

AIAA Atmospheric Flight Mechanics Conference 2012

**Minneapolis, Minnesota, USA
13-16 August 2012**

Volume 1 of 2

ISBN: 978-1-62276-326-9

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 1801 Alexander Bell Drive, Reston, VA 20191, USA.

TABLE OF CONTENTS

Volume 1

Aeroelastic Effects of Wing Stiffness on the Flight Dynamics of a MAV	1
<i>Judson Babcock, Richard Lind</i>	
Aircraft Spin Phenomenon Analysis Using Nonlinearity Index Theory	20
<i>Daniel Tapolcai, Ashraf Omran, Brett Newman</i>	
Application of Sweet Spot Determination to a Conventional Pair of Aircraft.....	46
<i>Wendy Okolo, Atilla Dogan, William Blake</i>	
Aircraft Stall Phenomenon Analysis Using Nonlinearity Index Theory	74
<i>Daniel Tapolcai, Ashraf Omran, Brett Newman</i>	
Nonlinear Model Reduction for Flexible Aircraft Control Design	95
<i>Andrea Da Ronch, Kenneth Badcock, Yinan Wang, Andrew Wynn, Rafael Palacios</i>	
Safe Set Maneuverability of Impaired Aircraft	118
<i>Harry Kwatny, Robert Allen</i>	
Analysis of Aircraft Nonlinear Dynamics Using Non-Gradient Based Numerical Methods and Attainable Equilibrium Sets	123
<i>Mikhail Goman, Evgeny Kolesnikov</i>	
Bifurcation Behaviour of a Flapping Wing MAV in Longitudinal Flight.....	137
<i>Victor Mwongera, Mark Lowenberg</i>	
The Bifurcation and Continuation Method from an Aerospace Systems Design Point of View	158
<i>Narayan Ananthkrishnan, Aditya Paranjape</i>	
Real-Time Frequency Response Estimation Using Multi-Sine Inputs and Recursive Fourier Transform	171
<i>Jared Grauer, Eugene Morelli</i>	
A Full-Envelope Air Data Calibration and Three Dimensional Wind Estimation Method Using Global Output-Error Optimization and Flight-Test Techniques.....	187
<i>Brian Taylor</i>	
Center of Gravity Estimation of an Aircraft Solely Using Standard Aircraft Measurement Sensors.....	203
<i>Andy Komendat, Agamemnon Crassidis</i>	
System Identification of Flexible Aircraft in Time Domain	221
<i>Bruno Silva, Wulf Moennich</i>	
Feasibility Study of a Novel Method for Real-Time Aerodynamic Coefficient Estimation	247
<i>Phillip Gurbaki, Agamemnon Crassidis</i>	
Unmanned Aircraft and the Applicability of Military Flying Qualities Standards	270
<i>John Bingaman</i>	
Aerodynamic Sensing for a Fixed Wing UAS Operating at High Angles of Attack.....	294
<i>Derrick Yeo, Ella Atkins, Luis Bernal, Wei Shyy</i>	
Centralized Robust Controllers Using Signal-based H_{∞} and μ-Synthesis for an Unmanned Helicopter	312
<i>Wei Yuan, Jay Katupitiya</i>	
Simulation Tool for Testing and Validating UAV Autopilots in Wind Gust Environments	326
<i>Syed Ali Raza, Jason Etele</i>	
Optimization of Engine Failure on a Flying Wing Configuration	337
<i>Manuel Sauciez, Jean-Luc Boiffier</i>	
Analysis of APC Characteristics of Control Mode Switching Induced by Active Side Stick	366
<i>W. Tan, W. Zhang, X. Qu</i>	
Performance Enhancements by Bounding Flight	377
<i>Gottfried Sachs, Jakob Lenz, Florian Holzapfel</i>	
Development of a Fundamental Model for Flapping Wing MAVs and Preliminary Validation	389
<i>S. Nogar, J. McNamara, A. Serrani, M. Oppenheimer, D. Boman</i>	
Ground Contact Model for Mars Science Laboratory Mission Simulations	410
<i>B. Raiszadeh, D. Way</i>	
Atmospheric Data System Sensor Placement Optimization for Mars Entry, Descent, and Landing	428
<i>Soumyo Dutta, Robert Braun, Chris Karlgaard</i>	
Investigation of Trajectory Generation for a Mission Adaptive Planetary Entry Guidance Algorithm.....	445
<i>Sarah D'Souza, Nesrin Sarigul-Klijn</i>	
Survey of Blunt Body Dynamic Stability in Supersonic Flow	469
<i>Cole Kazemba, Robert Braun, Ian Clark, Mark Schoenenberger</i>	

