Creating the Future of Aviation

Technical and Professional Activities 2014

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The MITRE Corporation
Center for Advanced Aviation System Development
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Introduction

I am pleased to introduce our fifteenth annual compendium of the Center for Advanced Aviation System Development (CAASD’s) technical and professional accomplishments. This book documents the significant outreach and collaboration demonstrated by The MITRE Corporation (MITRE) staff in support of our mission of advancing the safety, security, effectiveness, and efficiency of global aviation.

Delivery of the highest quality technical products has always been the hallmark of MITRE’s work. The advanced concepts, analyses, techniques, and technical results cataloged here provide the critical underpinnings that the Federal Aviation Administration (FAA) and global air navigation service providers rely on to help drive capability development and inform decision making. We publish and present extensively in order to garner constructive feedback, to enhance these capabilities, and to gain new perspectives.

Our staff thrive on intellectual challenges and the opportunity to innovate. The aviation community is facing many challenges: integration of unmanned and commercial space vehicles, human/systems integration, agile development and fielding of new capabilities, and increased reliance on automation and autonomy, to name just a few. The papers, patents, awards, and other technical contributions documented here are a testament to the innovative spirit of our staff.
Also documented in these pages is the diversity of our staff and capabilities. Our products leverage a broad range of operational experience and technical depth. Our staff include engineers, scientists, pilots, controllers, traffic managers, former airline and military personnel, and more. We leverage a diverse set of technical strengths in engineering, computer science, operations research, human factors, economics, communications, and more.

We understand that the success of the FAA’s Next Generation Air Transportation System (NextGen) requires that new concepts and technologies be evaluated to ensure they meet technical and operational needs and have an implementation path for delivery of benefits. To that end, we actively manage the transition of our research and technology to industry and community stakeholders to ensure the realization of end-user benefits.

MITRE staff inspire us with innovative ideas for future aviation capabilities and by applying technical and operational rigor to ensure their viability. The contributions and achievements documented here highlight the critical role that MITRE staff are playing in making these advancements a reality.

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


[38] “Comparative Fuel Burn Analysis for Geometric versus Economy Descent Profiles,” Thomas B. Hudak II and Matthew Pollock. Presented at the CNS Taskforce, December 5, 2014, St. Petersburg, FL.


WEBINARS


Honors and Awards

SPECIAL HONORS AND RECOGNITION


[97] The Institute of Navigation Distinguished Service Award was presented to Ronald Braff at the Institution of Navigation International Technical Meeting, January 2014.

[98] Modern-Day Technology Leader Award presented to Prakash Subramanian during the 28th Black Engineer of the Year Award Science, Technology, Engineering and Math Conference, February 2014.

[99] The Indian Minister of Transportation made a presentation and recognized MITRE’s contributions in helping make the GAGAN (GPS-Aided GEO-Augmented Navigation System) program a success. This presentation was during the opening ceremonies of the ICAO Ionospheric Study Task Force, February 2014.
RTCA’s Achievement Award was presented to Christopher J. Hegarty for his contributions to the successful accomplishment of RTCA’s mission and support of the aviation community at the 2014 Global Aviation Symposium, June 2014.


The Federal Aviation Administration presented an award to Clevin L. Weekes for his contributions to Aviation Education during the 2013 National Black Coalition of Aviation Employees/Organization of Black Aerospace Professionals Annual Aviation Career Education (ACE) Academy event, June 2014.

Craig R. Wanke was elected to the grade of Associate Fellow by the American Institute of Aeronautics and Astronautics (AIAA), October 2014.
BEST PAPER AWARDS


[111] Air Traffic Management Track paper “Paired Approaches to Closely Spaced Parallel Runways: Results of Real Time Pilot and ATC Simulations,” by David A. Domino was chosen to be presented as a poster sized summary displayed as a “coming attraction” at the 33rd Digital Avionics Systems Conference, October 2014.
LETTERS OF COMMENDATION

[112] From the Federal Aviation Administration in appreciation for Thomas B. Hudak II’s support of the follow-on project to Greener Skies referred to as Performance Based Navigation Initiatives in Atlanta, February 2014.

