



AOSP Newsletter

Airspace Operations and Safety Program (AOSP)

APR-JUN 2018 | Quarter 3



ATD-2 Evaluation Requirements 5
Freeze 2 Meeting

ATD-2 Completes FAA Safety Risk 17
Management Review for Phase 2
Field Demo

AOSP IN THE NEWS

[Parimal Kopardekar: FAA, NASA teaming up on drone research](#)

Federal News Radio (4/03) reports the FAA and NASA are deep into research on how drones will operate safely in U.S. airspace. Parimal Kopardekar, senior technologist for air transportation systems at NASA, spoke about it on Federal Drive with Tom Temin.

[Research Group Field-Test the Future of Transportation, on the Ground and in the Air](#)

WVNS-TV (4/25) reports the tests were part of the latest iteration of NASA's Unmanned Aircraft System (UAS) Traffic Management (UTM) research program, which is developing and testing technology designed to allow unmanned aircraft to share airspace safely and efficiently, with each other as well as with manned air traffic - and ground transportation.

[10 Drone Programs Get Federal OK To Break The Rules](#)

Nextgov (5/10) reports the partnership between Virginia's Innovation and Entrepreneurship Investment Authority, Virginia Tech and NASA will also focus on package delivery in both rural and urban areas. The tests will gauge progress on new technologies for detecting and avoiding obstacles—such as other drones—identification and tracking and mapping systems, as well as cybersecurity.

[NASA and Uber Sign Second Agreement to Develop Urban Air Transportation](#)

Interesting Engineering (5/10) reports that US space agency NASA released a statement on Tuesday announcing a second space act partnership with peer-to-peer ridesharing, food delivery, and transportation network company Uber to explore the safe and efficient implementation of an air transportation system for crowded urban areas. The system is part of NASA's urban air mobility (UAM) program.

[Here's What's Needed for Self-Flying Taxis and Delivery Drones to Really Take Off](#)

Scientific American (5/15) reports NASA is developing a UAS Traffic Management (UTM) network with several other organizations that the group plans to finish testing next year. Uber, in particular, has a lot riding on the UTM's success—the ride-sharing company made several announcements last week to promote its proposed uberAIR taxi service.

[Flying taxis BREAKTHROUGH: NASA and Uber sign deal for future of city travel](#)

Express (5/23) reports Uber is now planning on working with NASA to “explore concepts and technologies related to urban air mobility (UAM) to ensure a safe and efficient system for future air transportation in populated areas”. Jaiwon Shin, associate administrator for NASA's Aeronautics Research Mission Directorate, said: “NASA is excited to be partnering with Uber and others in the community to identify the key challenges facing the UAM market, and explore necessary research, development and testing requirements to address those challenges.

AOSP IN THE NEWS

[Building Flying Cars Is Less Complicated Than Figuring Out Traffic Control For Them](#)

Motherboard Vice (6/09) reports NASA is developing an air-traffic control framework that could track unmanned flying cars that fly under 500 feet. As reported in Skift, the NASA system is meant to be automated. It plans to finish its research by 2019, and hand over ideas for the FAA to implement no later than 2025.

[How NASA is creating air traffic control for drones](#)

CNET (US) (6/19) reports that, by 2022, the FAA predicts there could be 3 million drones. NASA is in the final testing stages of developing a system to integrate drones into the national airspace.

TECHNICAL AND PROGRAMMATIC HIGHLIGHTS

Media Day and Facebook Live Events Highlight UTM Project's TCL 3 Test Completion

POC: [RON JOHNSON](#)

Special media events took place following the completion of the Unmanned Aircraft System (UAS) Traffic Management (UTM) Project's Technical Capability Level 3 (TCL 3) test this quarter. On June 6, a media day was held in the airspace operations laboratory at NASA's Ames Research Center in California to showcase the recently completed TCL 3 testing that took place at six FAA UAS Test Sites (Nevada,

Alaska, North Dakota, New York, Virginia, and Texas) around the country. The testing, directed by the UTM project during the March through May period, investigated several aspects of the UTM system operation and UAS technologies, including communication and navigation in degraded environments, sensing and avoiding manned and unmanned aircraft, data exchange for nominal and off-nominal conditions, and a Concept of Operations for contingencies and priority operations such as public safety. The UTM project members, representatives from the six UAS Test Sites, and

two industry partners, Amazon Prime Air and SkySkopes, gave presentations. Television stations and internet news organizations attended the event. Links to videos of the media coverage are included below.

NTD Television SF Bay Area:
<http://www.ntdtv.com/xtr/b5/2018/06/07/a1378808.html>

KNTV (NBC): Amazon Delivery Drones Might be Coming Soon
<https://www.nbcbayarea.com/news/local/Amazon-Delivery-Drones-Might-be-Coming-Soon-484789181.html>



Ron Johnson, NASA (left), and Robert Champagne, Amazon Prime Air (right), brief the media on recently concluded testing of TCL 3.



Joey Rios (left) and Arwa Aweiss (right) present the UTM concept and specifics of how it was tested for a Facebook Live audience.

Following the Media Day event, a Facebook Live event was held in the airspace operations laboratory on June 26 to again showcase the recently completed TCL 3 testing that took place around the country. The event was directed by the Ames Public Affairs Office. UTM Chief Engineer Joseph Rios and Flight Director Arwa Aweiss gave presentations that described the UTM concept and provided details of the TCL 3 testing. The link to the video is below. The video has been viewed over 100K times.

<https://www.facebook.com/nasaames/videos/10155246534951394/>

TECHNICAL AND PROGRAMMATIC HIGHLIGHTS

NASA ATD-2 Team Briefs at Transportation Research Board Webinar

POC: [AL CAPPS](#)

On April 2, the NASA Airspace Technology Demonstration 2 (ATD-2) Team gave a remote briefing as part of the Transportation Research Board Webinar titled The Future of Airport Surface Management Tools and Benefits to Operational Efficiency. One hundred and seventy participants from a variety of domestic and international airports, air carriers, universities, aviation companies, and government organizations attended the event. The webinar objectives were to understand the capabilities and industry usage of existing tools, identify evolving capabilities and future integration plans to enable surface metering, and define airport and airline roles in surface management. Presentations included briefings on the ATD-2 Integrated Arrival/Departure/Surface (IADS) system, existing surface management tools employed at the Port Authority of New York and New Jersey airports, use of existing tools to support Collaborative Decision Making (CDM) partnerships, and implementation of the FAA's Terminal Flight Data Manager and System Wide Information Management. The ATD-2 briefing included an overview of the ATD-2 project, Surface-Collaborative Decision Making principles

used in the IADS system, data exchange, and integration features that facilitate collaboration among participating operational facilities, and early benefits assessment. The NASA ATD-2 team expressed appreciation for the opportunity to provide outreach to a broader group of stakeholders, and participants actively engaged in the question-and-answer session that followed the briefings.

ATD-2 Evaluation Requirements Freeze 2 Meeting

POC: [SHIVANJLI SHARMA](#)

On April 5, NASA's Airspace Technology Demonstration 2 (ATD-2) Team conducted an Evaluation Requirements Freeze 2 (FRZ2) meeting with Field Demo Partners and other stakeholders to gain concurrence on capabilities to be included in the Phase 2 Field Demo, which is targeted for the end of September 2018. The FRZ2 meeting took place at the Old Terminal Building at Charlotte Douglas International Airport (CLT), where NASA's ATD-2

laboratory is located. The FRZ2 meeting involved FAA participants from Washington Air Route Traffic Control Center (ARTCC), Charlotte Air Traffic Control Tower/Terminal Radar Approach Control Center, and Headquarters organizations National Airspace Systems Engineering and Integrations Office (ANG) and the Mission Support (AJV). Other participants included the Director of Portfolio Management & Technology Development (ANG-C), American Airlines (AAL) operations management personnel, AAL CLT ramp managers, and members of the National Air Traffic Controllers Association. The Field Demo Partners presented a status update on the ATD-2 Phase 1 Field Demo plans, followed by a discussion of the capabilities to be included in the Phase 2 Field Demo. The Phase 2 Field Demo will include Electronic Flight Data exchange by integrating the ATD-2 system with the FAA's Advanced Electronic Flight Strip prototype system, expanded data-sharing capabilities with air carriers and flight operators using



Field Demo Partners received updates on ATD-2 Phase 1 and Phase 2 Field Demo plans.