Parametric Modeling for Store Separation Aerodynamics Using System Identification.....	496
<i>Ryan Carter, R. Lind</i>	
Parameter Estimation of Highly Unstable Aircraft Assuming Linear Errors.....	517
<i>Erol Ozger</i>	
Aerodynamic Model Identification of Frauke UAV	532
<i>Thomas Lombaerts</i>	
Investigation of the Prediction Error Identification for Flutter Prediction.....	555
<i>Jie Zeng, Ping-Chih Chen, Sunil Kukreja</i>	
Gust Response Sensitivity Characteristics of Very Flexible Aircraft.....	573
<i>Matthew Dillsaver, Carlos Cesnik, Ilya Kolmanovsky</i>	
Flight Dynamics of a Micro Air Vehicle with Aeroservoelastic Interactions across a Range of Wing Stiffness.....	593
<i>Abraham Pachikara, Richard Lind</i>	
Flight Control Development for a Speed-Agile Powered-Lift Transport Aircraft.....	612
<i>David Hyde, Kamal Shweyk, Frank Brown, Cale Zeune</i>	
Validation of the Flight Control System of a Conceptual, Powered-Lift, Speed-Agile, Transport Aircraft.....	626
<i>Kamal Shweyk, David Hyde, Kristen Levengood, Cale Zeune</i>	
The Extension of Analytic Hypersonic Force Coefficients for Conceptual Design Using the Divergence Theorem	637
<i>Michael Grant, Robert Braun</i>	
Lateral Stability Analysis of Hypersonic Vehicle under Pressure Fluctuation by Solving Mathieu Differential Equation.....	653
<i>Qingkai Wei, Xun Huang, Edward Peers</i>	
Debris Aerodynamic Interactions during Uncontrolled Atmospheric Reentry.....	662
<i>Ysolde Prevereaud, Jean-Luc Verant, Jean-Marc Moschetta, F. Sourgen, Mathieu Blanchard</i>	
Design and Experimental Validation of a Control System for a Morphing Wing.....	675
<i>Lucian Grigorie, Ruxandra Botez, Andrei Popov</i>	
Scaling Laws for Flight Control Development and Testing in the Presence of Aeroservoelastic Interactions	686
<i>Jeffrey Ouellette, Mayuresh Patil, Rakesh Kapuria</i>	
Real-Time Frequency Response Estimation Using Joined-Wing SensorCraft Aeroelastic Wind-Tunnel Data.....	700
<i>Jared Grauer, Jennifer Heeg, Eugene Morelli</i>	
Aeroelastic Modeling of Elastically Shaped Aircraft Concept via Wing Shaping Control for Drag Reduction.....	717
<i>Nhan Nguyen, James Urnes</i>	
Method for Analyzing The Influence of Random Factors in Carrier Launching	746
<i>Qian Zhu, Weijun Wang, Xiangju Qu</i>	
Model-based Aerodynamic-angle Attitude Control of an Atmospheric Entry Capsule	753
<i>Jose Ospina, Enrico Canuto, Marcello Buoncore</i>	
Forced Oscillation Wind Tunnel Testing for FASER Flight Research Aircraft	768
<i>Garrison Hoe, D. Bruce Owens, Casey Denham</i>	
Bifurcation Analysis of the Generic Transport Model with a View to Upset Recovery.....	780
<i>Simon Pauck, Jacobus Engelbrecht</i>	
Trim Analysis of a Moving-mass Actuated Airplane.....	803
<i>Sukru Erturk, Onur Daskiran, Atilla Dogan</i>	
Bifurcation Analysis of the NASA GTM with a View to Upset Recovery	818
<i>Stephen Gill, Mark Lowenberg, Bernd Krauskopf, Guilhem Puyou, Etienne Coetze</i>	

