

AIAA Modeling and Simulation Technologies Conference 2017

Held at the AIAA SciTech Forum 2017

Grapevine, Texas, USA
9 - 13 January 2017

Volume 1 of 2

ISBN: 978-1-5108-4395-0

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 Uwptkug'Xcmg{ 'F tkxg."Uwkug"422, Reston, VA 20191, USA.

TABLE OF CONTENTS

VOLUME 1

MST-01: MODELING AND SIMULATION OF AEROELASTICITY AND STRUCTURAL DYNAMICS

User Subroutine for Fatigue Modeling of Wing Structure of Flapping Micro Air Vehicle (AIAA 2017-0574).....	1
<i>Hichem Abdelmoula, Mostafa Hassanalian, Abdessattar Abdelkefi</i>	
Effects of Engine Placement on Nonlinear Aeroelastic Gust Response of High-Aspect-Ratio Wings (AIAA 2017-0576)	11
<i>Pezhman Mardanpour, Ehsan Izadpanahi, Siavash Rastkar, Dewey H. Hodges</i>	
Modelling Framework for Handling Qualities Analysis of Flexible Aircraft (AIAA 2017-0577)	43
<i>Vilius Portapas, Sezay Y. Yusuf, Mohammad M. Lone, Etienne Coetzee</i>	
Structural System Identification Using Degree of Freedom-based Reduction Method and Sensor Selection Algorithm (AIAA 2017-0578)	62
<i>Heejun Sung, Seongmin Chang, Maenghyo Cho</i>	

MST-02: MODELING AND SIMULATION OF UNINHABITED AERIAL VEHICLES I

Longitudinal Aerodynamic Coefficients of Hydra Technologies UAS-S4 from Geometrical Data (AIAA 2017-0579)	70
<i>Marine Segui, Maxime Kuitche, Ruxandra M. Botez, Oliviu Sugar Gabor</i>	
Modeling, Simulation, and Control of Modular Vertical Lift Air Vehicles (AIAA 2017-0580)	78
<i>Brady Anderson, Jonathan Warner, Jonathan D. Rogers</i>	
Modelling Wing Wake and Tail-Wake Interaction of a Clap-and-Peel Flapping-Wing MAV (AIAA 2017-0581)	94
<i>Sophie F. Armanini, Joao V. Caetano, Coen C. de Visser, Guido de Croon</i>	

MST-03: MODELING AND SIMULATION OF AIR TRAFFIC MANAGEMENT I

Evaluation of Airport Capacity Optimization Measures (AIAA 2017-0803).....	113
<i>Christoph Schinwald, Kay O. Plötnier, Mirko Hornung</i>	
A EUROCONTROL Tower Simulator to Validate SESAR Routing, Guidance and Airport Safety Nets Concepts (AIAA 2017-0804).....	131
<i>Mohamed Ellejmi, Marc Bonnier, Roger Lane, Stephane Dubuisson</i>	
ATC Procedures Modeling for Capacity Estimation of Japanese Airspace (AIAA 2017-0805).....	144
<i>Kota Kageyama, Kazuo Akinaga</i>	
Human-in-the-Loop Simulation of Trajectory Based Operation Concept for Remotely Piloted Aircraft System Integration (AIAA 2017-0806)	154
<i>Jisoo Kang, Seonyoung Kang, Hyeju Oh, Keeyoung Choi, Hak-Tae Lee, Hyuntae Jung, Woo-Choon Moon</i>	