[113] From the Federal Aviation Administration in appreciation of Justin A. Ferrante for the exceptional service he provided ahead of the scrub conducted for a Human-in-the-Loop to explore the adaptation and use of Adjacent Center Metering between Houston, Fort Worth and Memphis ARTCCs, March 2014.


[116] From the Women’s Transportation Seminar – Greater Chicago Chapter in appreciation of Laurence F. Audenaerds’ contributions to the advancement of women in Science, Technology, Engineering and Math education, May 2014.
[117] From the American Institute of Aeronautics and Astronautics (AIAA) in appreciation of Glenn F. Roberts participation as a plenary panel moderator during the 2014 AIAA Aviation and Aeronautics Forum, June 2014.

[118] From the American Institute of Aeronautics and Astronautics (AIAA) in appreciation of David R. Maroney for serving as a member of the Executive Steering Committee as well as the General Chair for the 2014 AIAA Aviation and Aeronautics Forum, June 2014.

[119] From the Organization of Black Aerospace Professionals and the National Black Coalition of Federal Aviation Employees in appreciation for the MITRE teams’ hospitality during the ACE Academy event, June 2014.

[120] From the Federal Aviation Administration in appreciation for David G. Hamricks’ continued support of the FAA Unmanned Aircraft Systems Aviation Rulemaking Committee, June 2014.

[121] From the Federal Aviation Administration in appreciation of Ralf H. Mayer’s support, wisdom, and pioneering spirit for the Atlanta TRACON, September 2014.

[122] From Frontier Airlines in appreciation for Catherine E. Coslick’s introduction to the ASIAS program Portal for their new ASAP manager, September 2014.
[123] From the Federal Aviation Administration in appreciation of Shane Miller Swift’s efforts in support of the NextGen Integration Working Group, October 2014.

[124] From the Massachusetts Institute of Technology Lincoln Laboratory in appreciation of Marshall E. Koch’s presentation of the various mitigation approaches on terminal wake, November 2014.

[125] From the Federal Aviation Administration (FAA) in appreciation of the CAASD team in supporting FAA’s system-wide modeling efforts, December 2014.

PATENTS AWARDED


PATENT APPLICATIONS FILED

Professional Societies

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

ASSOCIATE FELLOWS

■ American Institute of Aeronautics and Astronautics (AIAA)
  Thomas A. Becher
  Valerie Gawron
  John C. Gonda III
  Christopher J. Hegarty
  Andrew R. Lacher
  Wesley B. Link
  David R. Maroney
  Sebastian V. Massimini
  Satish C. Mohleji
  Stephane L. Mondoloni
  Glenn F. Roberts
  Craig R. Wanke
  Andrew D. Zeitlin
MEMBERSHIPS

