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INTRODUCTION

I am pleased to introduce our seventeenth annual compendium of technical and professional accomplishments from MITRE’s Center for Advanced Aviation System Development (CAASD). This booklet documents the many significant outreach and collaboration actions of MITRE staff in support of CAASD’s mission: serving the public interest by advancing the safety, security, effectiveness, and efficiency of aviation in the United States and around the world.

This continues to be an exciting time for the aviation and aerospace communities. Unmanned aircraft and commercial space vehicles are inspiring innovative new business opportunities, but bring new operational and technical challenges in preserving the high level of safety and efficiency in today’s system. New technologies, such as autonomy, mobile computing, data analytics, machine learning, and advanced sensors, will play a part in this evolving landscape, but also present research challenges. As the FAA deploys NextGen capabilities, which are now being widely used in daily air traffic management operations, new procedures and technologies offer airspace users opportunities for significant operational improvement and safety enhancement.

This is a highly collaborative community—one which relies on the free exchange of ideas and full consideration of all stakeholder viewpoints. In that spirit, CAASD staff publish and present extensively in order to share our ideas, obtain community feedback, and understand new perspectives. The papers, patents, awards, and other technical contributions documented here are testaments to the collaborative spirit of our staff.
We also thrive on intellectual challenges and opportunities to innovate. Through analytic and human-in-the-loop simulation, our staff bring future concepts and capabilities to life in our laboratories to explore the opportunities offered by these advancements, but also to understand their associated risks. Such advancement requires significant research, analysis, and understanding. Our staff’s spirit of innovation and passion for advancing system operations are evidenced here. In order to ensure that our innovations have impact we actively manage the transition of our research and technology to government, industry, and other community stakeholders.

Also reflected in these pages is our diversity. Our work requires a broad range of operational experience and technical depth. Our staff include engineers, scientists, economists, pilots, controllers, traffic managers, former airline and military personnel, and more. They provide operational expertise in air traffic control, traffic flow management, and space operations, and technical expertise in systems engineering, computer science, operations research, human factors, economics, communications, navigation, surveillance, and other essential disciplines. We could not accomplish all that we do without this rich diversity of experience and thought.

Our staff inspire us by envisioning innovative ideas for future capabilities and by performing rigorous technical and operational analysis to ensure the viability of those ideas. The contributions and achievements documented here highlight the critical role CAASD and other MITRE staff are playing in making new ideas in aviation and aerospace operations a reality.

Lillian Z. Ryals
Senior Vice President, The MITRE Corporation
General Manager & Director,
Center for Advanced Aviation System Development

“Big Strides in Air Control,” John Reed, Uday Shankar, and Lesley A. Weitz, Aerospace America, Vol. 54, No. 11, p. 20, December 2016, American Institute of Aeronautics and Astronautics.


“Preparing for the Rise in Commercial Space Operations,”


**Web Site Articles/Featured Opinion**

Conferences are an important part of CAASD’s outreach to the global aviation community. CAASD staff participate in numerous ways: as presenters, moderators, panelists, chairs, and attendees in order to share their work, learn from other experts, make connections, and inform the aviation community about our unique FFRDC role.

CAASD has Conference Coordinators whose role is to champion and manage staff participation where we will have a significant presence or exhibition. The conferences for which CAASD has designated Conference Coordinators are listed below, along with the assigned Conference Coordinators.

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<td>Air Line Pilots Association (ALPA)</td>
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<td>Air Safety Forum</td>
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<tr>
<td>Air Traffic Control Association (ATCA)</td>
<td>David G. Hamrick</td>
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<tr>
<td>Annual Conference and Exposition</td>
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<td>Air Traffic Control Association (ATCA)</td>
<td>Joseph M. Veoni</td>
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<td>Aviation Cyber Security Day</td>
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<tr>
<td>Air Transport and Operations Symposium (ATOS)</td>
<td>David R. Maroney</td>
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<td>AirTTOp User Conference</td>
<td>John A. Kuchenbrod</td>
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# Conference Participation