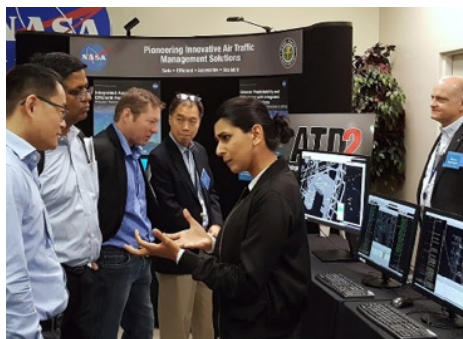
TECHNICAL AND PROGRAMMATIC HIGHLIGHTS

a prototype of the FAA's Terminal Flight Data Management (TFDM) Terminal Publication System Wide Information Management feed and mobile application, strategic and tactical surface scheduling fusion, and the extended use of electronic overhead stream insertion to Atlanta ARTCC. The presentation also addressed plans to test these capabilities in a Human-in-the-Loop simulation and discussed leveraging operational data to develop benefit metrics to improve the ATD-2 system. The Field Demo Partners expressed concurrence with the ATD-2 Phase 2 Field Demo plans. The FRZ2 meeting concluded with information about NASA's technology transfer strategy.

AOSP R&D Partnership Workshop

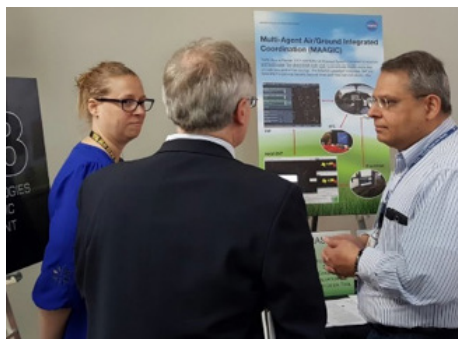
POC: [PARIMAL KOPARDEKAR](#)

NASA's Airspace Operations and Safety Program (AOSP) hosted



Workshop attendees were able to see the current system being used in the Phase 1 Field Demonstration at CLT (left) as well as ATD-3 concept animations (right).

a Research & Development Partnership Workshop at NASA's Ames Research Center in California from April 10 through 12. The purpose of the workshop was to develop new relationships for NASA research activities. In addition to NASA participants, more than 200 people attended the workshop, with 154 attendees from industry. Each project co-moderated breakout sessions with industry representatives. Industry was invited to meet with NASA to discuss the future of the National Airspace System, specifically how to accommodate a diverse mix of airspace users while maintaining highly efficient, safe, predictable, agile, and affordable airspace operation systems. The workshop started with an overview of AOSP, the Airspace Technology Demonstration project, the Unmanned Aircraft System Traffic Management project, the Air Traffic Management – eXploration



project, and the System-Wide Safety project. Breakout sessions focused on a variety of topics specific to each project were held with moderators that included project leads and current industry partners. The last day of the workshop included tours of various air traffic management research facilities and technology demonstrations.

ATD-2 Begins Shadow Sessions with Phase 3 Field Demo Partners in North Texas

POC: [ERIC CHEVALLEY](#)

NASA met with Field Demo Partners of the Airspace Technology Demonstration 2 (ATD-2) Phase 3 effort on April 10 and 12. The first meeting took place at Southwest Airlines (SWA) headquarters in Dallas, Texas. SWA is the primary air carrier partner at Dallas Love Field airport, and co-lead with American Airlines (AAL) in the ATD-2 Phase 3 field demonstration. The NASA team introduced the ATD-2 concept to SWA, and participants discussed near- and mid-term objectives and next steps in the joint venture. The NASA team toured SWA's Network Operations Control Center. The second Field Demo Partner meeting took place at the Dallas-Fort Worth International Airport (DFW) board facilities. DFW performs ramp management functions for two of the five terminals, Terminal E and

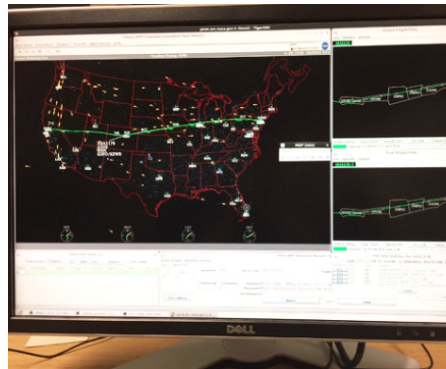
TECHNICAL AND PROGRAMMATIC HIGHLIGHTS

a portion of Terminal D, which the NASA team visited. The other three terminal ramp operations are managed by AAL. DFW personnel introduced the NASA team to the terminal operations at their facility and discussed potential areas where ATD-2 technology may help them. The Field Demo Partners expressed strong interest in ATD-2 capability and in beginning a collaborative development process with NASA. A follow-up meeting will take place at the NASA North Texas facility to introduce the Ramp Traffic Console capability and obtain initial feedback from participants. The NASA team plans to meet regularly with all North Texas Field Demo Partners to develop the Integrated Arrival/Departure/Surface system terminal departure capability and technology using the agile requirements identification process from ATD-2 Phases 1 and 2.

ATD-3 Alaska Airlines System Operations Control Visit

POC: [MIWA HAYASHI](#)

On April 13, Miwa Hayashi, Human Factors lead for the ground-side system of the Multi-Agent Air/Ground Integrated Coordination (MAAGIC) effort, visited the Alaska Airlines (ASA) System Operations Control (SOC) center at the Seattle-Tacoma Airport in Washington. During the visit,



A live National Airspace System Constraint Evaluation and Notification Tool display available at the Air Traffic Control Coordinator's desk at Alaska Airlines.

Hayashi observed the activities of ASA dispatchers to understand how the National Airspace System Constraint Evaluation and Notification Tool, the ground-side system of MAAGIC, would function in the SOC. The ASA SOC houses 11 dispatcher desks and one air traffic control (ATC) Coordinator Chief desk. The ATC Coordinator Chief monitors the FAA telecons and overall weather development to anticipate any potential problems and assist the dispatchers accordingly. Each ASA dispatcher monitors 30 to 45 flights during a 10-hour shift, with up to 20 flights at any given time. About one and a half hours before a flight departs the gate, the dispatcher assesses weather, airport and airspace restrictions, and required fuel, including considerations for possible rerouting. The dispatcher

sends a release document to the flight's Captain, which must be signed by the dispatcher and the Captain for a Part 121 flight to operate. While the flight is en route, the dispatcher monitors for updates and informs the pilots accordingly via electronic messages in the Aircraft Communication and Reporting System, and the pilots send the dispatcher any updates (e.g., ATC reroute). On April 13th, the Midwest region experienced severe weather, and several Ground Delay Programs, as well as Playbook routes, were in effect.

German Aerospace Center Personnel Visit Ames Research Center

POC: [DAVID THIPPHAVONG](#)

Jürgen Rataj, head of Controller Assistance at the German Aerospace Center in Braunschweig, Germany, visited NASA's Ames Research Center in California from April 13 through 16 to talk with NASA researchers. Discussions included an overview of air traffic management research within NASA's Airspace Operations and Safety Program, and topics such as disruption management and potential approaches to congestion management of Urban Air Mobility arrival traffic near vertiports. The group also discussed conventional unmanned air transport, with

TECHNICAL AND PROGRAMMATIC HIGHLIGHTS

the focus on developing more automated integrated air and ground operations. All parties planned to conduct follow-on meetings to further discussions towards defining new areas of collaboration.