The Advanced Computing Systems Association (System Administration) (USENIX)
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)
American Society for Quality (ASQ)
American Society of Safety Engineers (ASSE)
American Statistical Association (ASA)
Association for Aviation Psychology (AAP)
Association for Computing Machinery (ACM)
Association for Enterprise Information (AFEI)
The Association for Operations Management (APICS)
Association for Unmanned Vehicle Systems International (AUVSI)
Certified Consulting Meteorologist (CCM)
Certified Information Systems Security Professional (CISSP)
Cybersecurity and Cyberforensics Association of Northern Virginia Community College
Federal Aviation Administration Managers Association (FAAMA)
Guild of Air Traffic Control Officers (GATCO)
Human Factors and Ergonomics Society (HFES)
Information Systems Audit & Control Association (ICACA)
Institute for Operations Research and the Management Sciences (INFORMS)
Institute of Electrical and Electronics Engineers (IEEE)
  • Communications Society (IEEE COMSOC)
  • Computer Society (IEEE CS)
  • Control Systems Society (IEEE CSS)
  • Industrial Electronics Society (IEEE IES)
  • Industry Applications Society (IEEE IAS)
  • Women in Engineering (IEEE WIE)
Institute of Navigation (ION)
International Air Transport Association (IATA)
International Council on Systems Engineering (INCOSE)
International Federation for Automatic Control (IFAC)
International Institute of Forecasters (IIF)
International Society of Air Safety Investigators (ISASI)
International Union of Radio Science (URSI)
National Air Traffic Controllers Association (NATCA)
National Black MBA Association (NBMBAA)
National Society of Black Engineers (NSBE)
Project Management Institute (PMI)
Royal Aeronautical Society (RAeS)
Royal Institute of Navigation (RIN)
Society for the Advancement of Material and Process Engineering (SAMPE)
Society for Industrial and Applied Mathematics (SIAM)
Society of Automotive Engineers (SAE)
Society of Women Engineers (SWE)
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)
Women in Aerospace (WIA)
Women in Aviation, International (WAI)
Women Military Aviators (WMA)
HONOR SOCIETIES
Beta Gamma Sigma (Business)
Delta Mu Delta (International Business)
Eta Kappa Nu (Electrical and Computer Engineers)
Omega Rho (International Operations Research)
Phi Beta Kappa (Liberal Arts and Sciences)
Sigma Pi Sigma (Physics)
Sigma Xi (Scientific Research)
Tau Beta Pi (Engineering)

USERS GROUPS
Airline Group of the International Federation of Operations Research Societies (AGIFORS)
AirTOp User Group (AUG)
Americas/Pacific Rim TAAM User’s Group (APTUG)
BADA Users Group (BUG)
Large Installation System Administration Special Interest Group (LISA)
Special Interest Group on Computer Human Interaction (SIGCHI)
Worldwide TAAM Users’ Group (WWTUG)
TECHNICAL COMMITTEE MEMBERSHIPS

Aerospace Systems Design Lab of Georgia Tech School of Aerospace Engineering

■ Civil Aviation Research Division (CARD) Technical Advisory Board
  Katherine T. Harback

Air Traffic Control Association

■ Aviation Cyber Security Day Planning Committee
  Anthony Rood
  Joseph M. Veoni

American Institute of Aeronautics and Astronautics (AIAA)

■ Integrated Communications, Navigation, and Surveillance Conference (ICNS) Executive Committee
  John C. Gonda III
American Institute of Aeronautics and Astronautics (AIAA) (continued)

Program Committees

- **ATIO Conference Program Committee**
  Satish C. Mohleji

- **AVIATION 2014 Conference Executive Committee**
  David R. Maroney, General Chair

- **Unmanned Systems**
  David R. Maroney

Standing Committees

- **Emerging Technologies Committee**
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- **Corporate Member Committee**
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- **Aircraft and Atmospheric Systems Group**
  David R. Maroney, Deputy Director
  Satish C. Mohleji, Deputy Director Aircraft Operations

- **New Initiatives Subcommittee**
  Satish C. Mohleji

Technical Committees

- **Air Transportation Systems (ATS)**
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  David R. Maroney, Emeritus Member

- **Digital Avionics**
  John C. Gonda III, Emeritus Member

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

- Policy Board
  Lillian Z. Ryals

- Program Management Committee
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- Tactical Operations Committee
  Douglas L. Molin
  • NOTAM Subgroup
    Ezra D. Jalleta

- NextGen Advisory Committee (NAC)
  Lillian Z. Ryals

- NextGen Advisory Subcommittee (NAC SC)
  Urmila C. Hiremath

(See also RTCA, Inc. Standards Committee Memberships)

American Association of Airport Executives

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American Meteorological Society
- Aviation, Range and Aerospace Meteorology (ARAM)
  Matthew J. Fronzak

Civil Air Navigation Services Organization (CANSO)
- Environmental Working Group
  Katherine T. Harback
- Operations Standing Committee
  Bruce E. Killian, ASBU Chair

Department of Homeland Security
- Robotic Aircraft for Public Safety (RAPS) Steering Group
  Andrew R. Lacher