MST-04: MODELING AND SIMULATION OF UNINHABITED AERIAL VEHICLES II

New Methodology for Longitudinal Flight Dynamics Modelling of the UAS-S4 Ehecatl Towards its Aerodynamics Estimation Modelling (AIAA 2017-0807)	168
<i>Maxime Kuitche, Marine Segui, Ruxandra M. Botez, Georges Ghazi, Oliviu Sugar Gabor</i>	
Sensitivity of Unmanned Aerial Vehicle Model-Aided Navigation (AIAA 2017-0808)	178
<i>Stéphane D'Urso, Jason N. Gross</i>	
Model-based Implementation of an Onboard STANAG 4586 Vehicle Specific Module for an Air Vehicle (AIAA 2017-0809).....	188
<i>Markus Hochstrasser, Christoph Krause, Volker Schneider, Florian Holzapfel</i>	
Integration and Evaluation of UAS Systems: Building a Virtual Engineering Facility (AIAA 2017-0810).....	205
<i>Neil Cameron, Charles Patchett, Konstantin Vikhorev, Ken Lai, Louise Wong, David Bowman</i>	

Dynamic Modeling and Hardware-In-Loop Simulation for a Tail-Sitter Unmanned Aerial Vehicle in Hovering Flight (AIAA 2017-0811)	216
<i>Jingxuan Sun, Boyang Li, Lu Shen, Chih-Keng Chen, Chih-Yung Wen</i>	

MST-05: AVIATION SIMULATION SCENARIO DEVELOPMENT I

Scenario Development Process at the Vertical Motion Simulator (AIAA 2017-1075)	228
<i>Scott Reardon, Emily Lewis, Steven D. Beard</i>	
Using System Entity Structures to Model the Elements of a Scenario in a Research Flight Simulator (AIAA 2017-1076)	237
<i>Umut Durak, Insa Pruter, Torsten Gerlach, Shafagh Jafer, Thorsten Pawletta, Sven Hartmann</i>	
Creating Scenarios for Airport Management Simulations Involving Independent Connected Simulators (AIAA 2017-1077).....	245
<i>Reiner Suikat, Tim Stelkens-Kobsch, Focke Stiekel, Helge Lenz</i>	
The Use of Data from Accident Investigations in Development of Simulator Training Scenarios (AIAA 2017-1078)	254
<i>Dennis A. Crider</i>	

MST-06: HUMAN FACTORS, PERCEPTIOPN, CUEING I

Evaluation of a Steep Turn Spatial Disorientation Demonstration Scenario for Commercial Pilot Training (AIAA 2017-1079)	280
<i>David H. Klyde, Amanda K. Lampton, Philip C. Schulze</i>	
Evaluation of a Missed Approach/Go-Around Spatial Disorientation Demonstration Scenario for Commercial Pilot Training (AIAA 2017-1080)	301
<i>Amanda K. Lampton, David H. Klyde, Philip C. Schulze</i>	
Refinement of Objective Motion Cueing Criteria Based on Three Flight Tasks (AIAA 2017-1081).....	323
<i>Peter Zaal, Jeffery A. Schroeder, William W. Chung</i>	
An Objective Method to Determine the Fidelity of Rotorcraft Motion Platforms (AIAA 2017-1082)	343
<i>Michael Jones</i>	
Experimental Evaluation of Haptic Support Systems for Learning a 2-DoF Tracking Task (AIAA 2017-1083)	366
<i>Giulia D'Intino, Mario Olivari, Stefano Geluardi, Joost Venrooij, Lorenzo Pollini, Heinrich H. Buelthoff</i>	
Assessing the Severity of Wake Encounters in Various Aircraft Types in Piloted Flight Simulations (AIAA 2017-1084)	376
<i>Gerben Van Baren, Vincent Treve, Frédéric Rooseleer, Peter Van der Geest, Bart Heesbeen</i>	

MST-07: MODELING AND SIMULATION OF AIR TRAFFIC MANAGEMENT II

Integrated Arrival-Departure-Surface-Enroute Air Traffic Optimization (AIAA 2017-1085).....	392
<i>Parikshit Dutta, Prasenjit Sengupta, Jason Kwan, Padmanabhan K. Menon</i>	
Severe-Weather Avoidance Using Bezier Curve-based Trajectory Planning for Arrival Air Traffic Management (AIAA 2017-1086)	411
<i>Shusuke Izuta, Masaki Takahashi</i>	
Merging Optimization Method Application to Arrival Scheduling Algorithm for Parallel Runways (AIAA 2017-1087)	425
<i>Daichi Toratani, Navinda K. Wickramasinghe, Eri Itoh</i>	
Feasibility Study on Constrained Optimal Trajectory Application in the Japanese Airspace (AIAA 2017-1088)	439
<i>Navinda K. Wickramasinghe, Mark Brown, Hiroko Hirabayashi, Sakae Nagaoka</i>	