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<td>American Association of Airport Executives (AAAE)</td>
<td>Douglas L. Molin</td>
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<td>- Aviation Security Summit</td>
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<td>- Conference and Exposition</td>
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<td>- Issues Conference</td>
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<tr>
<td>American Institute of Aeronautics and Astronautics (AIAA) Aviation Conference</td>
<td>David R. Maroney</td>
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<tr>
<td>American Institute of Aeronautics and Astronautics (AIAA) SciTech Conference</td>
<td>Lesley A. Weitz</td>
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<tr>
<td>American Meteorological Society (AMS) Annual Meeting</td>
<td>Matthew J. Fronzak</td>
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<tr>
<td>Association for Unmanned Vehicle Systems International (AUVSI) XPONENTIAL Conference</td>
<td>Andrew R. Lacher</td>
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<tr>
<td>Avionics for NextGen</td>
<td>Sean F. McCourt</td>
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<tr>
<td>Civil Air Navigation Services Organization (CANSO) Asia-Pacific Conference</td>
<td>Miyoun L. (Mimi) Dobbs</td>
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<tr>
<td>Civil Air Navigation Services Organization (CANSO) World ATM Congress</td>
<td>Miyoun L. (Mimi) Dobbs</td>
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<tr>
<td>Congress of the International Ergonomics Association</td>
<td>Valerie Gawron</td>
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<tr>
<td>Digital Avionics Systems Conference (DASC)</td>
<td>Hilton Bateman</td>
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<tr>
<td>Embry-Riddle Aeronautical University’s Space Traffic Management Conference</td>
<td>Dean E. Fulmer</td>
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<td>FAA Commercial Space Transportation Conference</td>
<td>Dean E. Fulmer</td>
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<tr>
<td>FAA/EUROCONTROL ATM R&amp;D Conference</td>
<td>Craig R. Wanke</td>
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<tr>
<td>FAA Managers Association (FAAMA) Annual Gathering of Eagles Conference</td>
<td>Michael L. Klinker</td>
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<tr>
<td>FAA UAS Symposium</td>
<td>Hassan Shahidi</td>
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<tr>
<td>Human Factors and Ergonomics Society Annual Meeting</td>
<td>Valerie Gawron</td>
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<tr>
<td>Institute of Electrical and Electronics Engineers (IEEE) Conference on Intelligent Data Understanding</td>
<td>Andrew R. Lacher</td>
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<tr>
<td>Institute of Electrical and Electronics Engineers (IEEE) International Systems Conference</td>
<td>Glenn F. Roberts</td>
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<td>Institute of Navigation (ION):</td>
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<tr>
<td>• GNSS+</td>
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<td>• International Technical Meeting</td>
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<td>• Joint Navigation Conference</td>
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<td>• Pacific PNT Conference</td>
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<tr>
<td>• ION/IEEE Position, Location, and Navigation Symposium (PLANS)</td>
<td>Christopher J. Hegarty</td>
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<tr>
<td>International Conference on Applied Human Factors and Ergonomics</td>
<td>Valerie Gawron</td>
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<tr>
<td>International Symposium on Aviation Psychology</td>
<td>Valerie Gawron</td>
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<tr>
<td>MIT Lincoln Laboratory Air Traffic Control Workshop</td>
<td>David G. Hamrick</td>
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<tr>
<td>Munich Satellite Navigation Summit</td>
<td>Christopher J. Hegarty</td>
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<td>National Air Traffic Controllers Association (NATCA) Communicating for Safety Conference</td>
<td>Douglas L. Molin</td>
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<td>National Business Aviation Association (NBAA) Friends and Partners of Aviation Weather</td>
<td>Matthew J. Fronzak</td>
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<tr>
<td>RTCA Annual Symposium</td>
<td>Deborah A. Kirkman</td>
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<tr>
<td>Space Foundation’s Space Symposium</td>
<td>Dean E. Fulmer</td>
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<tr>
<td>Transportation Research Board (TRB) Annual Meeting</td>
<td>Laurence F. Audenaerd</td>
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<tr>
<td>University of New Mexico’s UAS Technical Analysis and Applications Center (TAAC) Conference</td>
<td>Andrew R. Lacher</td>
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<tr>
<td>U.S. Chamber of Commerce’s Annual Aviation Summit</td>
<td>Cheryl A. Croft</td>
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<tr>
<td>Women in Aviation International (WAI) Conference</td>
<td>Elida C. Smith</td>
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<td>Worldwide TAAM User Group Meeting</td>
<td>Jonathan H. Hoffman</td>
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“Air Traffic Controller Utilization of Voice and Data Link Communications During Interval Management,”


“Applicability of Lessons Learned from Aviation Safety Management System for Automated Vehicles,”
“Are We There Yet? How Redundant and Equivalent Mutants Affect Determination of Test Completeness,” Mariet S. Kurtz, Paul Ammann, Bob Kurtz, and Jeff Offutt, presented at The IEEE International Conference on Software Testing, Verification and Validation (ICST) 11th International Workshop on Mutation Analysis, April 10, 2016, Chicago, IL.


“ATM-Weather Integration (AWI) Gap Analysis of the NAS Segment Implementation Plan (NSIP),”


“Counter Drone Technology: Counteracting UAS for Safety’s Sake,” Andrew R. Lacher, Panel Moderator, Drone World Expo, AUVSI XPONENTIAL, November 14–16, 2016, San Jose, CA.
Conference Participation

“Counter UAS Challenges & Technologies,”
Andrew R. Lacher, presented at the Technology Training Corporation’s Civil and Commercial Drone Systems and Counter Drone Technologies Symposium, June 23–24, 2016, Arlington, VA.

“Counter-UAS Concepts and Technologies,”

“A Cross-Generational Industry Perspective,”

“Current Topics in Air Carrier Competition,”
Katherine T. Harback, Session Chair, Transportation Research Board 95th Annual Meeting, January 10–14, 2016, Washington, DC.


“Digital Copilot: Cognitive Assistance for Pilots,”
Kevin J. Burns, Steven L. Estes, John R. Helleberg, Kevin M. Long, Matthew E. Pollack, and
Jeffrey L. Stein, Proceedings of the Association for the Advancement of Artificial Intelligence Fall Symposium, November 17–19, 2016, Arlington, VA.

“Emerging Autonomy Operations: Defense and Security,”
Andrew R. Lacher, presented at the American Institute of Aeronautics and Astronautics (AIAA) Intelligent Systems Workshop, August 3–5, 2016, Hampton, VA.


Conference Participation


“Exploring Necessary Altitude Awareness and Response Times for Air Traffic Control during Space Launch and Reentry Vehicle Operations,” Jonathan L. Schwartz, Jon L. Semanek, Zheng Tao, Ganghuai Wang, Paul D. Wilde, and Ashley G. Williams, Proceedings of the 8th International Association for the Advancement of Space Safety (IAASS), May 18–20, 2016, Melbourne, FL.

“FAA Air Traffic Flow Management: Why, How, & the Future,” Marcus Smith, presented at the University of Massachusetts Transportation Center, April 28, 2016, Amherst, MA.


“GPS/GNSS Antenna Characterization,” **Christopher J. Hegarty**, presented at the Department of Transportation GPS Adjacent Band Compatibility Workshop V, October 14, 2016, Washington, DC.