Federal Aviation Administration
- 1090 MHz Spectrum Risk Assessment Team
  Stanley R. Jones
- Advanced Interval Management and Dynamic Required Navigation Focus Groups
  John C. Gonda III
- ASCENT Center of Excellence for Alternative Jet Fuels and Environment Advisory Committee
  Katherine T. Harback
- Environmental Reengineering Work Group
  Fred B. Bankert

- FAA/EUROCONTROL ATM R&D Seminar
  Craig R. Wanke

- 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

- Joint-Industry ADS-B Implementation Work Group
  Jeffrey P. Mittelman

- NextGen Air to Ground Enhanced Operational Capability (AGEOC) Capture Team
  John C. Gonda III

- Performance Based Operations Aviation Rulemaking Committee (PARC)
  Michael R. Cramer
  J. Jeffrey Formosa
Federal Aviation Administration (continued)

- Research, Engineering and Development Advisory Committee (REDAE)
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  - REDAC Human Factors Subcommittee
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  - REDAC NAS Operations Subcommittee
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- Unmanned Aircraft System (UAS) Aviation Rulemaking Committee (ARC)
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- Aerospace Systems Technical Group
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  David A. Domino
  Kathleen A. McGarry Peterson
  Scott H. Mills
  Peter M. Moertl

International Society of Air Safety Investigators (ISASI)

- Human Factors Working Group
  Mitchell L. Serber, Chair
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

- Remote Sensing Systems (WP 7C)
  Michael Tran

Mineta Transportation Institute
Seli J. Agbolosu-Amison

National Academy of Sciences

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- Committee on Autonomy Research for Civil Aviation
  Andrew R. Lacher

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- Flight Technology Committee
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- Air Traffic Management Steering Committee
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  Marcus Smith

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- Aviation Security and Emergency Management (AV090)
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- Aviation System Planning (AV020)
  Ehsan Esmaeilzadeh

- Committee on Intergovernmental Relations in Aviation (AV010)
  Commercial Space Transportation Sub-committee
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- Environmental Impacts of Aviation (AV030)
  Anuja A. Mahashabde
Transportation Research Forum

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University of California, Davis

- Aviation Noise and Air Quality Symposium Planning Committee
  Fred B. Bankert

Women in Aerospace (WIA)

Elida C. Smith, Board Member
STANDARDS COMMITTEE MEMBERSHIPS

Aerospace Industries Association

- Unmanned Aircraft Systems Committee
  R. Michael Guterres

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

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

ASTM International

- F38 Unmanned Aircraft Systems
  Francis Box
  R. Michael Guterres

The European Organisation for Civil Aviation Equipment

- EUROCAE: WG-62 Galileo
  Christopher J. Hegarty
International Civil Aviation Organization (ICAO)

- Aeronautical Communications Panel Working Group F
  Francis Box

- Air Traffic Management Requirements and Performance Panel
  Stephane L. Mondoloni

- Navigation Systems Panel
  Roland O. Lejeune

- Performance Based Operations Study Group
  William A. Miller

Leesburg Executive Airport Commission
Stephen H. Axeman

RTCA, Inc.

- RTCA/EUROCAE Forum on Aeronautical Software (FAS)
  John C. Angermayer

- SC-147 Traffic Alert & Collision Avoidance System (TCAS)
  Joseph M. Boyd
  Matthew T. DeGarmo
  Andrew D. Zeitlin

- SC-159 Global Positioning System (GPS)
  Christopher J. Hegarty, Co-Chair
  Kevin W. Bean
  M. Bakry El-Arini
  Roland O. Lejeune
  Michael Tran
RTCA, Inc. (continued)

- **SC-186 Automatic Dependent Surveillance-Broadcast (ADS-B)**
  
  Randall S. Bone
  D. Stuart Bowman
  David A. Domino
  Robert R. Eftekari
  David J. Elliott
  Nienke R. Jester-ten Veen
  Stanley R. Jones
  Raphael D. Katkin
  Brock J. Lascara
  Kara J. MacWilliams
  Peter M. Moertl
  Anand D. Mundra
  Hans P. Stassen
  Robert C. Strain
  Lesley A. Weitz

