# TABLE OF CONTENTS

## DASC WORKSHOP REPORT

DASC Workshop Report: What Drives Green Aviation Solutions ................................................................. 1  
*J. Mazurowski, A. Tank, C. Watkins*

## PLENARY SESSION

Greening of Hill AFB ........................................................................................................................................ 6  
*A. Tymofichuk*

L-3 CS-W: Data Links, Going Green in a Multi-Spectral Environment .......................................................... 26  
*N/A*

FAA and Industry Environmental Initiatives: Integrating Aircraft, Airspace, and Operations ....................... 51  
*D. Pool*

Challenges of Going Green for Avionics Engineers ......................................................................................... 76  
*N/A*

## TRACK 1 – GREEN AEROSPACE SOLUTIONS

### SESSION A: OPTIMIZING OVERALL OPERATIONS

Fuel Efficient Strategies for Reducing Contrail Formations in United States Airspace ............................... 90  
*B. Sridhar, N.Y. Chen, H.K. Ng*

Use of Influence Diagram Techniques to Understand the Influences and Assess the Environmental Impact of ATM ................................................................................................................................. 99  
*L. Tabernier, R. Dowdall, S. Gillet, P. Simonsson*

Trajectory Synchronization and Negotiation in Trajectory Based Operations ........................................... 114  
*J. Klooster, S. Torres, D. Earman, M. Castillo-Effen, R. Subbu, L. Kammer, D. Chan, T. Tomlinson*

Selecting Conflict Resolution Maneuvers Based on Minimum Fuel Burn .................................................. 125  
*A. Bowe, T. Lauderdale*

Topologically Based Decision Support Tools for Aircraft Routing ............................................................... 134  
*P.A. Vela, A.E. Vela, G. Ogunmakin*

### SESSION B: OPTIMIZING SURFACE AND DEPARTURE OPERATIONS

A Statistical Learning Approach to the Modeling of Aircraft Taxi Time .................................................. 145  
*R. Jordan, M.A Ishutkina, T.G. Reynolds*

Improving Efficiency with Surface Trajectory-Based Operations and Conformance Monitoring .............. 155  
*K.A. Klein, E.K. Stelzer, E.T. Nelson, C. Brinton, S. Lent*

A Comparison of Aircraft Trajectory-Based and Aggregate Queue-Based Control of Airport Taxi Processes .............................................................................................................................. 166  
*H. Lee, I. Simaiakis, H. Balakrishnan*

Field Test Results of Collaborative Departure Queue Management ......................................................... 181  
*C. Brinton, S. Lent, C. Provan*

The Surface Operations Data Analysis and Adaptation (SODAA) Tool: Innovations and Applications ....... 193  
*C. Brinton, J. Lindsey, M. Graham*

### SESSION C: MODELING, SIMULATION, AND ANALYSIS TECHNIQUES FOR OPTIMIZING OPERATIONS

Determination and Ranking of Trajectory Accuracy Factors ........................................................................ 204  
*S. Torres*
### SESSION D: OPTIMIZATION VIA NEW CONTROL ALGORITHMS AND EQUIPMENT

- **Control of Holding Patterns for Increased Throughput and Recovery of Operations**
  - A.E. Vela, E. Feron, W. Singhose, J. Clarke
  - Page: 216

- **High-Performance Trajectory Prediction for Civil Aircraft**
  - W. Schuster, M. Porretta
  - Page: 228

- **A Differential Flat Approach for Trajectory Noise Assessment**
  - T.C. Revoredo, J.G. Slama
  - Page: 237

### SESSION E: OPTIMIZING APPROACH AND ARRIVAL OPERATIONS

- **Advanced Aircraft Performance Modeling for ATM: Analysis of BADA Model Capabilities**
  - D. Poles, A. Nuic, V. Mouillet
  - Page: 246

- **Tom Swift And His Electric Airship**
  - H. Blair-Smith
  - Page: 260

- **Benefits Analysis of a Routing Aid for New York Area Departures**
  - J. DeArmon, C. Jackson, H. Bateman, L. Song, P. Brown
  - Page: 269

### TRACK 2: EVOLVING TO THE NEXTGEN ATM SYSTEM

- **SESSION A: IMPROVING TERMINAL AND AIRPORT OPERATIONS**

  - **Integrated Management of Airport Surface and Airspace Constraints for Departures: An Operational Sequence**
    - A. Borgman, P.J. Smith, M. Evans, R. Beatty, K. Durham, C. Billings, E. Wiley, A. Spencer
    - Page: 341