Testbed System Check with Boeing B777 ecoDemonstrator 2018

POC: [KEE PALOPO](#)

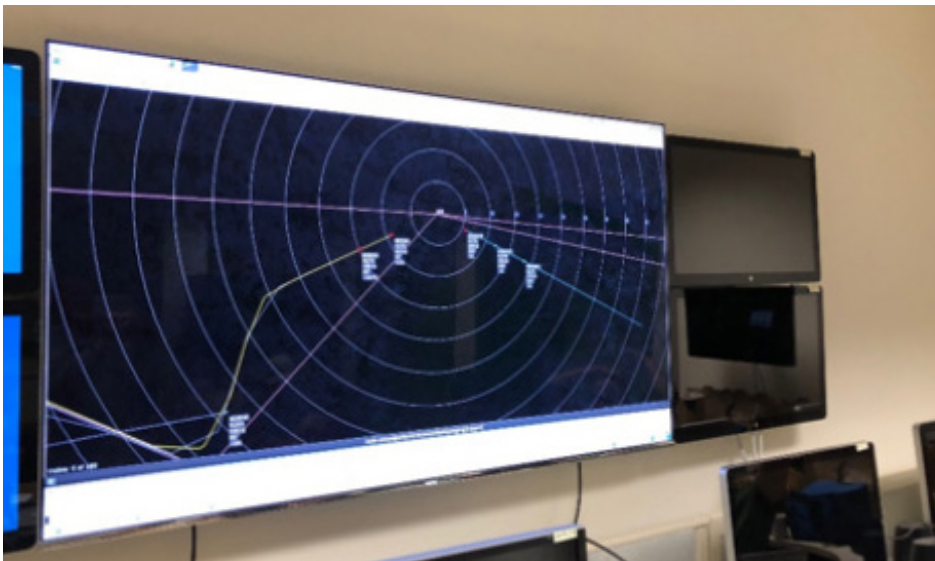
On April 14 and 15, the NASA Air Traffic Management Testbed team successfully conducted a system check with the Boeing Ground Station Console (GSC) during live flight tests of the Boeing B777 ecoDemonstrator. The system check consisted of two parts: message

connectivity and data transfer between the two parties, and a conflict detection and resolution algorithm, called the Autoresolver. The Testbed team flew a series of virtual aircraft flights using flight states data, updated and received every 64 seconds, from GSC, and System Wide Information Management data, updated every 12 seconds, from the aircraft. The Testbed team also used Multi Aircraft Control Simulation to intercept the Boeing flight to induce a virtual loss of separation. Both tests were successfully completed. This effort represents a major step toward executing a 2019 flight test as part of an ongoing NASA-Boeing ecoDemonstrator collaboration.

Jump Seat Flight Experience on a Revenue Flight for ATD-3

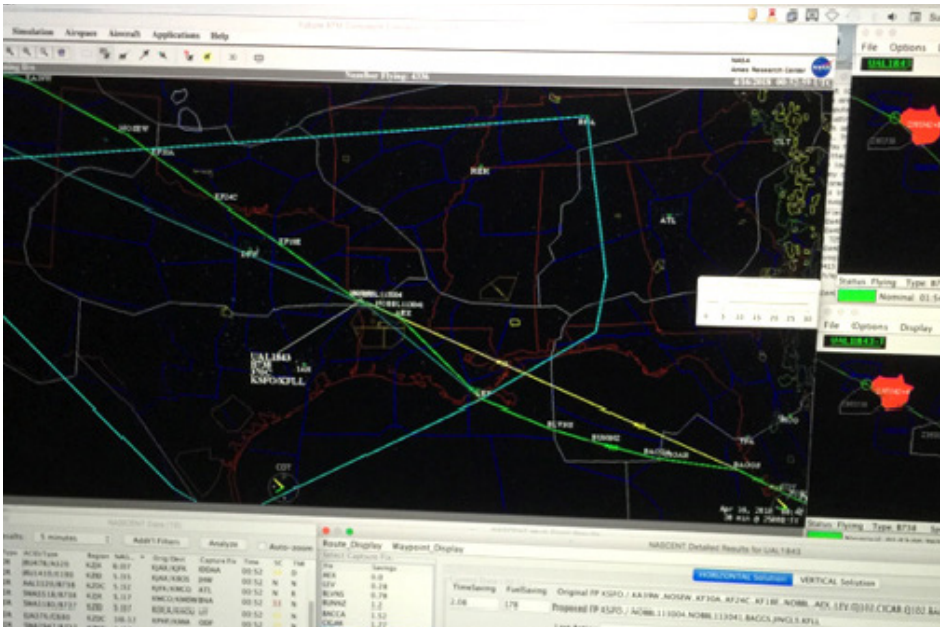
POC: [KAPIL SHETH](#)

Multi-Agent Air/Ground Integrated Coordination (MAAGIC) is an integration of the ground and cockpit technologies of Airspace Technology Demonstration 3 (ATD-3) for efficient routing and off-nominal (severe weather) events. On April 15, Kapil Sheth traveled from San Francisco, California (SFO) to Fort Lauderdale, Florida (FLL) in a cockpit jump seat of a major US airline flight. The next day, he flew back from FLL to Denver, Colorado, and returned to SFO, flying economy class. Severe weather was encountered only near FLL during the last leg of the first flight. While en route, Sheth purchased Wi-Fi connectivity and, using a Virtual Private Network and Virtual Network Computing, established a connection to the National Airspace System Constraint Evaluation and Notification Tool (NASCENT), a ground-based system of MAAGIC running at NASA's Ames Research Center in California. MAAGIC is an integration of the ground and cockpit technologies of ATD-3 for efficient routing and off-nominal (severe weather) events. During Sheth's flight, an advisory for time- and fuel-savings alerted for a direct route to a downstream fix. The advisory was presented



This image shows two instances of the same Boeing flight BOE069 (one from GSC and one from SWIM), and three NASA MACS virtual flights (NASA 379, NASA 436, and NASA 861) converging at a fix HVR in Montana airspace.

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The advisory (top) and the granted clearance (below) for the case mentioned.

to the captain, who requested the clearance after checking with the first officer. An air traffic controller granted clearance, and the flight plan amendment was observed on the NASCENT system through a System Wide Information Management feed within minutes. This was a test of the ATD-3 ground-based system with a simultaneous evaluation in the cockpit. Lessons learned included a determination that inflight Wi-Fi connectivity is not very reliable and verification that ground-system information can be displayed in the cockpit with relative ease. Further tests of the ground-based and cockpit-based systems are planned for the end of

May on a NASA aircraft at NASA's Langley Research Center in Virginia.

UAM Strategic Advisory Group Workshop

POC: [BRYAN BARMORE](#)

Bryan Barmore, Acting Deputy Project Manager for Technology for the Air Traffic Management – eXploration project, participated in Booz Allen Hamilton's Urban Air Mobility (UAM) Strategic Advisory Group Workshop in Washington, DC, on April 18. The workshop consisted of several guided exercises to obtain predictions about the future UAM market and the potential social, economic, technological, and legal barriers

it may face. During the workshop, Booz Allen Hamilton representatives provided initial findings from the first of three use-cases they are examining. The final report from this effort is expected within four months. Booz Allen Hamilton is one of two major contractors exploring the future UAM market with NASA to help develop future research portfolios. The contractor's strategic advisory group consists of government, non-profit, and industry representatives from across the UAM marketplace.

