2020 Integrated Communications Navigation and Surveillance Conference (ICNS 2020)

Herndon, Virginia, USA 8 – 10 September 2020



IEEE Catalog Number: ISBN: CFP20CNS-POD 978-1-7281-7271-2

Copyright © 2020 by the Institute of Electrical and Electronics Engineers, Inc. All Rights Reserved

Copyright and Reprint Permissions: Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limit of U.S. copyright law for private use of patrons those articles in this volume that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923.

For other copying, reprint or republication permission, write to IEEE Copyrights Manager, IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854. All rights reserved.

*** This is a print representation of what appears in the IEEE Digital Library. Some format issues inherent in the e-media version may also appear in this print version.

| IEEE Catalog Number: | CFP20CNS-POD |
|-------------------------|-------------------|
| ISBN (Print-On-Demand): | 978-1-7281-7271-2 |
| ISBN (Online): | 978-1-7281-7270-5 |
| ISSN: | 2155-4943 |

Additional Copies of This Publication Are Available From:

Curran Associates, Inc 57 Morehouse Lane Red Hook, NY 12571 USA Phone: (845) 758-0400 Fax: (845) 758-2633 E-mail: curran@proceedings.com Web: www.proceedings.com



ICNS 2020 Virtual Conference Online Papers

| Papers | Title | Author(s), Company | Pg. No. |
|--------|--|--|---------|
| 1A1 | Interpretable Machine Learning Using Switched Linear Models for Security of Cyber-Physical Systems | Anuj Puri, Sumit Ray, BAE Systems FAST Labs | 1 |
| 1B1 | Securing Trajectory Based Operations Through a Zero Trust Framework in the NAS | Larry Nace, L3Harris Technologies, Inc. | 12 |
| 1B2 | Demonstrating ADS-B and CPDLC Attacks with Software-Defined Radio | Sofie Eskilsson, Hanna Gustafsson, Suleman Khan, Andrei Gurtov, Linkoping University | 20 |
| 1C1 | Usability Testing within a DevSecOps Environment | Emerson Czerwinski Burkard, L3Harris Technologies | 29 |
| 2A1 | Design of a Rapid, Reliable Urban Mobility System for the D.C. Region | Mary Taylor, Lauren Flenniken, Jason Nembhard, Anderson Barreal, Center for Air Transportation Research at George Mason University | 35 |
| 2A2 | Design of a Vertiport Design Tool | Megan Taylor, Asya Saldanli, Andy Park, Center for Air Transportation Systems Research at George Mason University | 46 |
| 2A3 | UTM Evolution into the 2020s - New York as a Case Study | Raymond Young, ONE-ATM | 58 |
| 2B1 | Making a UTM Ecosystem a Reality | Praveen Raju, Federal Aviation Administration, Addam Jordan, LS Technologies LLC., Glenna Sowa, LS Technologies LLC. | 76 |
| 2C1 | Multimodal Transportation Operational Scenario and Conceptual Data Model for Integration with UAM | Sarasina Tuchen, U.S. Department of Transportation, Volpe National Transportation Systems Center, Ken Leiden, Mosaic ATM, Tim Bagnall, Mosaic ATM | 86 |
| 2C2 | Requirements and Technologies Towards UAM: Communication, Navigation, and Surveillance | Mustafa Erturk, Honeywell Aerospace, David Matolak, University of South Carolina | 101 |
| 2D1 | A Cost-Benefit Analysis to Achieve Command and Control (C2) Link Connectivity for Beyond Visual Line of Sight (BVLOS) Operations | Adrian Solomon, Thales, Chen Zhong, Syracuse University, Ziyi Zhao, Syracuse University, Chen Luo, Syracuse University, Carlos Caicedo, Syracuse University | 116 |
| 2D2 | Spectral Coexistence of Unmanned-Aircraft Control Links and L-Band Navaids: A 3D Whitespace Analysis | Frank Box, Leila Ribeiro, Richard Snow, Angela Chen, Timothy Luc, The MITRE Corporation | 130 |
| 2D3 | Reliable 4G/5G-Based Communications in the National Airspace | Izabela Gheorghisor, MITRE | 141 |