“Identification, Quantification and Mitigation of ATM-Weather Integration Gaps for NSIP Increments Dependent on Weather Information,” **Matthew J. Fronzak** and **Claudia V. McKnight**, Poster session: Aviation’s Usable Regions of Airspace, Hazards, and Mitigations at the American Meteorological Society (AMS) 96th Annual Meeting, January 10–14, 2016, New Orleans, LA.


“Mobility Solutions to Enhance Citizen Engagement,”

“Modeling Uncertainty in Inter-Aircraft Spacing Between the Final Approach Fix and the Runway Threshold,”


Conference Participation

“Operational Benefits of Parallel Offset Routes,”

“Operational Evolutions: Airport & Airspace Optimization/Operations (Track 6), Session B: Enabling Technologies,”


“Operational Evolutions: Performance-Based CNS/ATM (Track 7), Session C: Data Communication I,”


Conference Participation

“Predictors of Unsuccessful Approaches,”

“Projecting Air Traffic Impact of Blocked Airspaces,”

“Proposed sUAS Safety Performance Requirements for Operations over People,” Jeffrey L. Breunig, Edward A. Lester, and Brian C. Patterson, presented at the Massachusetts Institute of Technology (MIT) Lincoln Laboratory Air Traffic Control Workshop, December 8, 2016, Washington, DC.


“Remote and Smart Tower Future 2016 and Beyond,”


Conference Participation


“Trajectory Based Operations (TBO) SWIM needs focused” Stephane L. Mondoloni, presented at the FAA Air Transportation Information Exchange Conference, September 22–26, 2016, Silver Spring, MD.


“UAS Workshop—UAS Privacy & Security,”
Andrew R. Lacher, Panelist, Transportation Research Board 95th Annual Meeting, January 10–14, 2016, Washington, DC.


“Unmanned and Autonomous Vehicles: A Cultural Mismatch,” Andrew R. Lacher, presented at George Mason University—Center for Air Transportation Systems Research Seminar, April 27, 2016, Fairfax, VA.


Conference Participation


Technical Exchange Meetings

Technical Exchange Meetings (TEM) are forums for exchanging ideas, starting new initiatives, learning about new technologies, sharing resources, or collaborating across programs and organizational boundaries.

Conference Participation

“ACAS Xa and TCAS II NAS Operational Performance Assessment Update,” Emily P. Bromberg, Ryan W. Huleatt, Roland M. Sgorcea, and Erik P. Vargo, Data Science and Analytics mini-TEM Series, August 2016, McLean, VA.


Special Honors and Recognition

Aviation International News (AINonline) announced that the Federal Aviation Administration (FAA) has named Lillian Z. Ryals as a member of the RTCA Drone Advisory Committee (DAC), August 2016.

The Commission on Accreditation of Medical Transport Systems (CAMTS) Board of Directors letter of appreciation for the efforts of Steven L. Estes, John R. Helleberg, Kent V. Hollinger, and Mitchel Wynnyk on reviewing their Safety Culture Survey results as part of an FAA grant, September 2016.

The Department of Homeland Security Science and Technology (DHS S&T) Directorate Ceremony, Under Secretary’s Award for Outstanding Collaboration was presented to Kevin M. Long and Lisa A. Kerby for the Next Generation First Responder Apex Team: Honored for executing first-of-its-kind test and evaluation approach and communication strategies, July 2016.

The American Institute of Aeronautics and Astronautics (AIAA), elected Lesley A. Weitz to the grade of Associate Fellow in October 2016.
The Federal Aviation Administration notified the PARC Communications Working Groups that two significant ICAO manuals, The Global Operational Data Link Document (GOLD) and The Performance-Based Communications and Surveillance (PBCS), have been approved by the ICAO Secretary General, August 2016.

The R&D 100 Conference awarded the Massachusetts Institute of Technology (MIT) Lincoln Laboratory for their Airborne Collision Avoidance System X (ACAS Xu) project and recognized MITRE as a co-developer along with the Federal Aviation Administration and Johns Hopkins University Applied Physics Laboratory, November 2016.

The 2016 Institute of Electrical and Electronics Engineers (IEEE) and the American Institute of Aeronautics and Astronautics (AIAA) presented a certificate of appreciation to Dongsong Zeng for his outstanding contributions during the 35th IEEE/AIAA Digital Avionics Systems Conference (DASC) conference, September 2016.

RTCA 2016 Award for Global Harmonisation was presented to Randall S. Bone, John C. Gonda III, and Dongsong Zeng during the EUROCAE/RTCA Annual Symposium, April 2016.
The National Aeronautics and Space Administration presents the Group Achievement Award to the Operational Integration Assessment (OIA) Team:

Paul V. MacWilliams, Kathleen A. McGarry Peterson, Andrew S. Mendolia, David L. Toms, and Mitchel Wynnyk, for designing, developing, and conducting a complex human-in-the-loop simulation to test NASA’s Terminal Sequencing and Spacing technology in an operational environment, June 2016.

RTCA presented its Outstanding Leadership Award to Lesley A. Weitz for her contributions on Special Committee 186: Automatic Dependent Surveillance-Broadcast in producing DO-361: “Minimum Operational Performance Standards (MOPS) for the Flight-Deck Interval Management (FIM)” at the 2016 Global Aviation Symposium, June 2016.

RTCA presented its Significant Contributor Award to David J. Elliott for his contributions on Special Committee 186: Automatic Dependent Surveillance-Broadcast in producing DO-361: “Minimum Operational Performance Standards (MOPS) for the Flight-Deck Interval Management (FIM)” at the 2016 Global Aviation Symposium, June 2016.

RTCA presented its Significant Contributor Award to **Brock J. Lascara** for his contributions on SC-206 Aeronautical Information and Meteorological Data Link Services in producing DO-358: “Minimum Operational Performance Standards (MOPS) for Flight Information Services–Broadcast (FIS-B) with Universal Access Transceiver (UAT)” at the 2016 Global Aviation Symposium, June 2016.