Third Dynamic Routes for Arrivals in Weather Simulation Completed

POC: [DOUG ISAACSON](#)

From April 23 through May 4, the third in a series of planned Human-in-the-Loop (HITL) studies of the Dynamic Routes for Arrivals in Weather (DRAW) tool was conducted at the Air Traffic Control Simulation Laboratory at NASA's Ames Research Center in California. The third DRAW HITL simulation investigated the use of DRAW in an arrival-metering context within the Atlanta (ZTL) Air Route Traffic Control Center (ARTCC) airspace. The goal was to solicit feedback to refine the DRAW concept of operations by expanding assessment in a new airspace that presents a significantly

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TMC participating in a DRAW Simulation.

different arrival-metering operation than the one presented in previous studies using Fort Worth ARTCC (ZFW). A secondary objective of the HITL simulation was to expand knowledge of the use of DRAW in an environment approximating “extended metering” operations that requires the rerouting of flights with “frozen” scheduled times of arrival (STAs). Study participants included four recently-retired Traffic Management Coordinators (TMCs) from ZTL, and seven recently-retired Sector Controllers (two from ZTL and five from Oakland ARTCC). Each of the four TMCs was presented with four weather-impacted arrival traffic scenarios, along with reroute advisories and schedule impact and

delay information from DRAW. The TMCs used the DRAW trial planning capability to evaluate candidate reroutes for weather avoidance, assess their schedule delay impact, and amend flight routes as necessary to maintain effective arrival-metering. Questionnaires were administered to both TMC and Sector Controller participants, and data were collected to analyze arrival metering and DRAW performance. The primary objective of DRAW HITL simulation #3 was to understand how TMCs who use DRAW in ZTL airspace routinely assess reroute advisories for flights with frozen STAs and manage the arrival schedule accordingly, providing valuable feedback for using DRAW in operations that

will include extended metering and coupled scheduling.

Electric Vertical Take-Off and Landing Design Workshop

POC: [CRAIG HANGE](#)

On April 25 and 26, NASA researchers in the Airspace Operations and Safety Program, in collaboration with members of the local chapter of the Association for Unmanned Vehicle Systems International (AUVSI), hosted an electric Vertical Take-Off and Landing (eVTOL) workshop at NASA’s Ames Research Center in California. The intent of the two-day workshop was to bring together a technical audience from government and industry to leverage past lessons-learned and to understand current day technical challenges for new eVTOL vehicles and operations. New Vertical Take-Off and Landing (VTOL) aircraft are being designed and manufactured as the interest in Urban Air Mobility concepts has evolved. NASA’s rich history in traditional vertical take-off and landing research and development was also discussed during the workshop. The local chapter of AUVSI hosted the first day of the workshop at the Hiller Aviation Museum in San Carlos, California, and NASA invited guests to visit Ames to tour the facilities and

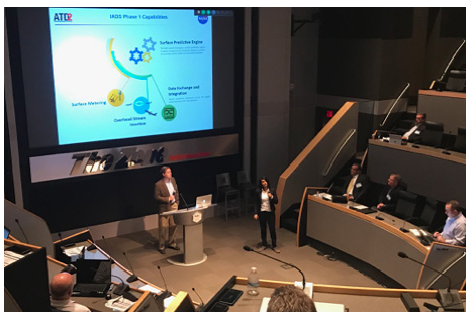
TECHNICAL AND PROGRAMMATIC HIGHLIGHTS

to discuss NASA's capabilities in more depth. Other NASA centers were also invited to participate.

ATD-2 Team Briefs the Main Forum at the Collaborative Decision Making Spring Meeting

POC: [SHIVANJLI SHARMA](#)

From April 30 through May 2, NASA researchers and members of the National Air Traffic Controllers Association provided a briefing on the Airspace Technology Demonstration 2 (ATD-2) project at the Collaborative Decision Making General Session Spring 2018 Meetings in Memphis, Tennessee. The meetings were held at the FedEx Institute of Technology on the campus of the University of Memphis. In addition to the briefing during the main forum, ATD-2 researchers participated in Surface Collaborative Team and Collaborative Automation Team breakout meetings. Meeting



Shivanjali Sharma gave an ATD-2 briefing to the main CDM forum.

participants included representatives from FAA and the airline industry, airport facility managers, and the FedEx Managing Director. The briefing to the main forum featured an update on the progress of the Phase 1 demonstration at Charlotte Douglas International Airport and a discussion of future work for ATD-2 and the benefits derived so far from the first six months of the field demonstration.

Defense Advanced Research Projects Agency Assured Autonomy Kick-Off Meeting

POC: [JOHN KOELLING](#)

At the invitation of the Boeing Company, John Koelling, System Wide Safety Project Manager, and Irene Gregory, senior technologist for Advanced Control Theory and Applications, from NASA's Langley Research Center in Virginia, attended a kick-off meeting for the Defense Advanced Research Projects Agency (DARPA) Assured Autonomy Program. The meeting took place in Malibu, California, from May 1 through 3. DARPA's program goal is to "develop rigorous design and analysis technologies for continual assurance of learning enabled autonomous systems, in order to guarantee safety properties in adversarial environments." The program is structured into four areas: Design for Assurance, Assurance

Monitoring and Control, Dynamic Assurance, and Integration and Experimentation Platforms. DARPA is seeking an order-of-magnitude increase in the scale and complexity of the challenge problems across the phases and, correspondingly, the assurance technologies developed in the program must scale-up to address these challenges. Selected performers involved in the program include HRL Labs, Rockwell Collins, Boeing, Northrop Grumman, Vanderbilt University, University of California, Berkeley, University of Pennsylvania, Imperial College London, and Shree Guru Gobind Singh Tricentenary University.

Visit from San Jose Police Department Bureau of Field Operations

POC: [JEFF HOMOLA](#)

On May 9, three members of the San Jose Police Department's Bureau of Field Operations, which represents the Air Support Unit and Special Weapons and Tactics Bomb Unit, attended a demonstration for Unmanned Aircraft Systems Traffic Management (UTM) at NASA's Ames Research Center in California. UTM researchers are engaging with members of the public safety community to understand requirements for a "public portal" designed to provide situational awareness of the UTM airspace. As part of this effort,

TECHNICAL AND PROGRAMMATIC HIGHLIGHTS

the San Jose Police Department visitors were invited to take part in a demonstration of UTM and provided their perspectives to NASA representatives on how UTM can support their operations, and shared potential concerns and needs related to operating in the UTM airspace. The visitors were impressed by the scale and maturity of the UTM project.

ATD-2 Field Demonstration Shadow Session Completed

POC: [BOB STAUDENMEIER](#) AND [JEREMY COUPE](#)

A shadow session was conducted on May 14 in a NASA laboratory at Charlotte Douglass International Airport (CLT). The objective of the session was to demonstrate new features of the recent Integrated Arrival/Departure/Surface Operations (IADS) software release and to discuss upcoming surface-metering enhancements. Participants included Field Demo Partners from the National Air Traffic Controllers Association, American Airlines (AAL), and the CLT FAA Air Traffic Control Tower (ATCT). The session included an interactive walkthrough of the many new features included in IADS release 3.1.2, a preview of surface-metering enhancements that will be introduced later this year, and a presentation of initial metrics showing the departure and arrival on-time performance. The surface-metering enhancements seek

to derive additional benefit from the surface-metering capability, and to extend surface metering into the strategic timeframes envisioned in the Surface Collaborative Decision Making concept. Discussions provided valuable feedback on the progress of the Phase 1 Field Demonstration, along with ideas for future enhancements to the system. Later in the week, onsite training was provided to CLT AAL Ramp Tower and ATCT personnel on the latest features included in the recent software release.

