TABLE OF CONTENTS

Volume 1

Practical Application of a Subscale Transport Aircraft for Flight Research in Control Upset and Failure Conditions .................................................. 1
K. Cunningham, J. Foster, A. Murch, E. Morelli

Real-Time Dynamic Modeling: Data Information Requirements and Flight Test Results ................. 15
E. Morelli, M. Smith

Transport Aircraft System Identification from Wind Tunnel Data ..................................................... 40
P. Murphy, V. Klein

Aerodynamic Effects and Modeling of Damage to Transport Aircraft ........................................... 54
G. Shah

Current Methods for Modeling and Simulating Icing Effects on Aircraft Performance, Stability and Control .................................................................................................................. 67
T. Ratvasky, S. Lee, B. Barnhart

Physical Modeling of Aircraft Upsets for Real-Time Simulation Applications ............................... 88
J. Keller, R. McKillip, D. Wachspress

Enhancement of the Non-Linear OLOP-Criterion Regarding Phase-Compensated Rate-Limiters ........ 101
D. Ossmann, M. Heller, O. Brieg

Development of Smart-Cue and Smart-Gain Concepts to Alleviate Loss of Control ....................... 115
D. Klyde, D. McRuer

Approach and Landing Flight Evaluation of Smart-Cue and Smart-Gain Concepts ....................... 129
D. Klyde, C. Ying-Liang

A Feasibility Study to the Application of Interval Analysis to Re-Entry Trajectory Optimization ......... 147
W. Chu, E. Mooij, E. van Kampen, P. Chu

Mars Entry Bank Profile Design for Terminal State Optimization ..................................................... 165
J. Lafleur, C. Cerimele

Retentry Terminal Guidance Through Sliding Mode Control .......................................................... 185
N. Hart, S. Balakrishnan

Guidance, Navigation, and Control Technology System Trades for Mars Pinpoint Landing .............. 203
B. Steinfeldt, M. Grant, D. Matz, R. Braun, G. Barton

Supersonic Disk Gap Band Parachute Performance in the Wake of a Viking-Type Entry Vehicle from Mach 2 to 2.5 ........................................................................................................ 219
A. Sengupta, J. Roeder, R. Kelsch, M. Wernet

Constrained Trajectory Optimization Using Pseudospectral Methods ........................................... 228
T. Jorris, C. Schulz, F. Friedl, A. Rao

Residualization of an Aircraft Aeroelastic Reduced Order Model to Obtain Static Stability Derivatives .................................................................................................................. 261
B. Danowsky, P. Thompson, C. Farhat, C. Harris

Application of Multiple Methods for Aeroelastic Uncertainty Analysis ........................................ 272
B. Danowsky, J. Chrstos, D. Klyde, C. Farhat, M. Brenner

Trajectory Tracking for High Aspect-Ratio Flying Wings ................................................................. 287
B. Raghavan, M. Patil, C. Woolsey

Adaptive Feedforward Control for Gust Loads Alleviation ............................................................ 303
J. Zeng, B. Moulin, R. de Callafon