RTCA presented its Significant Contributor Award presented to **J. William Carson** for his contributions to the SC-206 Aeronautical Information and Meteorological Data Link Services in producing Supplement to DO-358: “Minimum Operational Performance Standards (MOPS) for Flight Information Services-Broadcast (FIS-B) with Universal Access Transceiver (UAT),” 2016 Global Aviation Symposium, June 2016.
RTCA presented its Significant Contributor Award presented to **Douglas Havens** for his contributions to the SC-206 Aeronautical Information and Meteorological Data Link Services in producing Supplement to DO-358: “Minimum Operational Performance Standards (MOPS) for Flight Information Services-Broadcast (FIS-B) with Universal Access Transceiver (UAT),” 2016 Global Aviation Symposium, June 2016.

**Best Paper Awards**

Best of Session award presented to **Hilton Bateman, Shuo Chen, Ronald S. Chong, Jacob Richkus, and Emily K. Stelzer**, for their paper “Low Cost Surface Awareness Technology and Field Demonstration,” at the 35th Digital Avionics Systems Conference (DASC), September 2016, Sacramento, CA.

Honors, Awards, and Recognition


Letters of Commendation

From the Airports Authority of India in appreciation for MITRE’s generous hospitality and cooperation during our visit. We really appreciate the thorough planning and coordinated presentation of valuable information during our interaction. It showed a really good appreciation of our present day challenges and opportunities, February 2016.
From the Colvin Run Elementary School’s Conservation Rangers of Endangered Species team and coaches in appreciation of the amazing IDEA lab tour conducted by Paul V. MacWilliams, Jacob Richkus, and Samantha L. Tungul, October 2016.

From the European Aviation Safety Agency in appreciation of the time and support of the valuable and instructive presentations given by Eric B. Chang, Heather L. Danner, Christopher J. Devlin, Eugene A. Mwendwa, Prakash Subramanian, and Edward B. Walsh during their MITRE visit, October 2016.

From the Federal Aviation Administration in appreciation for the MITRE team’s significant contributions to the collaborative effort in producing the PBN NAS Navigation Strategy 2016, which was endorsed by the NextGen Advisory Committee (NAC), March 2016.

From the Federal Aviation Administration in appreciation for the MITRE team’s support in developing and briefing the Capability Package for the PBN Timing, Speed and Spacing Sequencing Tool NAC Tasking, March 2016.

Honors, Awards, and Recognition

From the Federal Aviation Administration in appreciation for the MITRE Space Team’s support and patience for a very successful six months on the ATO Commercial Space Integration Office accomplishments, April 2016.

From the Federal Aviation Administration in appreciation for the MITRE team’s support of the ATO Commercial Space Integration document, April 2016.

From the Federal Aviation Administration in appreciation of Michelle A. Duquette’s tremendous assistance during the UAS Symposium in conjunction with Embry-Riddle Aeronautical University, April 2016.

From the Federal Aviation Administration in appreciation for the excellent job Elida C. Smith did in setting up and executing the “demo day” at MITRE. This event was invaluable in educating the NAC PBN Tools Group on the various candidate capabilities, and in so doing, helped the community move forward with this important tasking, May 2016.

From the Federal Aviation Administration in appreciation for the support Justin R. Boesel, Michael L. Crane, Jason A. Reinhart, and Stanley J. Roessner provided at the SE 210 meeting, May 2016.
From the Federal Aviation Administration, a letter of appreciation to **Lillian Z. Ryals** and the MITRE team for their tremendous help developing the Performance Based Navigation (PBN) National Airspace System (NAS) Navigation Strategy, May 2016.

From the Federal Aviation Administration in appreciation of **Michael J. Fremberg, Grant Pan, John R. Polk, and Anuja Verma’s** great technical collaboration they provided to the FAA over the past year regarding the ASIAS work, July 2016.

From the Federal Aviation Administration in appreciation of **Michael J. Fremberg** and **Eugene A. Mwendwa’s** support of the Digital Audio Legal Recorder Remote Audio Access System (DRAAS), July 2016.

Commendation from the Federal Aviation Administration regarding **Cherlynn M. Jones’** methodical approach she used during her presentation on the Tuscon spaceport case study, August 2016.

From the Federal Aviation Administration regarding receiving approval from the JRC for the S1P2 Full Services portion of the program, in appreciation of MITRE’s excellent systems engineering work and leadership in helping the FAA achieve this milestone, August 2016.
From the Federal Aviation Administration in appreciation of the MITRE team in completing the “Human-in-the-Loop (HITL) Simulation Planning, Execution, and Reports Integration of IDRP and ARSI,” August 2016.

From the Federal Aviation Administration in appreciation for the efforts of Monique Exum and Suzanne Porter throughout the TRACON Evolution program, September 2016.

From the Federal Aviation Administration in appreciation for the efforts of Michelle J. Blucher and David Gouldey for the work accomplished in compiling the TRACON Evolution Shortfalls Analysis document, September 2016.

From the Federal Aviation Administration in appreciation for the efforts of Paul A. Diffenderfer throughout the TRACON Evolution program, September 2016.

From the Federal Aviation Administration in appreciation for the efforts expended on the coagulator work by Devon B. Kelley and Raymond Stanley, September 2016.

From the Federal Aviation Administration congratulating the MITRE Team in completing the A-IM Capture document on time, September 2016.

The FY16 Business Excellence recognition was awarded to the VOR MON program team members during the Federal Aviation Administration’s PMO All Hands meeting, September 2016.
From the Federal Aviation Administration in appreciation for the MITRE Team’s support of the “Operational Roles and Responsibilities for Space Vehicle Operations” white paper, November 2016.