UTM Lab Hosts Visit from NASA Associate Administrator Jaiwon Shin and Hyundai Executives

POC: [ARWA AWEISS](#)

On May 14, NASA's Unmanned Aircraft Systems (UAS) Traffic Management (UTM) team at NASA's Ames Research Center (ARC) in California met with Jaiwon Shin, NASA Associate Administrator for the Aeronautics Research Mission Directorate (ARMD), and Hyundai Motor Group Vice-Chairman Eui-Sun Chung. Other Hyundai executives in attendance included Youngcho Chi, Chief Innovation Officer; John Suh, Vice President; Jaehyung Kim, Senior Research Engineer; and Jaeho Choi, Executive Assistant at the Airspace Operations

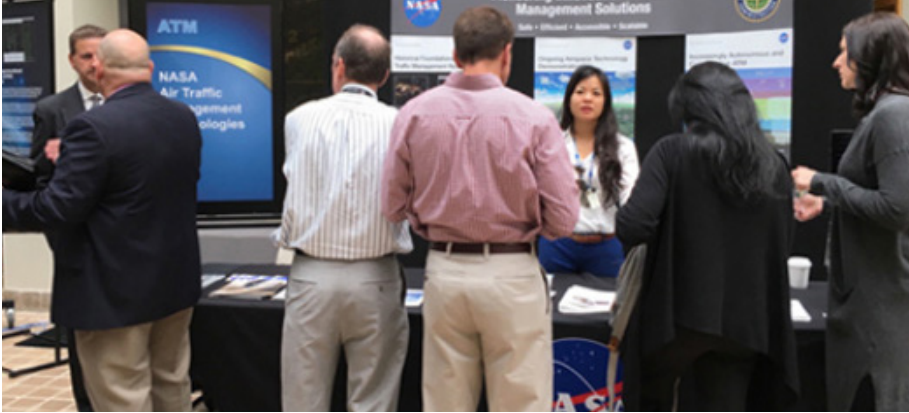
Laboratory. Also present were ARC Director Eugene Tu and Director of Aeronautics Huy Tran. During the meeting, UTM Chief Engineer Joseph Rios provided an overview of the UTM team's role in the research. Jeff Homola, UTM Integration and Testing lead, described the overall testing approach using playback flight scenarios from three of the national UAS test sites. These flight scenario examples were also used to demonstrate NASA's Airspace Operations Laboratory's simulation capabilities and UTM displays. ARMD's Jaewoo Jung described a Communication, Navigation, and Surveillance scenario flown at one of the UAS test sites.

NASA's Air Traffic Management Research Featured at Air Traffic Control Association Tech Symposium's Tech Center Tuesday

POC: [ANDREW GING](#), [JOEY MERCER](#),
[HEATHER ARNESON](#) AND [BARRY SULLIVAN](#)

NASA's Air Traffic Management research and development efforts were showcased during the Tech Center Tuesday segment of the annual Air Traffic Control Association (ATCA) Technical Symposium, held on May 15 at the FAA William J. Hughes Technical Center in Atlantic City, New Jersey. This year's theme, "Celebrating 60 years of Aviation

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Visitors at the ATD Booth during the ATCA Technical Symposium.



The UTM Booth at the ATCA Technical Symposium.

Achievements: Past, Present & Future,” featured technical tours, demonstrations, and exhibits in a variety of aviation fields from more than 40 different projects, programs, and organizations. NASA hosted two booths, which showcased the Airspace Technology Demonstration (ATD) sub-projects and Unmanned Aircraft Systems (UAS) Traffic Management (UTM) technologies.

The NASA ATD-2 booth featured an ATD-1 concept animation, an Avionics Phase 2 flight test video, and an ATD-2 concept animation. ATD-2 user displays highlighting the collaboration with the Tech Center Team were shown in an adjacent FAA booth. An ATD-3 concept animation depicting the integration of ground-based tools and a flight-deck-based tool

focusing on improving en route and arrival phases of flight was also shown. The UTM booth featured a simulated scenario of UAS operations, including recent flight test activities from the six FAA UAS test sites. The scenario also demonstrated simulated operations in the Bay Area, with ongoing explorations into other integration challenges, such as those associated with public safety. Visualizations and functions of the UTM research platform were also on display, bringing to life the system architecture and data models currently in use. Also featured were the Insight-UTM iPad app, the UTM Situation Display, and a gateway that offered a flight-following view of UAS operations in Google Earth’s 3D environment. Exhibit visitors included government and industry representatives, who showed considerable interest throughout the event.

As a follow-on to Tech Center Tuesday, the ATCA Technical Symposium relocated to the Resorts Hotel on May 16 and 17, where NASA personnel represented each of the five plenary sessions. Following opening remarks from Pete Dumont, President of ATCA, Shelley Yak, Director of the FAA Technical Center, and Robert Pearce, ARMD Deputy Associate Administrator for

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Strategy, discussed the importance of stakeholders and partnerships. Pearce also participated on the Blue Skies panel discussing “What Does the Future Hold Beyond NextGen, Regardless of Privatization?” which kicked off the plenary sessions. Other NASA panelists included Bill Thigpen, who participated on the “It’s all about the Information” panel; Heather Arneson, who participated on the “Cutting edge applications of Modeling and Simulation to support Future NAS” panel; Ken Goodrich, who participated on the “Challenges for Embracing Autonomy/ Autonomous Operations in and Beyond the NAS” panel; and Ron Johnson, who moderated the “Challenges for UAS/UTM Implementation in the NAS” panel.

Cognitive Walkthrough for the Air Traffic Management – eXploration Urban Air Mobility X1 in Preparation of September Test

POC: [WILLIAM CHAN](#)

From May 15 through 17, NASA representatives conducted a cognitive walkthrough in preparation for the Air Traffic Management – eXploration Urban Air Mobility X1 (UAM-X1) Human-in-the-Loop (HITL) simulation planned for September 2018. Three retired subject matter experts from Dallas-Fort Worth International Airport (DFW) and Dallas Love

Field Airport provided feedback on the ability to use current helicopter routes and procedures for flying passenger UAM flights within the vicinity of DFW. The participants also provided feedback on estimated levels of UAM traffic that could be managed given current routes and procedures. Many suggested procedure modifications such as definition of letter of agreements, which can reduce communication verbiage and allow higher densities of UAM flights. Further analyses of the feedback received is still underway in preparation for the UAM-X1 HITL simulation.

Forensics for Autonomous/ Automated Systems Monthly Meeting

POC: [YURI GAWDIAK](#)

Yuri Gawdiak, Associate Program Director for NASA’s Airspace Operations and Safety Program (AOSP), and Paul Nelson, AOSP Integration Manager for Cybersecurity and Communications, met with FAA representatives on May 16 to review the outline for conducting a tabletop review of an autonomous, system-of-systems mishap investigation and forensics analysis. The group developed initial objectives, deliverables, and metrics, and identified potential partners and collaborators for a walk-through. The tabletop review is planned for October 2018.

Global City Teams Challenge Formulation of the Aerial on Demand Mobility Action Cluster

POC: [YURI GAWDIAK](#)

On May 16, Yuri Gawdiak, Associate Program Director for NASA’s Airspace Operations and Safety Program, was asked by the Global City Teams Challenge (GCTC) Transportation Supercluster to lead the planning on implementing an Aerial on Demand Mobility Action Cluster. Meetings will be held in Portland, Maine, from June 20 through 22, at the GCTC Tech Jam. Attendees will discuss plans for a dedicated Aerial On-Demand Mobility Action Cluster Conference to be held in the fall or early winter of 2018.

NASA and American Airlines Host ATD-2 Technical Interchange Meetings with Stakeholders

POC: [SHIVANJLI SHARMA](#) AND [SHAWN ENGELLAND](#)

NASA and American Airlines (AAL) hosted numerous Technical Interchange Meetings (TIMs) with stakeholders this past quarter to familiarize them with NASA’s Airspace Technology Demonstration 2 (ATD-2) at Charlotte Douglas International Airport (CLT). The first TIM was held on April 3 and 4 for the AAL Control Center Harmonization (CCH) team. The

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ATD-2 technical interchange meeting with airline flight operators at CLT.

CCH team consists of managers and technical personnel from the Integrated Operations Center and Control Centers (i.e., ramp towers) at each AAL major hub. The second and third TIMs were held April 17 and May 17, respectively, for flight operators, which included air traffic management experts from Delta Air Lines, JetBlue Airways, and Southwest Airlines. Each TIM began with an orientation briefing, followed by observations on NASA's ATD-2 Integrated Arrival/Departure/Surface (IADS) system used for surface departure metering in the AAL Control Center at CLT. Attendees then relocated to the Air Traffic Control Tower and Terminal Radar Approach Control facility to observe FAA traffic management coordinators using the ATD-2 IADS system. After lunch, the group convened

in the NASA lab for an in-depth technical interchange concerning the ATD-2 Field Demonstration. Key topics of discussion included the ongoing collaboration between NASA and the FAA to fully leverage ATD-2 research results for the benefit of the FAA's Terminal Flight Data Management (TFDM) program; investments that flight operators will need to make in preparation for TFDM deployment; and what NASA can do to more effectively transfer ATD-2 technology and findings to flight operators, airport operators, and the vendors that support the two. AAL is serving as the "lead carrier" for the ATD-2 Field Demonstration, and this technical interchange meeting was one of several engagement opportunities for other flight operators to learn from their experience.