Low Order Model Approximation of Aeroelastic/Aeroservoelastic System .................................. 314
J. Zeng, D. Baldelli, M. Brenner
<table>
<thead>
<tr>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Towards Real-Time Simulation of Aeroservoelastic Dynamics for a Flight Vehicle from Subsonic to Hypersonic Regime</td>
</tr>
<tr>
<td>P. Hu, M. Bodson</td>
</tr>
<tr>
<td>Dynamic Flight Simulation (DFS) Tool for Nonlinear Flight Dynamic Simulation Including Aeroelastic Effects</td>
</tr>
<tr>
<td>P. Chen</td>
</tr>
<tr>
<td>Aircraft Stability and Control Characteristics Determined by System Identification of CFD Simulations</td>
</tr>
<tr>
<td>J. Dean, S. Morton, D. McDaniel, J. Clifton, D. Bodkin</td>
</tr>
<tr>
<td>Computational Prediction of Roll Damping for the F/A-18E at Transonic Speeds</td>
</tr>
<tr>
<td>B. Green</td>
</tr>
<tr>
<td>Effect of Targeting Pod Addition on F-18C Store Separation Characteristics</td>
</tr>
<tr>
<td>W. Godiksen</td>
</tr>
<tr>
<td>Store Separation Trajectory Simulation for the High Speed Anti-Radiation Demonstrator (HSAD) from the F-4 Aircraft</td>
</tr>
<tr>
<td>E. Hallberg</td>
</tr>
<tr>
<td>Viscous Effects for a Hypersonic Vehicle Model</td>
</tr>
<tr>
<td>M. Oppenheimer, D. Doman, J. McNamara, A. Culler</td>
</tr>
<tr>
<td>Canard-Elevon Interactions on a Hypersonic Vehicle</td>
</tr>
<tr>
<td>M. Oppenheimer, T. Skujins, C. Cesnik, D. Doman</td>
</tr>
<tr>
<td>Applicability of an Analytical Shock/Expansion Solution to the Elevon Control Effectiveness for a 2-D Hypersonic Vehicle Configuration</td>
</tr>
<tr>
<td>T. Skujins, C. Cesnik, M. Oppenheimer, D. Doman</td>
</tr>
<tr>
<td>Dynamics of Hypersonic Vehicles: Shift of Poles / Zeros by Improved Propulsion Modeling</td>
</tr>
<tr>
<td>S. Torrez, N. Scholten, J. Driscoll, M. Bolender, M. Oppenheimer, D. Doman</td>
</tr>
<tr>
<td>Uncertainty Analysis of Air Radiation for Lunar Return Shock Layers</td>
</tr>
<tr>
<td>B. Kleb, C. Johnston</td>
</tr>
<tr>
<td>Attitude Dynamics and Control of Moving Mass Multibody Aeromaneuver Vehicle</td>
</tr>
<tr>
<td>R. Mukherjee, J. Balaram</td>
</tr>
<tr>
<td>Low-Speed Flight Dynamic Tests and Analysis of the Orion Crew Module Drogue Parachute System</td>
</tr>
<tr>
<td>D. Hahne, C. Fremaux</td>
</tr>
<tr>
<td>Preliminary Study of Venus Exploration with Aerocapture System</td>
</tr>
<tr>
<td>K. Fujita, T. Yamada</td>
</tr>
<tr>
<td>Simulator Testing of Longitudinal Flying Qualities with L1 Adaptive Control</td>
</tr>
<tr>
<td>M. Cotting, N. Hovakimyan</td>
</tr>
<tr>
<td>Criteria to Estimate the Effect of Static Stability Margin on Aircraft HQ</td>
</tr>
<tr>
<td>L. Zaichik, V. Perebatov, Y. Yashin, P. Desyatnik, B. Lee</td>
</tr>
</tbody>
</table>

**Volume 2**

<table>
<thead>
<tr>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial Investigation of Reaction Control System Design on Spacecraft Handling Qualities for Earth Orbit Docking</td>
</tr>
<tr>
<td>R. Bailey, E. Jackson, K. Goodrich, W. Ragsdale, J. Neuhaus, J. Barnes</td>
</tr>
<tr>
<td>Piloted Evaluation of a Variable Autonomy Control System in Motion-Based Simulation</td>
</tr>
<tr>
<td>K. Goodrich, R. Williams, P. Schutte</td>
</tr>
<tr>
<td>Flying Qualities Specifications and Design Standards for Unmanned Air Vehicles</td>
</tr>
<tr>
<td>J. Holmberg, J. Leonard, D. King, M. Cotting</td>
</tr>
<tr>
<td>A New Flight Test Technique for Pilot Model Identification</td>
</tr>
<tr>
<td>O. Brieger, D. Ossmann, M. Rüdinger, M. Heller</td>
</tr>
</tbody>
</table>
Coupled Entry Heat Shield/Trajectory Optimization for Lunar Return
J. Johnson, M. Lewis, R. Starkey

Heating Augmentation due to Compression Pads on the Project Orion CEV Heat Shield
B. Hollis

Allowable Trajectory Variations for Space Shuttle Orbiter Entry-Aeroheating CFD

Three Dimensional Calculation of Hypersonic Flowfield Over Atmospheric Entry Body
M. Furudate, R. Takeuchi, K. Yasue, K. Sawada