From the Federal Aviation Administration in appreciation for the MITRE Team’s contribution for the AFST (renamed SFMA) 6th Mini-Evaluation 6 Summary Report, November 2016.

From the Federal Aviation Administration in appreciation for Thomas B. Hudak II’s participation at SASP1 in Montreal, November 2016.

From the Federal Aviation Administration in appreciation for Matthew J. Fronzak and John J. Huhn’s contributions during the Weather Evaluation Team (WET) meeting, November 2016.


From the Federal Aviation Administration in appreciation for Amanda S. Matthews’ support on the 3T evaluation coordination, October 2016.
Honors, Awards, and Recognition

From RTCA in appreciation for Kelly R. Markin’s leadership on Phase 2 Terms of Reference updates for the SC-228 milestone, September 2016.

From the University of Maryland in appreciation for Craig R. Wanke’s presentation at the NEXTOR 20th Anniversary Workshop, September 2016.

Patents Awarded


Patent Applications Filed

Fellows

- Human Factors and Ergonomics Society
  Valerie Gawron

- The Institute of Electrical and Electronics Engineers
  Christopher J. Hegarty

- The Institute of Navigation
  Ronald Braff
  Christopher J. Hegarty

- International Ergonomics Association
  Valerie Gawron

- Royal Aeronautical Society
  Stephane L. Mondoloni

Associate Fellows

- American Institute of Aeronautics and Astronautics
  Thomas A. Becher
  Valerie Gawron
  John C. Gonda III
  Christopher J. Hegarty
  Andrew R. Lacher
  Wesley B. Link
  David R. Maroney
  Sebastian V. Massimini
  Ralf H. Mayer
  Stephane L. Mondoloni
  Glenn F. Roberts
  Craig R. Wanke
  Lesley A. Weitz
  Andrew D. Zeitlin
Professional Societies

**Memberships**

- Advanced Computing Systems Association (System Administration) (USENIX)
- Air Force Association (AFA)
- Air Line Pilots Association, International (ALPA)
- Air Traffic Control Association (ATCA)
- Aircraft Owners and Pilots Association (AOPA)
- American Association of Airport Executives (AAAE)
- American Association of University Women (AAUW)
- American Economic Association (AEA)
- American Institute of Aeronautics and Astronautics (AIAA)
- American Mathematical Society (AMS)
- American Meteorological Society (AMS)
- American Physical Society (APS)
- American Planning Association (APA)
- The Association for Operations Management (APICS)
- American Society of Civil Engineers (ASCE)
- American Society for Quality (ASQ)
- American Society of Safety Engineers (ASSE)
- American Statistical Association (ASA)
- Armed Forces Communications and Electronics Association (AFCEA)
Professional Societies

Association for Aviation Psychology (AAP)
Association for Computing Machinery (ACM)
Association for Enterprise Information (AFEI)
Association for Unmanned Vehicle Systems International (AUVSI)
Certified Consulting Meteorologist (CCM)
Certified Information Systems Security Professional (CISSP)
Experimental Aircraft Association (EAA)
Federal Aviation Administration Managers Association (FAAMA)
Guild of Air Traffic Control Officers (GATCO)
Human Factors and Ergonomics Society (HFES)
Information Systems Audit and Control Association (ISACA)
Institute for Operations Research and the Management Sciences (INFORMS)
Institute of Electrical and Electronics Engineers (IEEE)
  • Communications Society (COMSOC)
  • Computer Society (CS)
  • Control Systems Society (CSS)
  • Industrial Electronics Society (IES)
  • Industry Applications Society (IAS)
  • Women in Engineering (WIE)
Professional Societies

Institute of Navigation (ION)
International Air Transport Association (IATA)
International Council on Systems Engineering (INCOSE)
International Federation of Automatic Control (IFAC)
International Institute of Forecasters (IIF)
International Society of Air Safety Investigators (ISASI)
International Union of Radio Science (URSI)
Mathematical Association of America (MAA)
National Air Traffic Controllers Association (NATCA)
National Association of Flight Instructors (NAFI)
National Black MBA Association (NBMBAA)
National Contract Management Association (NCMA)
National Safety Council (NSC)
National Society of Black Engineers (NSBE)
Project Management Institute (PMI)
Royal Aeronautical Society (RAeS)
Royal Institute of Navigation (RIN)
SAE International (SAE)
Society for the Advancement of Material and Process Engineering (SAMPE)
Society for Industrial and Applied Mathematics (SIAM)
Society of Women Engineers (SWE)
Professional Societies

TBM Owners and Pilots Association, Inc. (TBMOPA)
Threaded Track for Analysts by Analysts (TTAA)
Transportation Research Board (TRB)
Transportation Research Forum (TRF)
Virginia Helicopter Association (VHA)
Whirly Girls—International Women Helicopter Pilots
Women in Aerospace (WIA)
Women in Aviation, International (WAI)
Women Military Aviators (WMA)

Honor Societies
Beta Gamma Sigma (Business)
Eta Kappa Nu (Electrical and Computer Engineers)
Omega Rho (International Operations Research)
Phi Beta Kappa (Liberal Arts and Sciences)
Sigma Pi Sigma (Physics)
Tau Beta Pi (Engineering)

Users Groups
Airline Group of the International Federation of Operational Research Societies (AGIFORS)
AirTOp User Group (AUG)
Americas & Pacific Rim TAAM Users Group (APTUG)
Professional Societies

BADA User Group (BUG)

Large Installation System Administration Special Interest Group (LISA)