  - **Toward System Oriented Runway Management**
    - S. Atkins
    - Page: 356

  - **Probabilistic Forecasting of Airport Capacity**
    - G. Hunter
    - Page: 368

  - **Flow Management as a Contribution to Airport's Efficiency and Pollution Control**
    - Page: 376

  - **Design of an Optimal Route Structure Using Heuristics-Based Stochastic Schedulers**
    - S. Choi, J.E. Robinson III, D.G. Mulfinger, B.J. Capozzi
    - Page: 381

- **SESSION B: REDUCING CONVECTIVE WEATHER IMPACT**

  - **Airport Delay Prediction Using Weather-Impacted Traffic Index (WITI) Model**
    - A. Klein, C. Craun, R.S. Lee
    - Page: 398

  - **Convective Weather Forecast Accuracy Analysis at Center and Sector Levels**
    - Y. Wang, B. Sridhar
    - Page: 411

  - **Operational Dynamic Configuration Analysis**
    - C.F. Lai, S. Zelinski
    - Page: 428

  - **Airport Configuration Planning with Uncertain Weather and Noise Abatement Procedures**
    - L. Li, J. Clarke
    - Page: 441
### SESSION C: AIRCRAFT SPACING AND SEQUENCING

**Air Traffic Maximization for the Terminal Phase of Flight Under FAA's NextGen Framework**

P. Twu, R. Chipalkatty, A. Rahmani, M. Egerstedt, R. Young ............................. 450

**Evaluation of Separation Performance with ADS-B at the Philadelphia Key Site**

M.W. Castle, T. Trinh, C. Mayer, C. Parry ................................. 464

**A Departure Regulator for Closely Spaced Parallel Runways**

I. Robeson, J. Clarke ................................. 479

**Curved Approaches and Airborne Spacing for Efficient Closely Spaced Parallel Runway Operations in IMC**

B. Korn, C. Edinger, G. Schwoch, H. Becker, N. De Gelder, R. Ruigrok ................................. 490

### SESSION D: TRAFFIC CONFLICT MANAGEMENT AND FLOW MANAGEMENT

**Prediction of Descent Trajectories Based on Aircraft Intent**

E. Gallo ................................................................. 498

**Parametric Study of Aircraft Response Due to Wake Vortex Encounter**

Y. Zhang, S. McGovern ................................................................. 514

**A Ground Holding Model for Aircraft Deconfliction**

N. Durand, C. Allignol, N. Barnier ................................................................. 524

**Enhancement in Realism of ATC Simulations by Improving Aircraft Behaviour Models**

S. Gillet, A. Naic, V. Mouillet ................................................................. 534

**Sectorless ATM and Advanced SESAR Concepts: Complement Not Contradiction**

B. Birkmeier, B. Korn, D. Kugler ................................................................. 547

### SESSION E: AIRCRAFT EQUIPAGE AND BEHAVIOR FOR NEXTGEN ATM

**A New Geographic Routing Protocol for Aircraft Ad Hoc Networks**

S. Hyeon, K. Kim, S. Yang ................................................................. 555

**Optimization of the Crossing Waypoints in Air Route Network**

K. Cai, J. Zhang, C. Zhou ................................................................. 563

**An ATM Simulation Environment for the Development of HMI Technologies**

S. Bode, S. Kocks, C. Patzold, S. Schonhals, P. Hecker ................................................................. 571

### TRACK 3: COMMUNICATIONS, NAVIGATION, SURVEILLANCE (CNS)

### SESSION A: NEXTGEN SURVEILLANCE

**ADS-B Feasibility Study for Commercial Space Flight Operations**

P. Duan, J. Rankin ................................................................. 580

**Stochastic Analysis of ADS-B Integrity Requirements**

J. Hammer, D. Elliott ................................................................. 591

**Visualization & Assessment of ADS-B Security for Green ATM**

K. Sampigethaya, R. Poovendran ................................................................. 599

**Multiple Source Navigation Signal Receiver**

P. Bojda, R. Bloudicek ................................................................. 615

**Integration of a 2.5D Radar Simulation in a Sensor Simulation Suite**

N. Peinecke, E. Groll ................................................................. 623

### SESSION B: COLLISION AVOIDANCE

**Collision Avoidance for Airport Traffic Simulation Evaluation**

D.R. Jones, L.J. Prinzel III, K.J. Shelton, R.E. Bailey ................................................................. 632