Heatshield Qualification for the SpaceMail Re-Entry Capsule “Fotino” in the VKI Plasmatron
C. Asma, F. De Pascale, M. Kruijff

Computational Study of the Flight Dynamics, Stability and Control of an Unmanned Aerial Vehicle in an Integrated Simulation Framework
L. Tan, M. Damodaran

Nonlinear Control Techniques for Regulating the Altitude of a Radio/Control Helicopter
S. Esteban, J. Aracil, F. Gordi

Modeling of the Urban Gust Environment with Application to Autonomous Flight
D. Galway, J. Etele, G. Fusina

Lyapunov Based Asymptotic Stability Analysis of a Three-Time Scale Radio/Control Helicopter Model
S. Esteban, J. Aracil, F. Gordillo

Morphing Aircraft Dynamical Model: Longitudinal Shape Changes
A. Niksch, J. Valasek, L. Carlson, T. Strganac

Flight-Testing of a UAV Aircraft for Autonomous Operation Using Piccolo II Autopilot
N. Anderson, B. Hagenauer, R. Erickson, S. Bhandari

Development and Implementation of Electromechanical Actuators for the X-38 Atmospheric Test Vehicles
J. Albright, L. Moore

X-43A Flush Airdata Sensing System Flight Test Results
E. Baumann, J. Pahle, M. Davis, J. White

In-Flight Stability Analysis of the X-48B
C. Regan

Analysis of a Stall-and-Spin Accident Using Recorded Avionics Data
J. O’Callaghan

High-Rate, High-Value Flight Test Project Execution
B. Kish, G. Albrich, R. Erb, S. Lim, D. Carroll

Analysis of the Sensitivity of Aircraft Flight Control at High Angles of Attack
K. Sibilski, J. Pietrucha, M. Zlocka

Wake-Vortex Induced Wind with Turbulence in Aerial Refueling - Part A: Flight Data Analysis
A. Dogan, T. Levis, W. Blake

Wake-Vortex Induced Wind with Turbulence in Aerial Refueling - Part B: Model and Simulation Validation
A. Dogan, T. Levis, W. Blake

Flight Dynamics of Flapping-Wing Air Vehicle
R. Krashanitsa, D. Silin, S. Shkarayev, G. Abate

Bias Momentum Sizing Validation Experiment for a Hovering Dual-Spin Vehicle
P. Rothhaar

Simulation Analysis of the Controllability of a Tandem Ducted Fan Aircraft
E. Tobias, J. Horn
Volume 3

Modelling, Simulation and Validation of Different Control Strategies for a Launch Vehicle with a Non Negligible Roll Rate ................................................................. 1090
G. Baldesi, S. Monaco, C. Bérard, P. Resta

Golf Ball and Other Sports Objects Flight Dynamics in 6-DOF of Motion ......................................... 1118
R. Rogers

K. Stewart, K. Blackburn, J. Wagener, G. Abate, J. Czabaranek

Flight Testing of a Model Aircraft with Trailing-Edge Flaps Optimized for Lift Distribution Control..................................................................................................................... 1143
N. Guerreiro, J. Hubbard

Flight Dynamic Response of HALE Aircraft to KC-135 Flowfield.................................................. 1157
A. Devuono, C. Shearer

A Novel Force Control Traverse for Simulating UAV Flight in a Wind Tunnel................................. 1178
J. Muse, A. Kutay, A. Calise

Considerations in the Lateral Stability Characteristics of Airship Dynamics.................................... 1198
B. Danowsky, T. Myers

A Model-Based Approach to Aircraft Performance Assessment..................................................... 1208
P. Ohme, C. Raab

Global Aircraft Dynamics Using Piecewise Volterra Kernels............................................................ 1225
A. Omran, B. Newman

Periodic Optimal Control for Solar Aircraft with Unlimited Endurance Capability ....................... 1247
G. Sachs, J. Lenz, F. Holzapfel

Dynamics and Control of a Flexible Aircraft...................................................................................... 1259
F. Silvestre, P. Paglione

