed Geometry for Finite Element Analysis (AIAA 2018-3584)</b> .....	209
<i>Pedro M. Mendoza Strilchuk, Emily Arnold</i>	

## **MST-05: MODELING AND SIMULATION FOR FAULT DETECTION AND PREDICTION**

<b>Automated Scenario Generation for Human-in-the-Loop Simulations (AIAA 2018-3751)</b> .....	229
<i>Gano Broto Chatterji, Kee Palopo, Yun Zheng, Jimmy Nguyen</i>	
<b>A Mission Optimization Tool for Air to Ground Tactical Operations (AIAA 2018-3752)</b> .....	242
<i>Mehmet Akgul, Gunes Aydin</i>	
<b>Fuzzy Modelling of Zero-pressure Balloon Ascent (AIAA 2018-3753)</b> .....	249
<i>Kanika Garg, Reza Emami</i>	

## **MST-07: MODELING AND SIMULATION FOR UNMANNED AND PERSONAL AERIAL VEHICLE OPERATIONS**

<b>Development and Demonstration of a Flight Simulator for the Dual-Aircraft Platform Concept (AIAA 2018-3886)</b> .....	257
<i>Nolan Coulter, Hever Moncayo, William A. Engblom</i>	
<b>Evaluation and Comparison of Sailing Flight Optimization Algorithms for a Stratospheric Dual Aircraft Platform Concept (AIAA 2018-3887)</b> .....	279
<i>Nolan Coulter, Hever Moncayo, William A. Engblom</i>	
<b>Multicopter Operations for Autonomous Assembly Applications in Manufacturing Environments (AIAA 2018-3888)</b> .....	298
<i>Cosme A. Ochoa, Katja S. Meuche, Ella M. Atkins</i>	
<b>Monte Carlo Simulation Based Design of a Robust Autopilot for Loitering Aerial Vehicles (AIAA 2018-3889)</b> .....	310
<i>Oguz H. Altintas, Ozgur Atesoglu</i>	
<b>Evaluating the Performance Impact of Cooperative Navigation for Unmanned Aerial Systems in GPS-Denied Environments (AIAA 2018-3890)</b> .....	323
<i>Mackenzie Lau, Michael Steffens, Dimitri N. Mavris</i>	
<b>Agent-based Simulation of Urban Air Mobility (AIAA 2018-3891)</b> .....	336
<i>Raoul Rothfeld, Milos Balac, Kay O. Ploetner, Constantinos Antoniou</i>	

## **MST-08: MODELING AND SIMULATION FOR AIRCRAFT DESIGN AND CERTIFICATION**

<b>A Novel Framework Approach Enabling Model-based Requirements Validation and Verification (AIAA 2018-3892)</b> .....	346
<i>Bastian Binder, Marcel Gottschall, Torsten Blochwitz</i>	
<b>A Computational Interface for Steady-State Models: An FMI Extension (AIAA 2018-3893)</b> .....	356
<i>Giulio Mose' Mancuso, Fabio Cremona, Leonardo Mangeruca, Alessandro Ulisse, Alessandro Mignogna, Stefano Boccabella, Alberto Ferrari, Luigi Di Guglielmo</i>	
<b>Generic Control Allocation Toolbox for Preliminary Vehicle Design (AIAA 2018-3894)</b> .....	368
<i>Jing Pei, George Bassett, James Grisham, Peter Finch, Matt Toniolo, Luke Miller, Pamadi Bandu</i>	
<b>New Economical Cruise Methodology for the Cessna Citation X Business Jet by an Original Morphing Horizontal Tail Application (AIAA 2018-3895)</b> .....	385
<i>Marine M. Segui, Matthieu Mantilla, Georges Ghazi, Ruxandra M. Botez</i>	
<b>Shimmy Simulation and Virtual Verification for Amphibious Aircraft's Landing Gear Airworthiness Certification (AIAA 2018-3896)</b> .....	398
<i>Xufei He, Jianliang Ai, Zhitao Song</i>	

## **MST-09: MODELING AND SIMULATION OF NAVIGATION AND COMMUNICATION SYSTEMS**

<b>Simulation of Radar Signal Propagation via Multipath (AIAA 2018-4060)</b> .....	407
<i>Alicia Sudol, Seth E. Gordon, Hallie Ford, Eric Inclan, Dimitri N. Mavris, Michael Z. Miller</i>	
<b>A Component-Level Model of Automatic Dependent Surveillance - Broadcast (ADS-B) (AIAA 2018-4061)</b> .....	419
<i>Michael M. Madden</i>	
<b>Physics-based Radio Frequency Visualization for Operational Analysis (AIAA 2018-4062)</b> .....	433
<i>Michael Z. Miller, Evan Searles</i>	

**MST-10: DATA ANALYSIS TECHNIQUES APPLIED TO SIMULATION**

**Progress Toward Efficient Compression Algorithms for Application in Flight Simulation Environments (AIAA 2018-4064)** ..... 443  
*Jeffrey Thomas, Earl Dowell, Michael Anderson, Gregory McGowan*

**An Adaptive Sequential Experiment Design Method for Metamodeling (AIAA 2018-4065)** ..... 455  
*Yuchen Zhou, Ke Fang, Ping Ma, Ming Yang*

**Author Index**