Volume 2

Modeling and Detection of Ice Particle Accretion in Aircraft Engine Compression Systems	832
<i>Ryan May, Donald Simon, Ten-Huei Guo</i>	
Aircraft Dynamic Modeling in Turbulence	844
<i>Eugene Morelli, Kevin Cunningham</i>	
Using Indirect Turbulence Measurements for Real-Time Parameter Estimation in Turbulent Air	866
<i>Borja Martos, Eugene Morelli</i>	
Unsteady Aerodynamic Modeling in Roll for the NASA Generic Transport Model.....	895
<i>Patrick Murphy, Vladislav Klein, Neal Frink</i>	

Computational 3D Icing Results for Scaled DLR-F6 Geometry	911
<i>Jason Gadebusch</i>	
Nonlinear Unsteady Aerodynamic Modeling by Volterra Variational Approach	928
<i>Mallesh Bommanahal, Mikhail Goman</i>	
A Conceptual Study of Airfoil Performance Enhancement Using CFD	941
<i>Armin Ghoddousi, Scott Miller</i>	
Determining the Stability and Control Characteristics of High-Performance Maneuvering Aircraft Using High-Resolution CFD Simulation with and without Moving Control Surfaces	959
<i>James Clifton, Clinton Ratcliff, David Bodkin, John Dean</i>	
Simulation of Aircraft Encounters with Perturbed Vortices Considering Unsteady Aerodynamic Effects	979
<i>David Bieniek, Robert Luckner</i>	
Parametric Study of Powered Parafoil Flight Dynamics	1004
<i>Michael Ward, Sean Culpepper, Mark Costello</i>	
Flight Performance Issues of Electric Aircraft	1021
<i>Gottfried Sachs</i>	
A Multi-Model Gauss Pseudospectral Optimization Method for Aircraft Trajectories	1032
<i>Matthias Bittner, Florian Fisch, Florian Holzapfel</i>	
Subcritical Bifurcations in Shimmy Dynamics	1046
<i>Gabor Stepan, Denes Takacs</i>	
Effects of Freeplay on Aircraft Main Landing Gear Stability	1056
<i>Chris Howcroft, Bernd Krauskopf, Mark Lowenberg, Simon Neild</i>	
Bifurcation Analysis of a Coupled Nose Landing Gear-Fuselage System	1072
<i>Nandor Terkovics, Simon Neild, Mark Lowenberg, Bernd Krauskopf, Sanjiv Sharma</i>	
Towards Industrialisation of Bifurcation Analysis in Rotorcraft Aeroelastic Problems	1086
<i>Djamel Rezgui, Mark Lowenberg, Mark Jones, Claudio Monteggia</i>	
A Two-Stage Method for the Parametric Identification of Scale-Model Helicopter Dynamics	1103
<i>Wei Yuan, Jay Katupitiya</i>	
Parameter Identification of an Executive Transport Aircraft - Simulation Update and Flight Test Results	1118
<i>Monica Londono, Bret Leonhardt</i>	
Design Evolution of a High Packing Density Micro Air Vehicle for Local-Area Seeding	1131
<i>Daniel Edwards, Aaron Kahn</i>	
Robust Parafoil Terminal Guidance Using Massively Parallel Processing	1143
<i>Jonathan Rogers, Nathan Slegers</i>	
Aerodynamic Effects of Parafoil Upper Surface Bleed Air Actuation	1161
<i>Keith Bergeron, Michael Ward, Mark Costello</i>	
Parafoil Control Using Payload Weight Shift	1178
<i>Michael Ward, Sean Culpepper, Mark Costello</i>	
Prediction of Aircraft Spin Characteristics by Continuation and Bifurcation Methods	1188
<i>Wieslaw Wroblewski, Krzysztof Sibilski</i>	
Numerical Continuation Analysis of a Dual-Sidestay Main Landing Gear Mechanism	1211
<i>James Knowles, Bernd Krauskopf, Mark Lowenberg, P. Thota, Simon Neild</i>	
Bifurcation Analysis and Simulation of Stall and Spin Recovery for Large Transport Aircraft	1235
<i>Jacobus Engelbrecht, Simon Pauck, Iain Peddle</i>	
An Initial Flight Investigation of Formation Flight for Drag Reduction on the C-17 Aircraft	1247
<i>Joseph Pahle, David Berger, Mike Venti, Chris Duggan, James Faber, Kyle Cardinal</i>	
Ground Vibration Test Identified Structure Model for Flutter Envelope Prediction	1260
<i>Jie Zeng, Ping-Chih Chen, Erich Ritz, Dallas Kingsbury, Marc Mignolet, Starr Ginn</i>	
Adaptive Control of Flow over Wind Turbine Blades	1273
<i>Nailu Li, Mark Balas</i>	
Investigation of Optimal Control Allocation for Gust Load Alleviation in Flight Control	1290
<i>Susan Frost, Marc Bodson, Brian Taylor</i>	
Linear, Parameter Varying Model Reduction for Aeroservoelastic Systems	1301
<i>Claudia Moreno, Gary Balas, Peter Seiler</i>	
Model Predictive Control of Agile Projectiles	1315
<i>Frank Fresconi, Mark Ilg</i>	
Aerodynamic Parameter Identification for Symmetric Projectiles: An Improved Gradient Based Method	1331
<i>Bradley Burchett</i>	
Trajectory Optimization Studies of Long Range Morphing Projectiles	1345
<i>Kevin Ryan, Mark Lewis</i>	