- **SC-206 Aeronautical Information Services (AIS) and Meteorological Data Link Services**
  
  Laurence F. Audenaerd
  John W. Carson
  Izabela L. Gheorghisor
  Douglas Havens
  Brock J. Lascara
  Clark R. Lunsford

  
  David A. Domino
  Mitchell L. Serber
- **SC-214 Standards for Air Traffic Data Communication Services**
  Randall S. Bone
  Stephen L. Giles
  John C. Gonda III
  Dongsong Zeng

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

- **SC-223 Aeronautical Mobile Airport Communication System (AeroMACS)**
  Francis Box
  Izabela L. Gheorghisor

- **SC-227 Standards of Navigation Performance**
  D. Stuart Bowman
  Michael R. Cramer
  William A. Miller

- **SC-228 Minimum Operational Performance Standards for Unmanned Aircraft Systems**
  Francis Box
  Stephen P. Cook
  Matthew T. DeGarmo
  Izabela L. Gheorghisor
  Leonid Globus
  R. Michael Guterres
  Edward A. Lester
  Alexe E. Leu
  Kara J. MacWilliams
  David R. Maroney
  Kyle R. Noth
  Brian C. Patterson
  Erin M. Sunshine
Academic and Teaching Appointments

Aviation Week Young Professionals’ Advisory Board

■ Panel Member
   Elida C. Smith

DePaul University

■ Visiting Scholar
   Laurence F. Audenaerd

Northwestern University

■ Adjunct Faculty
   Laurence F. Audenaerd

The George Washington University
School of Engineering and Applied Science

■ National Advisory Council
   Andrew R. Lacher

State University of New York at Buffalo

■ Department of Mechanical and Aerospace Engineering, Faculty Advisory Board
   Lesley A. Weitz, Board Member
COURSES TAUGHT

“Air Traffic Management Executive Training (ATMET) VI: Planning and Implementing the Future Air Traffic Control System,” May 27–June 9, 2014; Reston, VA.


“Safety Management Systems Audit,” January 29, 2014; Savannah, GA.

“Safety Management Systems Audit,” April 11, 2014, and October 24, 2014; McLean, VA.


“Safety Management Systems Principles,” March 10–14, 2014; May 12-16, 2014; July 14–18, 2014; September 15–19, 2014; and December 8–12, 2014; McLean, VA.


American Institute of Aeronautics and Astronautics (AIAA)

- *Journal of Aerospace Information Systems*
  Marco Enriquez, Reviewer
  Shin-Lai Tien, Reviewer
  Craig R. Wanke, Reviewer

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

- *Journal of Guidance, Control, and Dynamics*
  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

ACTA Press Communications Journal
Leone C. Monticone, Co-Editor-in-Chief

Canadian Journal of Civil Engineering
Panta Lucic, Reviewer

Ergonomics in Design: The Quarterly of Human Factors Applications
Valerie Gawron, Editorial Board
■ European Journal of Operations Research
   Panta Lucic, Reviewer
   Craig R. Wanke

   Christopher J. Hegarty, Co-series Editor

■ Institute of Electrical and Electronics Engineers
   • Transactions for Aerospace and Electronic Systems
     Young C. Lee, Associate Editor
   • Transactions on Intelligent Transportation Systems
     Craig R. Wanke, Reviewer

■ International Journal of Aviation Psychology
   Valerie Gawron, Consulting Editor

■ Journal of Navigation (Royal Institute of Navigation)
   Christopher J. Hegarty, Editorial Advisory Board

■ NAVIGATION: Journal of the Institute of Navigation
   Christopher J. Hegarty, Associate Editor

■ Society of Industrial and Applied Mathematics [SIAM] Undergraduate Research Online Journal (SIURO)
   Marco Enriquez, Associate Editor
Journal of the Transportation Research Board
Laurence F. Audenaerd, Reviewer

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