MST-08: AVIATION SIMULATION SCENARIO DEVELOPMENT II

Enhanced Scenario-Based Training for Unmanned Aircraft System Operational Missions (AIAA 2017-1309)	457
<i>Kevin T. Rigby, Nickolas D. Macchiarella, Alexander Mirot</i>	
Harmonizing the Scenario Generation Process, Tools and Standards for Flight Simulators (AIAA 2017-1310)	467
<i>Joris Field, Arno Gerretsen, Remco Meiland, Frederik Mohrmann</i>	

Graphical Specification of Flight Scenarios with Aviation Scenario Definition Language (ASDL)	
(AIAA 2017-1311)	476
<i>Shafagh Jafer, Bharvi Chhaya, Umut Durak</i>	

MST-09: HUMAN FACTORS, PERCEPTION, CUEING II

Development of Model-following Control Laws for Helicopters to Achieve Personal Aerial Vehicle's Handling Qualities (AIAA 2017-1312)	484
<i>Carlo Andrea Gerboni, Stefano Geluardi, Joost Venrooij, Alexander Joos, Walter Fichter, Heinrich H. Buelthoff</i>	
Passive Haptics to Enhance Virtual Reality Simulations (AIAA 2017-1313)	500
<i>Richard D. Joyce, Stephen Robinson</i>	
Real-Time Performance Feedback in a Manually-Controlled Spacecraft Inspection Task (AIAA 2017-1314)	510
<i>John Karasinski, Stephen Robinson, Patrick Handley, Kevin Duda</i>	
A Hybrid-Systems Approach for Analyzing Pilot-Cockpit Interactions (AIAA 2017-1315)	522
<i>Bongjun Yang, Sang Gyun Park, Jayaprakash Suraj Nandiganahalli, Inseok Hwang</i>	
Effects of Eye Parameters on Human Controller Remnant and Control Behavior (AIAA 2017-1316)	546
<i>Alexandru Popovici, Peter Zaal, Daan M. Pool, Max Mulder, Marinus M. Van Paassen</i>	
Real Time Eye Tracking Interface for Visual Monitoring of Radar Controllers (AIAA 2017-1317)	571
<i>Hong Jie Wee, Sun Woh Lye, Jean-Philippe Pinheiro</i>	

VOLUME 2

MST-10: MODELING AND SIMULATION OF AIR TRAFFIC MANAGEMENT III

Automated Route Clustering for Air Traffic Modeling (AIAA 2017-1318)	585
<i>Alessandro Bombelli, Adria Segarra Torne, Eric Trumbauer, Kenneth D. Mease</i>	
TFDM Departure Queue Management - Effective Calibration and Validation Strategies for High-Fidelity Modeling (AIAA 2017-1319)	608
<i>Vaishali Shah, Christina David, Scott James, Michael Huffman</i>	
Estimation of Midair Collision Risk for Established on Required Navigation Performance Procedures (AIAA 2017-1320)	621
<i>Cody Nichols, Jason Walls</i>	
A Study on Free Routing Considering Interference of Air Traffic Flow (AIAA 2017-1321)	633
<i>Yoichi Nakamura, Kota Kageyama, Yoshikazu Miyazawa, Haruki Matsuda</i>	
An Elementary Algorithm for Autonomous Air Terminal Merging and Interval Management (AIAA 2017-1322)	643
<i>Allan L. White</i>	
Prediction of Delay Due to Air Traffic Control by Machine Learning (AIAA 2017-1323)	655
<i>Noboru Takeichi, Ryosuke Kaida, Akihide Shimomura, Takahiro Yamauchi</i>	