An Approach to Predict Flight Dynamics and Stability Derivatives of Distressed Aircraft............... 1277
N. Sarigul-Klijn

Aircraft Performance Optimization Using Fish-Like Locomotion.................................................... 1303
S. Pourtakdoust, S. Mortazavi

Genetic Algorithm Optimization of Hydra Pulse Jet Controller..................................................... 1314
B. Burchett

Wind Tunnel Tests and Open-Loop Trajectory Simulations for a 155 mm Canards Guided Spin Stabilized Projectile........................................................................................................ 1327
P. Wernert, F. Leopold, L. Lehmann, K. Baer, A. Reindler

Wind Tunnel Study of a Grid Fin Stabilized Guided Projectile...................................................... 1344
A. Ghosh, A. Singhal, A. Misra, K. Ghosh

Computational Comparisons of the Interaction of a Lateral Jet on a Supersonic Missile.................. 1361
P. Gnemmi, R. Adefi, J. Longo

Cascade Fins: An Alternate Tail Stabilization Unit ........................................................................... 1370
A. Ghosh, A. Misra, K. Ghosh

Plasma Actuation for the Guidance of a Supersonic Projectile....................................................... 1378
P. Gnemmi, C. Rey

External Geometry Optimization with Flight Mechanics Constraints Using Response Surfaces........ 1390
U. Kutluay, I. Karbancioglu, M. Hasanoglu

Automated Calculation of Aircraft Hazard Areas from Space Vehicle Accidents:
Application to the Shuttle .............................................................................................................. 1408
E. Larson, S. Carbon, D. Murray
Space and Air Traffic Management of Operational Space Vehicles

D. Murray

Risk to Commercial Aircraft from Reentering Space Debris

R. Patera

Air Traffic Management Considerations for Special Use Airspace in NexGen Operations

J. Torres

A Common Communications, Navigation and Surveillance Infrastructure for Accommodating Space Vehicles in the Next Generation Air Transportation System

R. VanSuetendael, A. Hayes, R. Birr

System Identification of Large Flexible Transport Aircraft

C. Theodore, C. Ivler, M. Tischler

GLOMAP Approach for Nonlinear System Identification of Aircraft Dynamics Using Flight Data

M. Marwaha, J. Valasek, P. Singla

Preliminary System Identification of the Blended Wing Body Flight Demonstrator VELA 2

M. Trittler, R. Voit-Nitschmann, R. Schmoldt, K. Kittmann, W. Fichte

Identification of a High-Order Linear Model of the UH-60M at Hover

J. Fletcher

System Identification of a Miniature Helicopter

J. Grauer, J. Conroy, J. Hubbard, D. Pines

Extracting Aerodynamic Coefficients for a Micro Air Vehicle from Aircraft Trajectories

M. Rhinehart, B. Mettler

Modeling and Simulation of the Yak-54 Scaled Unmanned Aerial Vehicle Using Parameter and System Identification

S. keshmiri, H. Leong, R. Jager, R. Hale

Practical Assessment of Real-Time Impact Point Predictors for Smart Weapons

G. Cooper, F. Fresconi, M. Costello

Time Dependent Effects of Liquid Moments on the Trajectory of Spinning Projectiles

G. Cooper, M. Costello

Unsteady Free-Flight Aerodynamics of a Spinning Projectile at a Transonic Speed

J. Sahu

A Variable Stability Projectile Using an Internal Moving Mass

J. Rogers, M. Costello

Real-Time Targeting and Trajectory Estimation for Enhanced Network Centricity

N. Coleman, K. Lam, K. Patel, G. Roehrich, C. Lin

Development of Launch Area Risk Assessment Input Data for Ares I-X

J. Gowan, R. Cross, B. Starr, J. Beaty, B. Thompson

Risk Considerations for the Launch of the SpaceX Falcon 1 Rocket

S. Millard

Development of a Business Jet Class Survivability Model for Broad Ocean Areas

C. Draper, P. Wilde

Guided Weapon Danger Area & Safety Template Generation - A New Capability

S. Wilson, I. Valetich, C. Boyd, D. Fletcher, M. Jokic

Separation Distances for Rocket Launch Operations

E. Zapata, D. Murray

Author Index