**Effect of Conflict Resolution Maneuver Execution Delay on Losses of Separation**

A.C. Cone ................................................................. 647

**Robustness of Optimized Collision Avoidance Logic to Modeling Errors**

M.J. Kochenderfer, J.P. Chryssanthacopoulos, P.P. Radecki ................................................................. 661
TCAS Surveillance Performance Analysis ................................................................. 671

SESSION C: DATALINK FOR AIR TRAFFIC MANAGEMENT

ESA Iris Programme: Design Options for the Satellite Communication Sub-Network of the European Air Traffic Management System ......................................................... 684
C. Morlet, F. Ongaro, N. Ricard, A. Santovincenzo

Characterisation of the Data Link Communication Air Traffic for the European Airspace .............................................................. 697
C. Morlet, M. Elhammer, T. Graupl, C.H. Rokitansky

A Performance-Aware Public Key Infrastructure For Next Generation Connected Aircrafts ................................................ 710
M.S.B. Mahmoud, N. Larrieu, A. Pirovano

Protocol Architecture Analysis for Internet Connectivity in Aeronautical Ad Hoc Networks .......................................................... 726
F. Hoffmann, D. Medina, A. Wolisz

Co-Site Interference Mitigation for VHF Com Voice and Datalink Operations ................................................................. 738
B. Baker, F. Studenberg

SESSION D: COMMUNICATIONS

New Concepts for a Decentralized, Self-Organizing Air-to-Air Radio Link ................................................................. 742
M. Walter, N. Franzen, M. Schnell

A New Generation of High Frequency Receivers for Civil Aeronautics Communications .................................................. 754
B. Lombardi

Transmission Control Optimization for Aeronautical Air-Ground Access Networks .................................................. 763
C. Xiao

Quality of Service IP Cabin Infrastructure ................................................................. 771
E. Heidinger, C. Heller, A. Klein, S. Schneele

SESSION E: DATALINK INFRASTRUCTURE + NAV

Analysis of Advanced Flight Management Systems (FMS), Flight Management Computer (FMC)
Field Observations Trials; Standard Instrument Departures .............................................. 781
A.A. Herndon, M. Cramer, T. Nicholson, S. Miller

An Adaptive Security Architecture for Future Aircraft Communications .............................................. 797
M.S.B. Mahmoud, N. Larrieu, A. Pirovano, A. Varet

L-DACS1 Laboratory Demonstrator Development and Compatibility Measurement Set-Up .................................................. 813
M. Schnell, N. Franzen, S. Gligorevic

How the L-DACS2 Radio-Frequency Signals Modulation Affects the DME Performance .................................................. 824
N. Neji, R. De Lacerda, A. Azoulay, T. Letertre, O. Outtier

TRACK 4: HUMAN FACTORS + SPECIAL TOPICS

SESSION A: SAFETY, SECURITY AND SITUATION AWARENESS

A Comparative Study of Air Carrier and Business Jet TCAS RA Experiences ................................................................. 836
J.E. Olszta, W.A. Olson

TCAS Operational Performance Assessment in the U.S. National Airspace ................................................................. 846
W.A. Olson, J.E. Olszta

Human/Automation Interaction Accidents: Implications for UAS Operations ................................................................. 857
D. Glassick, J. Histone

Airspace Structure, Future ATC Systems, and Controller Complexity Reduction ................................................................. 868
J. Histone, L. Li, R.J. Hansman

Pilot and Controller Workload and Situation Awareness with Three Traffic Management Concepts ................................................................. 882
### SESSION B: HUMAN FACTORS METHODS, MODELS, AND PERSPECTIVES – I

<table>
<thead>
<tr>
<th>Title</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diagnosticity of an Online Query Technique for Measuring Pilot Situation Awareness in NextGen</td>
<td>892</td>
</tr>
<tr>
<td>Human-in-the-Loop Simulation of Area Navigation Visual Flight Procedures at Atlanta International Airport</td>
<td>904</td>
</tr>
<tr>
<td>J. Ferrante, D. Zondervan</td>
<td></td>
</tr>
<tr>
<td>A Pairing Algorithm for Landing Aircraft to Closely Spaced Parallel Runways</td>
<td>914</td>
</tr>
<tr>
<td>A.H. Farrahi, S.A. Verma</td>
<td></td>
</tr>
<tr>
<td>Guidance at Changing Propulsion Between Vertical and Horizontal</td>
<td>929</td>
</tr>
<tr>
<td>T. Minohara</td>
<td></td>
</tr>
</tbody>
</table>