MST-11: MODEL AND SIMULATION DESIGN, DEVELOPMENT, TESTING, AND VALIDATION

Parameter Identification through Adaptive Optimal Estimation (AIAA 2017-1548)	663
<i>Anthony Hebert, Sergio Cafarelli, Paul Mackin, Jonathan Shaver</i>	
Development of Post-stall Flight Models from Certification Flight Test and Wind-tunnel Data (AIAA 2017-1549)	682
<i>Peter R. Grant, Zhanhong Luo, Stacey F. Liu, Gregory J. Moszczynski</i>	
Development and Validation of a Flight-Identified Full-Envelope Business Jet Simulation Model Using a Stitching Architecture (AIAA 2017-1550)	706
<i>Tom Berger, Mark Tischler, Steven G. Hagerott, M Christopher Cotting, William R. Gray, James Gresham, Justin George, Kyle Krogh, Alessandro D'Argenio, Justin Howland</i>	
Matching of Aerodynamic Databank with Flight Test Data - Latero-Directional Dynamics (AIAA 2017-1551)	741
<i>Marcelo S. Sousa, Adson A. de Paula, Fabricio M. Porto, Sebastião Cunha Junior</i>	

MST-12: MODELING AND SIMULATION OF SPACE VEHICLE DYNAMICS, SYSTEMS, AND ENVIRONMENTS

Microsatellite Simulation for Constellation Research (AIAA 2017-1553)	764
<i>Kai Leidig, Jens Eickhoff</i>	
Characterization of Multi-Antenna GNSS, Multi-Sensor Attitude Determination for Stratospheric Balloon Platforms (AIAA 2017-1554)	777
<i>Nathan Tehrani, Jason N. Gross</i>	
Interaction of a Robotic Servicing Vehicle with Satellite Flexible Modes During Capture (AIAA 2017-1555)	793
<i>Justin Brannan, Craig Carignan</i>	
An Open-source, Stochastic, Six-degrees-of-freedom Rocket Flight Simulator, with a Probabilistic Trajectory Analysis Approach (AIAA 2017-1556)	806
<i>Willem J. Eerland, Simon Box, Hans Fangohr, Andras Sobester</i>	
Modeling and Simulation of Aerobee-150A Sounding Rocket (AIAA 2017-1557)	821
<i>Ugur Akcal, Burak Yuksek, Nazim K. Ure</i>	

MST-14: MODELING AND SIMULATION OF UNINHABITED AERIAL VEHICLES III

Flight Testing, Data Collection, and System Identification of a Multicopter UAV (AIAA 2017-1558)	834
<i>Subodh Bhandari, Paul Navarro, Alex Ruiz, Sung Cho, Andrew Rashid</i>	
Improving Model Fidelity For a Small Quadcopter Through Experimental Modeling (AIAA 2017-1559)	848
<i>Peter R. Olejnik, Bradley T. Burchett</i>	
Dynamic Modeling and Simulation of A Quadcopter with Motor Dynamics (AIAA 2017-1560)	868
<i>A Ram Kim, Prasanth Vivekanandan, Patrick McNamee, Ian Sheppard, Aaron Blevins, Alex Sizemore</i>	
Modeling and Flight Control Simulation of a Quadrotor Tailsitter VTOL UAV (AIAA 2017-1561)	884
<i>Fu Zhang, Ximin Lyu, Ya Wang, Haowei Gu, Zexiang Li</i>	