Special Interest Group on Computer-Human Interaction (SIGCHI)—ACM / SIGCHI

Worldwide TAAM Users Group (WWTUG)
TECHNICAL COMMITTEE MEMBERSHIPS

American Institute of Aeronautics and Astronautics (AIAA)

- Aviation 2017 Executive Steering Committee
  Glenn F. Roberts

- Program Committees
  - Transformational Flight
    David R. Maroney
  - Unmanned Systems
    Andrew R. Lacher
    David R. Maroney

- Standing Committees
  - Emerging Technologies Committee
    David R. Maroney
  - Corporate Member Committee
    Lillian Z. Ryals

- Technical Activities Committees
  - Aircraft and Atmospheric Systems Group
    David R. Maroney, Deputy Director
  - Air Transportation Systems
    Stephane L. Mondoloni
    David R. Maroney, Emeritus Member
Committee Participation

- **Guidance, Navigation, and Control**
  Lesley A. Weitz, Chair
- **Intelligent Systems Technical Committee**
  Andrew R. Lacher
- **Modeling and Simulation**
  Christine P. Taylor

**American Association of Airport Executives (AAAE)**
- Operations, Safety, and Planning Committee
  Cheryl R. Andrews

**American Meteorological Society (AMS)**
- Aviation, Range, and Aerospace Meteorology (ARAM)
  Matthew J. Fronzak
- Aviation, Range, and Aerospace Meteorology (ARAM) Conference
  Michael Robinson

**Civil Air Navigation Services Organisation (CANSO)**
- Operations Standing Committee
  Bruce E. Killian, ASBU Chair

**EU-U.S. Cooperation on Satellite Navigation**
- Working Group C—ARAIM Technical Subgroup
  Young C. Lee
Committee Participation

**Federal Aviation Administration (FAA)**

- 1090 MHz Spectrum Risk Assessment Team
  Stanley R. Jones

- Advanced Interval Management and Dynamic Required Navigation Focus Groups, FAA Data Communication Segment 2 Subject Matter Expert
  John C. Gonda III

- Air Carrier Training Aviation Rulemaking Committee (ACT ARC) Flight Path Management Working Group
  William A. Miller

- Center of Excellence for Commercial Space Transportation, Executive Committee
  Zheng Tao

- **Flight Standards: CNS Task Force** *(Joint with Airlines for America)*
  Michael R. Cramer
  Sean F. McCourt
  William A. Miller

- General Aviation Issues Analysis Team (GA-IAT)
  Jeffrey P. Mittelman, Tri-chair

- Performance-Based Operations Aviation Rulemaking Committee (PARC)
  Michael R. Cramer, WG Chair—Navigation
  - *Communications Working Group*
    Dongsong Zeng
• **VNAV Action Team**  
  William A. Miller, RNP Established Action Team  
  Chair

- **Research, Engineering, and Development Advisory Committee (REDAc)**
  - **REDAc Human Factors Subcommittee**  
    Christopher T. DeSenti
  - **REDAc NAS Operations Subcommittee**  
    Emily K. Stelzer
  - **REDAc Subcommittee for Aircraft Safety**  
    Andrew R. Lacher

- **Space-Based ADS-B Support Team**  
  Stanley R. Jones

- **Unmanned Aircraft Safety Team (UAST)**  
  Deborah A. Kirkman  
  Patricia Abel Massimini  
  Hassan Shahidi  
  Anuja Verma

- **Unmanned Aircraft System (UAS) Aviation Rulemaking Committee (ARC)**  
  David G. Hamrick

- **Unmanned Aircraft Systems Executive Committee (DHS, DoD, FAA, NASA)**
  - **Science and Research Panel**  
    Andrew R. Lacher  
    Brian C. Patterson
  - **USA/Europe ATM R&D Seminar**  
    Craig R. Wanke
Committee Participation

**Human Factors and Ergonomics Society**

- A. R. Lauer Safety Award Committee
  Valerie Gawron, Chair

- Aerospace Systems Technical Group
  Valerie Gawron, Chair
  David A. Domino
  Kathleen A. McGarry Peterson
  Scott H. Mills
  Emily K. Stelzer

- Cognitive Engineering and Decision Making Technical Group
  Emily K. Stelzer

**International Society of Air Safety Investigators (ISASI)**

- Human Factors Working Group
  Mitchell L. Serber

**International Telecommunication Union—Radiocommunication Sector (ITU-R)**

- Efficient Orbit/Spectrum Utilization for FSS and BSS (WP 4A)
  Michael Tran

- Efficient Orbit/Spectrum Utilization for MSS and RDSS (WP 4C)
  Michael Tran

- MMS/GMDSS: Aeronautical Mobile Service and Radiodetermination (WP 5B)
  Michael Tran
Committee Participation

  Michael Tran

- **Space Radiocommunication Applications (WP 7B)**
  Michael Tran

**National Aviation Authorities**

- **Joint Authorities for Rulemaking on Unmanned Systems (JARUS)**
  Brian C. Patterson

**National Business Aviation Association (NBAA)**

- NTSB Recommendation Project Team
  Jeffrey P. Mittelman

**Regional Airline Association**

- Flight Technology Committee
  Sean F. McCourt

**RTCA, Inc.**

- **RTCA Annual Symposium**
  Deborah A. Kirkman, CAASD Coordinator

- **Drone Advisory Committee (DAC)**
  Lillian Z. Ryals

- **Integration and Coordination Committee (ICC)**
  Robert A. Hekl

- **NextGen Advisory Committee (NAC)**
  Lillian Z. Ryals
Committee Participation

- NAC Advisory Subcommittee
  Dennis A. Sawyer

- NAC Policy Board
  Lillian Z. Ryals

- Program Management Committee (PMC)
  Christopher J. Hegarty, Chair

- Tactical Operations Committee (TOC)
  Douglas L. Molin
  - GPS Adjacent Band Compatibility Task Group
    Kelly R. Markin

- Wake Vortex Tiger Team
  Clark R. Lunsford

(See also RTCA, Inc., Standards Committee Memberships.)