### SESSION C: HUMAN FACTORS METHODS, MODELS, AND PERSPECTIVES – II

<table>
<thead>
<tr>
<th>Title</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Flexible Resource Sharing Framework for Integrating Hierarchical Real-Time Components</td>
<td>935</td>
</tr>
<tr>
<td>K.H. Kim, G.M. Tchamgoue, Y. Jun, K. Bang</td>
<td></td>
</tr>
<tr>
<td>Evaluating the Impact of Sensor Data Uncertainty and Maneuver Uncertainty in a Conflict Probe</td>
<td>943</td>
</tr>
<tr>
<td>J. Tadema, E. Theunissen, R.M. Rademaker, M. Uijt De Haag</td>
<td></td>
</tr>
<tr>
<td>Warning, Runway Occupied: An Evaluation of Tower Controller Behavior When Maintaining Runway Safety</td>
<td>959</td>
</tr>
<tr>
<td>R.K. Stevens, J. Sanchez</td>
<td></td>
</tr>
</tbody>
</table>

### SESSION D: PILOT HUMAN FACTORS

<table>
<thead>
<tr>
<th>Title</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>NextGen Flow Corridors Initial Design, Procedures, and Display Functionalities</td>
<td>971</td>
</tr>
<tr>
<td>A. Yousefi, J. Lard, J. Timmerman</td>
<td></td>
</tr>
<tr>
<td>Flight Simulator Evaluation of an Airport Surface Display with Indications and Alerts (SURF IA)</td>
<td>990</td>
</tr>
<tr>
<td>J.A. Lancaster, R. Khatwa, K.J. Conner, J.H. Glover</td>
<td></td>
</tr>
<tr>
<td>Pilot Response To Off-Nominal Conditions In Merging And Spacing Operation</td>
<td>1002</td>
</tr>
<tr>
<td>Management of Continuous Descent Approach During Interval Management Operation</td>
<td>1015</td>
</tr>
</tbody>
</table>

### SESSION E: SPECIAL TOPICS

<table>
<thead>
<tr>
<th>Title</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>System Integration Issues In Apollo 11</td>
<td>1028</td>
</tr>
<tr>
<td>H. Blair-Smith</td>
<td></td>
</tr>
<tr>
<td>Mathematical Formulation of a Fast-Time Geometric Heading Navigation Model</td>
<td>1039</td>
</tr>
<tr>
<td>G.T. Fairley, S.M. McGovern</td>
<td></td>
</tr>
<tr>
<td>High-Intensity Radiated Field Fault-Injection Experiment for a Fault-Tolerant Distributed Communication System</td>
<td>1049</td>
</tr>
<tr>
<td>Architecting HD Full Motion Video into Military Avionics Infrastructures</td>
<td>1064</td>
</tr>
<tr>
<td>C.S. Kuehl</td>
<td></td>
</tr>
</tbody>
</table>

### TRACK 5: AVIONICS DESIGN AND APPLICATIONS + UNINHABITED AIRCRAFT SYSTEMS (UAS)

### SESSION A: AVIONICS SYSTEMS

<table>
<thead>
<tr>
<th>Title</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Challenges of Graphics Processing in the Avionics Industry</td>
<td>1076</td>
</tr>
<tr>
<td>M. Dutton, D. Keezer</td>
<td></td>
</tr>
<tr>
<td>Power-over-Ethernet for Avionic Networks</td>
<td>1085</td>
</tr>
<tr>
<td>C. Heller, E. Heidinger, S. Schneele, W. Fischer, P. Klose</td>
<td></td>
</tr>
<tr>
<td>Mixed-Criticality Networks For Adaptive Systems</td>
<td>1096</td>
</tr>
<tr>
<td>W. Steiner, G. Bauer</td>
<td></td>
</tr>
<tr>
<td>Extending ARINC 818: The Development of an ARINC 818 Switch Architecture</td>
<td>1106</td>
</tr>
<tr>
<td>T. Keller, J. Alexander</td>
<td></td>
</tr>
</tbody>
</table>
Model-Driven Development of ARINC 653 Configuration Tables
A. Horvath, D. Varro

On-the-Fly Healing of Race Conditions in ARINC-653 Flight Software
O. Ha, J. Suh, Y. Jun