MST-15: MODELING AND SIMULATION OF AIR VEHICLE DYNAMICS, SYSTEMS, AND ENVIRONMENTS

Ventus - Towards a Cost-effective Phenomenological Post-stall Aerodynamic Model Add-on for Upset Recovery Training (AIAA 2017-1756)	897
<i>Manfred Roza, Rick Van der Ploeg, Martin Laban</i>	
A Tailless Fighter Aircraft Model for Control-Related Research and Development (AIAA 2017-1757)	905
<i>Michael A. Niestroy, Kenneth M. Dorsett, Katherine Markstein</i>	
Modeling of Flight Dynamics and Pilot's Handling of a Hang Glider (AIAA 2017-1758)	923
<i>Yoshimasa Ochi</i>	
Aerodynamic Lateral-Directional Coefficients Modeling During Aircraft Design Phases (AIAA 2017-1759)	942
<i>Adson A. de Paula, Fabricio M. Porto, Marcelo S. Sousa, Sebastiao Simoes de Cunha</i>	
A Four-Stage One-Dimensional Model for Rime, Mixed and Glaze Ice Accretion on Aerofoils (AIAA 2017-1760)	974
<i>Zaid Janjua, Barbara Turnbull, Stephen Hibberd, Kwing-So Choi</i>	

MST-16: MODELING AND SIMULATION IN EDUCATION/SPECIAL TOPICS IN MODELING AND SIMULATION

A Proposed Hardware in the Loop Gimbal Platform that Supports an Applied Graduate Controls Course (AIAA 2017-1761)	983
<i>Monty Smith, James Reasoner, Robert Fithen</i>	
Design, Build and Integration of a Low-Cost Self-Erecting Inverted Pendulum Mechanism (AIAA 2017-1762)	989
<i>Kamran Turkoglu, Brian Graham</i>	
The Use of Modelling and Simulation to Give Students a HEADSTART into Aerospace Engineering (AIAA 2017-1763)	1010
<i>Mark D. White, Christopher Dadswell, Thomas Fell, Roy Coates</i>	

MST-17: MODELING AND SIMULATION INTEGRATION AND ARCHITECTURES

Schedule Failure Analysis within the Horizon Simulation Framework (AIAA 2017-1765)	1023
<i>Ian M. Lunsford, Eric A. Mehier</i>	
An Iteration on the Horizon Simulation Framework to Include .NET and Python Scripting (AIAA 2017-1766)	1042
<i>Morgan Yost, Eric Mehier</i>	
A Virtual Laboratory for Aviation and Airspace Prognostics Research (AIAA 2017-1767)	1061
<i>Chetan S. Kulkarni, Christopher Teubert, George Gorospe, Cuong C. Quach, Edward Hogge, Kaveh Darafsheh</i>	
A Code Architecture to Streamline the Missile Simulation Life Cycle (AIAA 2017-1768)	1071
<i>Ray Sells</i>	
Integrated System Modeling in SysML for Small Satellites (AIAA 2017-1769)	1086
<i>Lloyd Walker, Dale Thomas</i>	

MST-18: MODELING AND SIMULATION OF PROPULSION SYSTEMS

Design of a Transient Variable Cycle Turbine Engine Model for System Integration with Controls (AIAA 2017-1940)	1095
<i>Robert Buettner, Rory A. Roberts, Mitch Wolff, Alireza Behbahani</i>	
Cessna Citation X Engine Model Identification and Validation in the Cruise Regime from Flight Tests Based on Neural Networks combined with Extended Great Deluge Algorithm (AIAA 2017-1941)	1110
<i>Mahdi Zaag, Ruxandra M. Botez</i>	
Identification and Validation of the Cessna Citation X Engine Component Level Modeling with Flight Tests (AIAA 2017-1942)	1125
<i>Paul Alexandre Bardela, Ruxandra M. Botez</i>	
Design and Benchmarking of a Network-In-the-Loop Simulation for Use in a Hardware-In-the-Loop System (AIAA 2017-1943)	1140
<i>Eliot Aretskin-Hariton, George Thomas, Jonathan L. Kratz, Dennis E. Culley</i>	
Application of Immersed Boundary Method with Wall Injection for Solid Rocket Motor Internal Flow (AIAA 2017-1944)	1152
<i>Takuya Hirose, Shinichiro Ogawa, Daisuke Sasaki, Yuma Fukushima, Shigeru Obayashi</i>	
Author Index	