SAE International

- Air Traffic Management Steering Committee
  Christopher J. Hegarty

Transportation Research Board (TRB)

- Airfield and Airspace Capacity and Delay (AV060)
  Marcus Smith

- Aviation Economics and Forecasting (AV040)
  Katherine T. Harback

- Aviation System Planning (AV020)
  Ehsan Esmaeilzadeh
  Michael T. Wells
Committee Participation

- Committee on Intergovernmental Relations in Aviation (AV010)
  - Commercial Space Transportation Subcommittee
    Cheryl R. Andrews
    Marcus Smith

- Common Performance Metrics for Airport Infrastructure and Operational Planning (ACRP 03-41)
  Marcus Smith

- Environmental Impacts of Aviation (AV030)
  Anuja A. Mahashabde

- NextGen—Understanding the Airport’s Role in Performance-Based Navigation (ACRP 03-34)
  Laurence F. Audenaerd, Review Panel Member

- Standing Committee on Aircraft/Airport Compatibility (AV070)
  Neal Westlund

- Standing Committee on Airfield and Airspace Capacity and Delay (AV060)
  Neal Westlund

- Standing Committee on Light Commercial and General Aviation (AV080)
  Neal Westlund

Transportation Research Forum (TRF)

- Chicago Chapter
  Laurence F. Audenaerd
Committee Participation

Women in Aerospace (WIA)

Elida C. Smith, Board of Directors
Emily K. Stelzer
STANDARDS COMMITTEE MEMBERSHIPS

ARINC Engineering Services (AES), LLC (Rockwell Collins, Inc.)

- Airlines Electronic Engineering Committee (AEEC)
    John C. Gonda III
  - Data Link (DLK) Systems Subcommittee
    Dongsong Zeng
  - Systems Architecture and Interfaces (SAI) Subcommittee
    John C. Gonda III
    William A. Miller
  - Flight Management Systems Subcommittee
    William A. Miller

ASTM International

- F38 Unmanned Aircraft Systems
  Francisco Box
  Matthew T. DeGarmo
  R. Michael Guterres
  Andrew R. Lacher
  Edward A. Lester
Committee Participation

European Organisation for Civil Aviation Equipment (EUROCAE)
- WG-62 GALILEO
  Christopher J. Hegarty

International Civil Aviation Organization (ICAO)
- Aeronautical Communications Panel Working Group I
  Dongsong Zeng
- Flight Operations Panel
  William A. Miller, Advisor
- Instrument Flight Procedures Panel (IFPP) Integration Working Group
  William A. Miller, Advisor
- Navigation Systems Panel
  Roland O. Lejeune

Leesburg Executive Airport Commission
  Caiolinn C. Ertel

National Academy of Sciences
- Aviation Safety Assurance Committee
  Craig R. Wanke

RTCA, Inc.
- RTCA/EUROCAE Forum on Aeronautical Software (FAS)
  John C. Angermayer
Committee Participation

- **SC-147 Traffic Alert & Collision Avoidance System (TCAS)**
  - Joseph M. Boyd
  - David J. Elliott
  - Edward A. Lester
  - Andrew D. Zeitlin

- **SC-159 Navigation Equipment Using the Global Navigation Satellite System (GNSS)**
  - Christopher J. Hegarty, Co-Chair
  - Kevin W. Bean
  - M. Bakry El-Arini
  - James P. Fernow
  - Roland O. Lejeune
  - Michael Tran

- **SC-186 Automatic Dependent Surveillance-Broadcast (ADS-B)**
  - Randall S. Bone, WG-1 Co-Chair
  - D. Stuart Bowman
  - David A. Domino
  - David J. Elliott
  - Stanley R. Jones
  - Raphael D. Katkin
  - Daniel B. Kirk
  - Brock J. Lascara
  - Edward A. Lester
  - Anand D. Mundra
  - William J. Penhallegon
  - Stephanie A. Priess
  - Hans P. Stassen
  - Robert C. Strain
  - Lesley A. Weitz

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Committee Participation

- **SC-206 Aeronautical Information Services and Meteorological Data Link Services**
  Laurence F. Audenaerd
  J. William Carson
  Izabela L. Gheorghisor
  Douglas Havens
  Brock J. Lascara
  Clark R. Lunsford
  Robert C. Strain
  Dongsong Zeng

  David A. Domino
  Mitchell L. Serber

- **SC-214 Standards for Air Traffic Data Communication Services**
  Randall S. Bone, Tiger Team Co-Chair
  Stephen L. Giles
  John C. Gonda III
  Daniel B. Kirk
  Dongsong Zeng, Subgroup Chair

- **SC-216 Aeronautical Systems Security**
  John C. Angermayer

- **SC-223 Internet Protocol Suite (IPS) and AeroMACS**
  Francis Box
  Izabela L. Gheorghisor
  Dongsong Zeng, Secretary
Committee Participation

- **SC-227 Standards of Navigation Performance**
  Michael R. Cramer
  William A. Miller, WG-3 Chair

- **SC-228 Minimum Operational Performance Standards for Unmanned Aircraft Systems**
  Donald S. Arnstein
  Francis Box
  Joseph M. Boyd
  Izabela L. Gheorghisor
  Leonid Globus
  R. Michael Guterres
  Edward A. Lester
  Kelly R. Markin
  Kyle R. Noth
  Brian C. Patterson
  Erin M. Sunshine