Flight Testing of Multi-Agent Air/Ground Integrated Coordination Software

POC: [KARL BILIMORIA](#)

The Airspace Technology Demonstration 3 Multi-Agent Air/Ground Integrated Coordination (MAAGIC) project team held a workshop at NASA's Langley Research Center in Virginia from May 22 through 24. The team included researchers from NASA's Ames Research Center in California and Langley, as well as technical pilots from industry partner Alaska Airlines (ASA). The team discussed various aspects of the MAAGIC effort and conducted flight testing of MAAGIC software. Two live end-to-end tests were conducted. During the tests, NASA's National Airspace System Constraint Evaluation and Notification Tool (NASCENT) software for Dispatchers, which ran on a computer at Ames, communicated with the Traffic Aware Planner (TAP) software for pilots, which ran on NASA's HU-25 aircraft operating out of Langley. The tests showcased many capabilities of TAP and NASCENT, as well as the communication and information-sharing capabilities that MAAGIC provides for air-ground integration. The team determined methods needed to prepare the integrated software system for operational deployment

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The ATD-3 MAAGIC team held a workshop at NASA's Langley Research Center in Virginia.

on ASA flights. A delivery date of the MAAGIC software to ASA is targeted for the end of August 2018, with MAAGIC flight trials on ASA revenue flights scheduled to begin in mid-November 2018.

Smart Cities and Community Briefing to ARMD

POC: [DESTINY ANDERSON](#)

On May 31, Sokwoo Rhee, Associate Director of the Cyber-Physical Systems Program at the National Institute of Standards and Technology (NIST), provided a briefing on the NIST Smart Cities and Communities effort to staff at NASA Headquarters in Washington, DC. Staff attendees included personnel from the Aeronautics Research Mission Directorate Senior Management Team, Headquarters Program Offices, Aeronautics Research Directorate Offices, Urban Air Mobility Coordination and Assessment Team, and the Airspace Operations and Safety Program Office and Project. The presentation, which included a

question-and-answer segment, was broadcast via WebEx and vertical interval test signals to the other four NASA Centers. Rhee is currently leading the Global City Teams Challenge, which aims to create a replicable and scalable model of a city for the collaborative incubation and deployment of the Internet of Things and Cyber-Physical Systems solutions to improve the quality of life in smart cities around the world.

The Aviation Safety Reporting System Annual Review

POC: [BECKY HOOEY](#)

On May 31, the Aviation Safety Reporting System (ASRS) Director and FAA representatives visited NASA's Ames Research Center in California for an annual review of recent activity. Acting ASRS Director Becky Hooey provided a review of technical accomplishments, including results of a NASA-funded effort to increase the percentage of general aviation reports that are de-identified for access on the public website, and an update on topics that the ASRS follows closely, such as Unmanned Aircraft System encounters. The sponsors were pleased with current progress and remain committed to identifying opportunities to secure additional FAA funding for technology upgrades and the expansion of current activities. In addition, representatives from the Ames Legal and Partnerships Offices joined the

group for a review of the proposed agreement renewal. The meeting ended with concurrence on a new agreement that will begin around January 1, following a six-month extension of the current agreement.

NASA Provides ATD-2 Familiarization for FAA Systems Analysis and Modeling Team

POC: [AL CAPPES](#)

On June 5, NASA hosted an Airspace Technology Demonstration 2 (ATD-2) familiarization session at Charlotte Douglass International Airport (CLT). Attendees were FAA personnel from the NAS Systems Engineering and Integration Office (ANG-B), the Future Standards and Procedures Office (AJV-85), and Atlanta Center (ZTL). ANG-B personnel included representatives from the Systems Analysis and Modeling Division (ANG-B7), which co-leads the FAA's Joint Analysis Team. The familiarization session began with a preview of ATD-2 surface-metering procedures,



NASA provided an ATD-2 familiarization at Charlotte International Airport for FAA personnel.

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before proceeding to observations of surface metering in operational use at the AAL Control Center at CLT. This discussion was followed by an orientation for the ATD-2 system from the ATD-2 National Air Traffic Controllers Association lead, and observations on the CLT Air Traffic Control Tower. After lunch, NASA and FAA personnel convened in the NASA laboratory at CLT for an in-depth technical exchange regarding the methodologies used to generate benefit metrics and characterize system performance. For this discussion, members of the ATD-2 Integrated Arrival/Departure/Surface Analysis Team participated remotely from NASA's Ames Research Center in California. Other engaging discussions included ideas on performance measures and leveraging the ATD-2 lessons-learned for future FAA research.

ATD-2 Completes FAA Safety Risk Management Review for Phase 2 Field Demo

POC: [AL CAPPS](#)

The FAA conducted a Safety Risk Management (SRM) review of the Airspace Technology Demonstration 2 (ATD-2) Phase 2 Field Demonstration candidate capabilities at the Carolinas Aviation Museum in Charlotte, North Carolina, on June 6 and 7. The SRM panel comprised representatives from NASA, FAA, National Air Traffic Controllers



The safety risk management review panel poses in front of US Airways Flight 1959 ("Miracle on the Hudson") at the Carolinas Aviation Museum.

Association (NATCA), Volpe, and American Airlines (AAL) who are responsible for implementing operational changes, accepting associated risks, validating identified controls, and implementing required safety mitigations. Five candidate capabilities were evaluated for inclusion in the Phase 2 Field Demonstration. These capabilities include: ATD-2 integration with the Advanced Electronic Flight Strip System, Atlanta En Route Center participation in Integrated Departure/Arrival Capability-like scheduling into Time Based Flow Management, strategic surface-metering capabilities, publishing ATD-2 data to the FAA System Wide Information Management architecture via the Terminal Flight Data Manager Terminal Flight Data Management TTP prototype and the integration of two-way data exchange for the existing pilot mobile application. The SRM review began with a description of the current ATD-2 system

capability, followed by a discussion of each capability and the proposed changes envisioned. Next, the panel identified potential safety risks for each change. For each risk, the panel analyzed its severity and likelihood, and reviewed existing controls and mitigation plans. The panel also performed a preliminary analysis of the potential safety risks of ATD-2 Phase 2 capabilities. The results were encouraging and suggest the panel will receive the necessary approval to proceed as planned. Appropriate controls will be implemented prior to the Phase 2 Field Demonstration in accordance with SRM findings. The safety review outcome will be included in an SRM document before the Phase 2 Field Demonstration, scheduled for the end of September 2018, takes place. The ATD-2 project team is thankful for the contributions of FAA, NATCA, Volpe, and AAL personnel who supported this SRM panel to allow continued demonstration

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and expansion of NASA research at CLT during Phase 2.

ATD-2 Demonstration of the Ramp Traffic Console to Dallas/Fort Worth International Airport and American Airlines Control Center Personnel

POC: [LINDSAY STEVENS](#)

On June 13, NASA's Airspace Technology Demonstration 2 (ATD-2) team introduced the Ramp Traffic Console (RTC) to field demonstration partners from American Airline's Control Center and the Dallas/Fort Worth International Airport (DFW) Board facilities. In recent weeks, the ATD-2 team has adapted and tested the changes required to run the RTC at DFW in addition to its existing deployment at Charlotte Douglas International Airport. During the live data demonstration of RTC, the NASA team described the foundations of the Integrated Arrival Departure Surface system that enables the data exchange and integration between operators and FAA Air Traffic personnel. This demonstration also afforded the opportunity to discuss the potential future use of RTC at DFW and to identify potential new data elements that might be useful in future data exchange. All partners expressed strong interest in using the RTC and in continuing engagement in the agile development process. The next steps for the ATD-2 team include



Field demo partners from American Airlines and Dallas/Fort-Worth (DFW) Airport are given a demo of the Ramp Traffic Console recently adapted and tested for the DFW Airport.

the initial deployment of RTC at the DFW partner's facilities, training, and additional shadow sessions.