| 2E1 | Comparing Regain Well Clear Guidance | Erik Theunissen, Netherlands Defence Academy, Wytze Zijlstra, 0 | 155 |
|-----|---|--|-----|
| 2E2 | Effective Non-Cooperative Surveillance for UAS Situational Awareness | James Keller, Bin Deng, David Gore, Jay Minnix, L3Harris Technologies | 171 |
| 2F1 | Dynamic Event Tree Framework to Assess Collision Risk between Various Aircraft Types | Seungwon Noh, John Shortle, George Mason University | 181 |
| 2F2 | Likelihood of Unmitigated Collision Risks for UAS in Defined Airspace Volumes | Brandon Daniel, Anuja Verma, The Mitre Corporation | 194 |
| 2G1 | Unlicensed Technology Assessment For UAS Communications | Vanessa Kuroda, Maxim Egorov, Steven Munn, Antony Evans, Airbus UTM | 201 |
| 2G2 | Modeling and Simulation of Sensor Placement Strategies to Detect Malicious UAS Operations | Milan Rollo, Vojtech Kaiser, Premysl Volf, AgentFly Technologies | 213 |
| 2G3 | UAV Swarm Path Planning | Scott James, Robert Raheb, Allison Hudak, Noblis | 225 |
| 3A1 | Measuring Resiliency for Withstanding and Rapid Recovery of NAS Events | James Uhing, Terrol Guyan, L3Harris Technologies | 236 |
| 3A2 | Developing a Configurable Air Traffic Controller Agent for Fast-Time Simulation | David Bodoh, Clark Britan, Paden Coats, MITRE | 243 |
| 3B1 | Validating Sectorless ATM in the Hungarian Airspace: Results of Human in The Loop Simulations | Bernd Korn, Vilmar Mollwitz, Tobias Finck, Christiane Edinger, Sebastian Tittel, DLR Institute of Flight Guidance | 256 |
| 3B2 | Evaluating the Benefits of Flying Wind-Optimal Trajectory Inside the Pacific Airspace | Tao Li, Institute for Transportation Research and Education, North Carolina State University | 265 |
| 3C1 | Exploring a Time-Based Management Fleet Prioritization Service | Marcus Smith, Amanda Staley, Amanda Matthews, and Sally Stalnaker, MITRE Corportation | 277 |
| 3C2 | Using Synchronized Trajectory Data to Improve Airspace Demand Predictions | Alicia Fernandes, Dan Wesely, Holtzman Bill, Mosaic ATM | 291 |
| 3C3 | Multi-objective Optimization of CDO Trajectory in a Flexible Airspace Structure | Wenbo Li, Lei Yang, Yutong Chen, Haoran Zhang, Zheng Zhao, Nanjing University of Aeronautics and Astronautics, China | 306 |
| 3D1 | Modified Depth-First Search for the Automated Design of RNAV Approach Procedures | David Stauffer, Justin Barnes, Leland Smith, MITRE Corporation | 321 |
| 3D2 | Automating the Design of Instrument Flight Procedures | Ethan Israel, The MITRE Corporation | 329 |
| 3D3 | Evaluating the Benefits of Accepting Cruising Flight Levels That Are Not in Compliance with the Hemispherical Rules in the Pacific Airspace | Tao Li, Institute for Transportation Research and Education, North Carolina State Univer | 340 |
| 3E1 | Operational Evaluation of Digital Taxi Instruction | Noureddin Ghazavi, Federal Aviation Administration, Scott Masarky, Joe Monahan, Mike Copp, and Arnol Ketros, LS Technologies | 353 |

| 3E2 | Enabling General Aviation Departure Readiness Information Exchange | Kevin Long, Paul Diffenderfer, Caroline Abramson, John Carroll, MITRE | 361 |
|------|--|--|-----|
| 3F1 | Real-Time Autonomous Trajectory Conflict Detection and Resolution in Restricted Airspace | Yutong Chen, Lei Yang, Haoran Zhang, Zheng Zhao, Minghua Hu, Nanjing University of Aeronautics and Astronautics | 369 |
| 3F2 | Integrating ARIMA and Bidirectional LSTM to Predict ETA in Multi-airport System | Lechen Wang, The Chinese University of Hong Kong,Shenzhen | 384 |
| 3F3 | Travel Time Prediction for Multi-Airport Systems via Multiclass Queuing Networks | Kailin Chen, Shaoyu Wang, Jianfeng Mao, The Chinese University of Hong Kong, Shenzhen | 399 |
| 4A1p | First Results of the L-band Digital Aeronautical Communications System (LDACS) Flight Trials | Thomas Gräupl, German Aerospace Center (DLR) | N/A |
| 4A2p | AeroMACS Considerations to Foster Innovation in Air Transportation | Declan Byrne, AeroMACS - WiMAX Forum | N/A |
| 4B1 | Distributed Mobility Anchoring using LISP Mobile Node | Thomas McParland, BCI, Madhu Niraula, Collins Aerospace | 411 |
| 4B2 | Mobility Management Approach For Future Aviation IPv6 Networks | Madhu Niraula, Collins Aerospace | 417 |
| 4B3 | Transforming Today's Closed Communications Network to Tomorrow's Cross-Domain Aviation Internet | Dongsong Zeng, Stephen Giles, Angela Chen, The MITRE Corporation | 427 |
| 4C1 | Hyper-Spectral Communications and Networking for ATM: Results and Prospective Future | David Matolak, University of South Carolina, Ismail Guvenc, North Carolina State University, Hani Mehrpouyan, Boise State University, Greg Carr, Architecture Technology Corporation | 436 |
| 4D1p | Multi-Sectored DME Ground Station | Kevin Sivits, Selex ES Inc., A Leonardo Company | N/A |
| 4F1 | Integration and Testing of Infill Radars at Travis AFB | David Mazel, Regulus-Group, LLC, Manoj Thakur, FAA-William J. Hughes Technical Center, Atlantic City, NJ, Ruben Rivera, Travis Air Force Base, CA, Michael Lesmerises, C Speed, LLC, Liverpool, NY, Bryan Miller, BEM International, LLC, WY | 451 |
| 4G1 | RF Fingerprint Measurement for Detecting Multiple Amateur Drones Based on STFT and Feature Reduction | Chengtao Xu, Bowen Chen, Yongxin Liu, Fengyu He, Houbing Song, Embry-Riddle Aeronautical University | 460 |
| 4G2 | Full Apron Visibility Design | Leonhard Korowajczuk, CelPlan Technologies | 467 |
| 5A1 | Artificial Intelligence Applications for Air Traffic Management Network Operations and Security | Ziad Chaudhry, Kevin Fox, L3Harris Technologies | 482 |
| 5A2 | Detecting Point Merge Patterns from Track Data | Thomas Schneider, EUROCONTROL / Institut Polytechnique des Sciences Avancees, Bruno Favennec, EUROCONTROL , Joana Frontera-Pons, Institut Polytechnique des Sciences Avancees / CEA Universite Paris-Saclay, Eric Hoffman, EUROCONTROL, Karim Zeghal, EUROCONTROL | 493 |