SESSION B: AVIONICS NETWORKS

Reliable Burst Protocol - Deterministic Streaming Data Transport
T.J. Wilson

Streaming Ports - ARINC 653 API Extension for Reliable Data Transport
T.J. Wilson

Ethernet Protocol Services for Critical Embedded Systems Applications
M. Jakovljevic, A. Ademaj

Interoperability Within Optical Networks in Aerospace Platforms
J. Mazurowski, S. Habiby, J. Stark, D. Drury

Modeling & Simulating Power Line Communications on Civil Aircraft: First Steps
O. Elgezabal, A. Sanz

SESSION C: UNINHABITED AIRCRAFT SYSTEMS (UAS)

The SamarEye: a Biologically Inspired Autonomous Vehicle
C. Hockley, B. Butka

UAS Sensor Autonomy Achieved via Market-Based Optimization Methods
B.S. Parker

Intelligent UAS Situation Awareness and Information Delivery
Q. Hu, C. Jella

The NASA Langley Research Center's Unmanned Aerial Syste Surrogate Research Aircraft

Novel Multiple Access Scheme for Wireless Sensor Network Employing Unmanned Aerial Vehicle
T.D. Ho, J. Park, S. Shimamoto

SESSION D: UNINHABITED AIRCRAFT SYSTEMS (UAS) – AIRSPACE, NAVIGATION, AND PERFORMANCE

Altitude Measurement using Three Circular Marks
H. Lee

Study of Unmanned Aircraft Systems Procedures: Impact on Air Traffic Control
J. Kamienski, E. Simons, S. Bell, S. Estes

Closing The ISR-Navigation Loop
E. Theunissen, A.A.H.E. Goossens, J. Tadema

Maximizing the Use of the Vertical Maneuver Space for Conflict Prevention and Resolution: Concept, Implementation and Evaluation
R.M. Rademaker, E. Theunissen, A.A. Lambregts

Failure Modes Effects Test for Flight Control System
S. Seo, W. Yeon, S. Jang, B. Hwang, C. Song, K. Min, J. Lim, S. Chung

SESSION E: INTEGRATED MODULAR AVIONICS

Applying Virtualization to Avionics Systems - The Integration Challenges
T. Gaska, B. Werner, D. Flagg

ARINC 653 Hypervisor
S.H. Vanderleest

How to Address Certification for Multi-Core Based IMA Platforms: Current Status and Potential Solutions
R. Fuchsen

The FAA Handbook on Microprocessor Selection and Evaluation in Airborne Systems
J.D. Lee, N. Gupta, R.N. Mahapatra, B.E. Manners
Exploring the Design Space of IMA System Architectures
R. Bradford, S. Fliginger, M. Nam, S. Mohan, R. Pellizzoni, C. Kim, M. Caccamo, L. Sha

TRACK 6: POSTER PAPERS

SESSION A: GREEN AEROSPACE SOLUTIONS + UNINHABITED AIRCRAFT SYSTEMS (UAS)

Avionics System Design of a Mini VTOL UAV
M. Ilarslan, M.K. Bayradkekken, A. Arisoy

Air-to-Air Surveillance for Future ATM Systems
J.A. Besada, D. Martin, G. Frontera, G. De Miguel, A. Bernardos

SESSION D: HUMAN FACTORS + SPECIAL TOPICS

Multipurpose Low-Cost Synthetic Vision System
P. Frantis

Design of OpenGL SC Emulation Library over the Desktop OpenGL 1.3
N. Baek, G.J. Baeck

New Modeling Algorithm for Improving Accuracy of Weapon Launch Acceptability Region
K.S. Yoon, J.H. Park, J.G. Kim, K.S. Ryu

Acquisition & Integration Activities of Ground Support Hardware Items in Terms of System Engineering Process
A. Paksa, G. Alat, P. Kaya, B. Baykal

SESSION E: AVIONICS DESIGN AND APPLICATIONS

Integrated Model Driven Design Development (IMDD) for Software and System Engineering
C.M. Ananda

Model-Based Development Framework for Distributed Embedded Control of Aircraft Fuel Systems
C.C. Insaurralde, M.A. Seminario, J.F. Jimenez, J.M. Giron-Sierra

Model-Driven Development of ARINC 653 Configuration Tables
A. Horvath, D. Varro

Modeling and Analysis of Integrated Avionics Processing Systems
X. Li, H. Xiong

Development of Test Automation Framework for Testing Avionics Systems
A.K. Jha

Author Index