Air Traffic Management – eXploration Project Testbed Team Meeting with General Electric

POC: [KEE PALOPO](#)

NASA's Air Traffic Management – eXploration Project Testbed team met with representatives from General Electric (GE) on June 14. The purpose of the meeting was to discuss use-cases for an initial collaboration in air traffic management technology development using the Testbed. The Testbed team included Jim Murphy, Alan Lee, Chok Fung (Jack) Lai, and Kee Palopo. Representing the GE team were Piet Ephraim (GE Aviation/Products) and Abhinav Saxena (GE Global Research). The group discussed access to data (e.g., System Wide Information Management) and initial use of data to support GE's Recovery

software application, which uses advanced optimization tools and a configurable rules engine to identify and plan for airline operation disruptions before they occur, and to recover quickly when unavoidable disruptions do occur. The application optimizes the recovery of the aircraft, crew, and passenger schedules to prevent disruptions from propagating throughout the schedule. The group also discussed a potential future use-case in support of the Recovery analysis that involves running multiple Monte Carlo simulations by disrupting flight departure schedules. A follow-up meeting is expected to take place at NASA to train GE personnel on the Testbed, explain how to write an adapter for connecting to the Testbed, and share the knowledge of how to use the Testbed for future GE applications.

Cyber-Physical Systems Interagency Working Group Monthly Meetings

POC: [YURI GAWDIAK](#) AND [PAUL NELSON](#)

Yuri Gawdiak, Associate Program Director for NASA's Airspace Operations and Safety Program (AOSP), and Paul Nelson, AOSP Integration Manager for Cybersecurity and Communications, continued to represent AOSP at the Monthly Cyber-Physical Systems (CPS) Interagency Working Group Meetings this quarter. Both men

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participated in the review of the new Office of Science and Technology Policy requirements for chartered working groups, versus ad-hoc teams, in Washington, DC, on May 17. At that meeting, Gawdiak discussed the Forensics Tabletop activity as one of the possible future interagency working group activities for CPS, as well as a means of developing a registry by which agencies can document their CPS-related research and development activities. At a follow-up meeting on June 21, each of them participated in the planning for upcoming working group meetings, including an “Integration of Infrastructures” activity, and also discussed the Smart Cities and Communities Resource Guide.

FAA Interagency Planning Office Core Cyber Team Monthly Meeting

POC: [PAUL NELSON](#)

On June 21, Paul Nelson participated in the FAA Interagency Planning Office Monthly Core Cyber Team (ICCT) Meeting. Topics included a presentation from the National Institute of Standards and Technology on the “Framework for Improving Critical Infrastructure Cybersecurity,” and the retirement of Steve Hofmann, ICCT Tri-Chair with the Department of Defense. Following the retirement announcement, Allan

Storm, United States Air Force Deputy Chief of Civil/Military Integration, was announced as Hofmann’s replacement.

ATD-2 Assessment of Ramp Times Human-in-the-Loop at FutureFlight Central Facility

POC: [LINDSAY STEVENS](#) AND [SHAWN ENGELLAND](#)

NASA’s Airspace Technology Demonstration 2 (ATD-2) team successfully completed a Human-in-the-Loop (HITL) simulation at FutureFlight Central (FFC) this past quarter. The focus of the HITL was to assess the feasibility of various ramp goals, including compliance with target off-block times and target movement area entry times generated by the ATD-2 scheduler, and the impact of these goals on operations and controller workload. Prior to the actual simulation, the team performed a shakedown simulation of the ATD-2 system from May 22 through 25. The objectives of the shakedown simulation were to evaluate different aspects of the integration of the tactical and strategic scheduling components, specifically exploring the ideal Target Movement Area Times (TMAT) compliance window, and to determine whether instructing ramp personnel to focus on compliance of Target Off Block Times with and without TMAT will result in more optimal surface operations. The Assessment of



Human-in-the-Loop simulations were conducted at ARC Future Flight Central to assess certain aspects of the ATD-2 system prior to the Phase 2 Field Demonstration at CLT.

Ramp Times HITL will also be used to test new capabilities of the ATD-2 system before field deployment. The traffic scenario is based on analyzing traffic from Bank 2 at Charlotte Douglas International Airport (CLT) and is composed of nearly 200 flights, including arrivals and departures, as well as additional overhead traffic to Washington Center (ZDC). The simulation environment at the FFC includes a 360-degree tower cab that simulates airline ramp operations, and a 270-degree out-the-window view that simulates the Air Traffic Control Tower (ATCT). The HITL shakedown involved ten former air traffic controllers and managers from various FAA facilities, including CLT ATCT, and American Airline’s (AAL) Ramp Tower. The former CLT and AAL Tower controllers managed surface traffic in the HITL simulation using the Ramp Traffic Console, the Ramp Manager Tower Console, and the Surface Trajectory Based Operations user

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interface to schedule departures into the ZDC overhead stream. The HITL shakedown provided valuable feedback that will be used to refine the ATD-2 system for the Phase 2 Field Demonstration.

The simulation successfully completed data collection runs from June 26 through 28. The HITL simulation involved participants from the field demonstration site operational facilities, including the National Air Traffic Controllers Association, the CLT Air Traffic Control Tower, Terminal Radar Approach Control, and American Airline's Ramp Tower. Training for the participants was conducted the morning of June 26, followed by nine data collection runs of quantitative and qualitative data. Debriefs at the end of each day provided for more in-depth discussions to refine the ATD-2 system, including feedback on ATD-2's recently developed Surface Metering Display. The ATD-2 team was joined by representatives from the FAA's NextGen, Surface, Operational Requirements and Validation offices, as well as the Washington Atlanta Air Traffic Centers, to evaluate the ATD-2 system and contribute to discussions. Participant feedback and simulation results will be used to formalize plans for the introduction of strategic planning for surface metering at CLT during the Phase 2 Field Demonstration.

ATD-3 Invited Briefing to Delta Air Lines

POC: [KAPIL SHETH](#)

At NASA's Airspace Operations and Safety Program Workshop in April, Brook Heiling, a Technical Pilot with Delta Air Lines, expressed the need for a briefing to Delta Airlines personnel on NASA's Airspace Technology Demonstration 3 (ATD-3) rerouting technologies. In response to this request, on June 28, ATD-3 team members Kapil Sheth, from NASA's Ames Research Center in California, and David Wing, from NASA's Langley Research Center in Virginia, met with approximately 20 Delta Air Lines personnel and provided briefings. The ATD-3 sub-project overview was presented, along with demonstrations of ground- and cockpit-based reroute technologies, the National Airspace System Constraint Evaluation and Notification Tool (NASCENT) and the Traffic Aware Planner (TAP) tool. Developed under ATD-3, NASCENT and TAP can be connected with each other through data sharing, a feature of interest to Delta. Delta is in the process of



The ATD-3 Team poses for a picture with Delta Air Lines Representatives.

investing in connectivity solutions within aircraft and between air and ground. As a result of this briefing, Delta has expressed a desire to explore partnership and tech transfer opportunities with NASA. The collaboration would implement and expand the capabilities of these tools, including integration with other Delta systems, such as their Flight Weather Viewer tool for pilots. A follow-on meeting is planned within the next few months to explore all ATD technologies and additional opportunities for engagement, which ATD Acting Program Manager Shawn Engelland is coordinating.

UTM Technology Transfer to the FAA

POC: [JOSEPH RIOS](#)

The seventh installment of Unmanned Aircraft Systems Traffic Management (UTM) technology transfers to the FAA was sent on June 29. This technology transfer is part of the Research Transition Team Plan co-approved by NASA and the FAA. The technology transfer includes a working research platform version of the Flight Information Management System (FIMS) and its various software and documentation components. The FIMS platform was recently used in the Technical Capability Level 3 testing. FIMS was delivered to the FAA's NextGen Integration & Evaluation Capability laboratory, located at the FAA William J. Hughes Technical Center

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in Atlantic City International Airport, New Jersey. It will be used to demonstrate capabilities of the Air Navigation Service Provider interface for UTM and prototype capabilities for UTM stakeholder coordination. The FAA is deploying FIMS to their collaborative cloud environment, and ongoing UTM project development to continuously improve FIMS will become immediately available to the FAA.