End-To-End Simulation of Launch Vehicle Trajectories Including Stage Separation Dynamics	1368
<i>Cindy Albertson, Paul Tartabini, Bandu Pamadi</i>	
Effects of Articulated Wings on the Stability of Small Unmanned Aircraft.....	1378
<i>Emily Leylek, Mark Costello</i>	
Aeroelastic Effects of Battens on the Flight Dynamics of a MAV.....	1406
<i>Judson Babcock, Richard Lind</i>	
Low-Order Modeling For A Small-Scale Flybarless Helicopter UAV A Grey-Box Time-Domain Approach	1425
<i>Skander Taamallah</i>	
LQR Controller for Stabilization of Flapping Wing MAV in Gust Environments	1467
<i>Manav Bhatia, Mayuresh Patil, Craig Woolsey, Bret Stanford, Philip Beran</i>	
Structured-Singular-Value-Based Optimal Aeroelastic Uncertainty Quantification using Surrogate Models and Flight Test Data.....	1495
<i>Brian Danowsky, Philip Schulze, Martin Brenner</i>	
Eigenvalue Constraints for Realization-Based Identification	1510
<i>Daniel Miller, Raymond De Callafon, Martin Brenner</i>	
Designer Materials for Controlling Thermally and Aerodynamically Excited Viscoelastic Lifting Surface Flutter and Structural Failures	1526
<i>Harry Hilton</i>	
Effect Of Jump Strut Nose Landing Gear In Preliminary Design Of Aircraft	1547
<i>Balaji Sankar</i>	
Airship Waypoint Navigation in the Presence of Wind	1560
<i>Jatuporn Nakpiam, Onur Daskiran, Christopher Elliott, Atilla Dogan</i>	
Design, Simulation, and Experimental Testing of Humanitarian Aid Airdrop Micro Packages	1587
<i>Thomas Herrmann, Carlos Montalvo, Mark Costello, Blaine Costello</i>	
Simulation of Flight Dynamics with an Improved Post-Stall Aerodynamics Model.....	1614
<i>Ryan Paul, Ashok Gopalarathnam</i>	
Store Separation Equations of Motion.....	1631
<i>Ryan Carter</i>	
Continuous Differentiation of Complex Systems Applied to a Hypersonic Vehicle	1655
<i>Derek Dalle, James Driscoll</i>	
Author Index	