- **SC-230 Airborne Weather Detection Systems**
  Robert M. Avjian

- **SC-233 Addressing Human Factors/Pilot Interface Issues for Avionics**
  Valerie Gawron
ACADEMIC AND SPECIAL APPOINTMENTS

Teaching Positions

*DePaul University*

- Visiting Scholar
  Laurence F. Audenaerd

*Northwestern University*

- Adjunct Faculty
  Laurence F. Audenaerd

*George Washington University School of Engineering and Applied Science*

- National Advisory Council
  Andrew R. Lacher

*Queens University, Belfast, Northern Ireland*

- Visiting Professor in Remotely Piloted Aircraft Systems
  David R. Maroney

*State University of New York at Buffalo*

- Department of Mechanical and Aerospace Engineering, Faculty Advisory Board
  Lesley A. Weitz, Board Member
Courses Taught Through MITRE

Aviation System Block Upgrades (ASBU) Implementation Training, February 8–12, 2016, AEROTHAI, Bangkok, Thailand.

Decision Makers’ Methodology and Best Practices for Aviation System Block Upgrades (ASBU) Implementation Training, Scott L. Jacobs and Kent V. Hollinger, August 1–5, 2016, Singapore, Singapore Aviation Academy.


“SMS Audit,” April 15, 2016, October 21, 2016, McLean, VA.

“SMS II,” April 12–14, 2016, October 18–20, 2016, McLean, VA.

“SMS Principles,” March 14–18, 2016, ABX Air, Inc., Wilmington, OH.

“SMS II,” April 5–7, 2016, Skywest Airlines, Salt Lake City, UT.

“SMS Audit,” April 8, 2016, Skywest Airlines, Salt Lake City, UT.
Academic and Special Appointments

“SMS Overview,” April 18–19, ASERTEC, Monterrey, Mexico

“SMS Gap Analysis,” June 13–15, ASERTEC, Monterrey, Mexico

“SMS Gap Analysis,” June 17, ASERTEC, Toluca, Mexico


Other Courses Taught


“Simulation Applications in Training,” Valerie Gawron, presented for the Flight and Ground Vehicle Simulation Update, January 18, 2016, Binghamton University, Binghamton, NY.
Special Appointments

Virginia Unmanned Systems Commission, **David G. Hamrick**, appointed by Governor Terry McAuliffe.

American Institute of Aeronautics & Astronautics, Inc.

- *Journal of Aerospace Information Systems*
  Craig R. Wanke, Reviewer

- *Journal of Air Transportation*
  Scott H. Mills
  Glenn F. Roberts, Associate Editor
  Craig R. Wanke, Associate Editor
  Lesley A. Weitz, Reviewer

- *Journal of Aircraft*
  Craig R. Wanke, Reviewer

- *Journal of Guidance, Control, and Dynamics*
  Shin-Lai Tien, Reviewer
  Craig R. Wanke, Reviewer
  Lesley A. Weitz, Reviewer

- *Air Traffic Control Association: Air Traffic Control Quarterly*
  Glenn F. Roberts, Editorial Board
  Craig R. Wanke, Reviewer
  R. Michael Guterres, Reviewer

- *Canadian Journal of Civil Engineering*
  Panta Lucic, Reviewer
Book and Journal Editors and Reviewers

- *Ergonomics in Design: The Quarterly of Human Factors Applications*
  Valerie Gawron, Editorial Board

- *European Journal of Operational Research*
  Panta Lucic, Reviewer
  Craig R. Wanke, Reviewer

  Christopher J. Hegarty, Co-series Editor

- *Institute of Electrical and Electronics Engineers*
  - *Aerospace and Electronics Systems*
    R. Michael Guterres, Reviewer
  - *Transactions on Aerospace and Electronic Systems*
    Young C. Lee, Associate Editor
  - *Transactions on Communications*
    Donald S. Arnstein, Reviewer
  - *Transactions on Intelligent Transportation Systems*
    Craig R. Wanke, Reviewer

- *International Journal of Aviation Psychology*
  Valerie Gawron, Domain Editor
  Emily K. Stelzer, Reviewer

- *Journal of Aerospace Operations*
  Shin-Lai Tien, Reviewer

- *Journal of Navigation* (Royal Institute of Navigation)
  Christopher J. Hegarty, Editorial Advisory Board
Book and Journal Editors and Reviewers

- *Journal of the Transportation Research Board*
  Laurence F. Audenaerd, Reviewer

- *Journal of the Transportation Research Forum*
  Laurence F. Audenaerd, Reviewer

- *NAVIGATION: Journal of the Institute of Navigation*
  Christopher J. Hegarty, Associate Editor
  Young C. Lee, Reviewer
MITRE’s Technology Transfer Office works with staff members to ensure that the benefits of their innovations reach the largest possible user base. We share our innovations with sponsoring as well as non-sponsoring agencies. In many situations, it benefits our sponsors to make our knowledge and intellectual property more readily available to a broader audience. We do this through publications, open source contributions, and relationships with industry and other research partners.

We also transfer our technologies to commercial organizations when appropriate so that they can undertake the technical, business, and manufacturing activities necessary to bring products and services incorporating our intellectual property to market. As product development is not part of our mission, commercialization may be the only viable transfer mechanism to bring commercial products that are accessible, affordable, and supported to our sponsors.

Technology transfer provides government organizations with new capabilities. It also helps MITRE achieve its mission to advance technology and return value to the nation’s economy. Furthermore, it enhances U.S. competitiveness in the world market.
Here is a list of recent technologies and capabilities developed in CAASD that were transferred in 2015-2016 or are in the process of being transitioned currently.

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<th>Technology</th>
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PHOTO LEGEND
Back interior cover includes photos of CAASD staff participating in various conferences, meetings, showcases, and industry events over the course of 2016.