| 5B1 | Predicting Conflict Free Trajectories Suing Supervised Machine Learning, Initial Investigations | Raphael Christien, Karim Zeghal, and Hoffman Eric, EUROCONTROL | 509 |
|------|---|--|-----|
| 5B2 | Machine Learning Approach to Chirp Rate Estimation of Linear Frequency Modulated Radars | Anne Young, Defence Research and Development Canada, David Luong, Carleton University, Bhashyam Balaji, Defence Research and Development Canada, Sreeraman Rajan, Carleton University | 519 |
| 5C1 | Tree-based Airspace Capacity Estimation | Kai Zhang, Yongxin Liu, Jian Wang, Houbing Song, Dahai Liu, Embry-Riddle Aeronautical University | 524 |
| 5C2 | Explicit Contingency Planning for Improved Human-Autonomy Teaming in Decision Support | Chris Brinton, Alicia Fernandes, Curt Kaler, Mosaic ATM, Inc. | 532 |
| 5C3 | A Methodological Framework of Human-Machine Coevolutionary Intelligence for Decision-Making Support of ATM | Xiao-Bing Hu, Civil Aviation University of China | 540 |
| 5D1 | Autonomous Systems Design, Testing and Deployment: Lessons Learned from the Deployment of an Autonomous Shuttle Bus | Lance Sherry, John Shortle, George Donohue, Jonathan West, Center for Air Transportation Systems Research at George Mason University | 548 |
| 5D2 | 25.3 GOPS Autonomous Landing Guidance Assistant System Using Systolic Fuzzy Logic System for UAM Vehicles Using FPGA | Hossam Ahmed, American College of the Middle East (ACM) | 561 |
| 5D3 | Building Human Talent in Air Traffic Organizations | Eric Weis, Objective Area Solutions | 572 |
| 6A1p | Big Data: The Legal Landscape for the Aerospace Industry | Russell Klingaman, Hinshaw & Culbertson LLP | N/A |
| 6A2 | On-Demand Mobility Cargo Demand Estimation in Northern California Region | Mihir Rimjha, Sayantan Tarafdar, Nicolas Hinze, Antonio A. Trani, Howard Swingle, Virginia Polytechnic Institute and State University | 581 |
| 6B1 | Agent-based Simulation of Metropolitan Area Evacuation by Unmanned Air Mobility | Jonathan West, George Mason University, Lance Sherry, Center for Air Transportation Systems Research at George Mason University | 591 |
| 6D1 | Operational Benefits of Remote Oceanic Meteorology Information Operational (ROMIO) Demonstration: A Survey-based Analysis | Jungmin Seo, Arman Izadi, Antonio Trani, Virginia Polytechnic Institute and State University | 597 |
| 6D2 | Trade-Off Analysis of Options for Mitigating Climate Effects of Aircraft Induced Clouds | Oleksandra (Sasha) Donnelly, Lance Sherry, Center for Air Transportation Systems Research at George Mason University | 608 |
| 6D3 | An Effective Hybrid Algorithm for Real-Time Optimizing Locations of Urban Mobile Stations for Luggage Check-in Service | Hang Zhou, Civil Aviation University of China, Xiao- Bing Hu, Civil Aviation University of China | 622 |