ATD-3 Dynamic Routes Around Weather and Traffic Aware Strategic Aircrew Requests Technology Transfer to the FAA

POC: [KAPIL SHETH](#)

NASA is developing the Dynamic Routes Around Weather (DRAW) technology as part of the Airspace Technology Demonstration 3 (ATD-3) suite of technologies. DRAW proposes advisories that save time and fuel for aircraft during their arrival phase by routing them to a different arrival fix or to a modified route to avoid convective weather. DRAW simultaneously proposes to prolong use of the FAA's Time Based Flow Metering, with its origins in NASA's Traffic Management Advisor, during inclement weather in the vicinity of destination airports. NASA is also developing the Traffic Aware Strategic Aircrew Requests (TASAR) technology as an additional part of the ATD-3 suite of technologies. TASAR, an integral component of the Multi-Agent Air/

Ground Integrated Coordination effort, resides in the cockpit of an aircraft and proposes advisories that optimize the en route phase of flight while taking into account airspace constraints such as crossing traffic, convective weather, and Special Use Airspace. As part of the Joint Project Management Plan between the FAA and NASA, a technology transfer occurred on June 29 at NASA's Ames Research Center in California. The package included public outreach materials, concept of operations, measures of performance specifications, technical publications, technology artifacts, and simulation and evaluation results. To keep the technology transfer comprehensive, the contents of the deliverable also included the Dynamic Weather Routes and Multi-Flight Common Routes technology documents previously transferred in August and December, respectively, of 2017. A follow-on technical interchange meeting is planned with the FAA for August to discuss the transferred documents, receive feedback, and outline subsequent work.

UTM Focus Group Meetings Held at Ames Research Center

POC: [RON JOHNSON](#)

Throughout the month of June, NASA Unmanned Aircraft Systems (UAS) Traffic Management (UTM) researchers in the airspace operations laboratory conducted focus group sessions to understand

the needs and concerns of different groups with respect to information access and situational awareness of UAS operations. The focus group effort is a complement to Technical Capability Level 3 testing with regard to development of a prototype public portal intended to provide users with visualizations of UTM data. Participants were invited from the domains of public safety, industry, government and municipality, and the general public. In total, 31 individuals participated, either by attending a focus group session or by individual interview. Of the four focus sessions, two group sessions focused on public safety, in which participant groups were comprised solely of individuals from various public safety entities, and two sessions focused on the views of industry, local government, and the general public. Results from these sessions are being compiled and analyzed to identify important themes and guidelines that will inform future information and interface requirements as they relate to each representative group. To gain further insight, lab-based usability tests of an internal public portal prototype with a subset of focus group participants are also planned.

RECOGNITION

NASA Participates in UAV-based Intelligent Transportation Workshop

POC: [PARIMAL KOPARDEKAR](#)

Parimal Kopardekar, senior technologist for Air Transportation Systems at NASA's Ames Research Center in California, gave a presentation at the Unmanned Aerial Vehicle (UAV)-based Intelligent Transportation Workshop held at the University of Nebraska-Lincoln, on April 6. A team of professors from the university are working on a project funded by Nebraska state concerning UAV-based, next-generation traffic management. As part of the project, the team is organizing this workshop for researchers and practitioners from federal agencies, academia, and industry who work in the field of intelligent aerial traffic management.

Integrated Communications Navigation and Surveillance Announces Best Paper Award

POC: [PARIMAL KOPARDEKAR](#)

On April 11, co-authors Krishna Sampigethay, of United Technologies Research Center, and Parimal Kopardekar and Jerry Davis, of NASA's Ames Research Center in California, were recognized at the Integrated Communications Navigation and Surveillance Conference, held at the Westin Washington Dulles International Airport Hotel. Their paper, *Cyber Security of Unmanned Aircraft System Traffic Management (UTM)*, won the 2nd Best Professional Paper award.

Embedded Forensics Systems Exploration Meeting

POC: [DESTINY ANDERSON](#)

On April 13, representatives from NASA, FAA, and the National Transportation Safety Board met in Washington, DC, to brainstorm and explore the concept of developing a Full Lifecycle Embedded Forensics capability for development and testing phases in support of autonomous and complex systems builds and prototyping. Regarding the operational phase, exploration will include business-customer equality insight and validation, distributed systems-of-systems and Industrial Internet of Things (IIoT), and incident and mishap investigation support.

NASA Participates at Association for Unmanned Vehicle Systems International Exponential

POC: [PARIMAL KOPARDEKAR](#)

NASA representatives hosted a booth at the Association for Unmanned Vehicle Systems International Exponential trade show at the Colorado Convention Center, in Denver, Colorado, from April 30 through May 3. Among the material available at the NASA Aeronautics booth, NASA provided information on: Unmanned Aircraft Systems (UAS) Integration and Validation Laboratory, Small Business Innovation Research, Technology Transfer, Mars Aeronautics (Mars

Electric Reusable Flyer/Prandtl-D), SAFE2DITCH/Tempest Model, UAS Traffic Management system, UAS in the National Airspace System, and CERTAIN/Fit2Fly. In addition, NASA's Parimal Kopardekar, senior technologist for Air Transportation Systems, moderated a panel on National UAS Standardized Performance Testing and Rating on April 30.

2018 Finalist in Promising Innovations for Service to America, Samuel J. Heyman Award

POC: [PARIMAL KOPARDEKAR](#)

Parimal Kopardekar, senior technologist for Air Transportation Systems and principal investigator for the Unmanned Aircraft Systems Traffic Management project at NASA has been named a finalist for the Promising Innovations category of this year's Samuel J. Heyman Service to America Medals awards. By designing a first-of-its-kind traffic management system for Unmanned Aerial Vehicles that paved the way for large-scale use of commercial drones, Kopardekar placed among three other finalists in this category. "The Sammies," also known as the "Oscars" of U.S. government service, represent a highly respected honor that are bestowed following a rigorous selection process. This year's winners will be announced on October 2.

RECOGNITION

EEG Sensor Analysis Presentation at Aerospace Medical Association Conference

POC: [ANGELA HARRIVEL](#)

Angela Harrivel of NASA's Langley Research Center in Virginia presented a briefing entitled "Comparative Electroencephalography (EEG) Sensor Analysis for Attentional State Prediction" at the 2018 Annual Scientific Meeting of the Aerospace Medical Association, held in Dallas, Texas, from May 7 through 10. Approximately 60 people attended the briefing, which allowed for informative discussion and thought-provoking questions. Results presented at the briefing encouraged continued development of real-time detection of attentional human performance, limiting states using less-obtrusive and commercially available EEG sensors. Such state detection, in combination with ground-based training, could contribute to the reduction of loss of control in-flight accidents and could also support the optimization of human-machine teaming via adaptive automation. John Allen, NASA Program Executive of Crew Health and Safety, expressed appreciation for Harrivel and her team's work, asked whether the group has any contact with NASA's space mission efforts, and offered to help with connections. Contacts were made with NASA flight surgeons and the Element Scientist of the Human Factors and Behavioral

Performance Element of NASA's Human Research Program (HRP) for further discussion about application of these CSM systems to the HRP efforts. Additional discussions took place with a University of West Florida researcher who is working on detecting cognitive impairment (including hypoxia) using dry EEG technologies in operational environments, in partnership with Capt. G. Merrill Rice of the Naval Aerospace Medicine Institute. These efforts support Commercial Aviation Safety Team Safety Enhancement 211 under the research performed under Technologies for Airplane State Awareness sub-project within Airspace Operations and Safety Program's System-Wide Safety Project.

NASA Presents Keynote Talk and Tutorial at International Conference on Research in Air Transportation

POC: [PARIMAL KOPARDEKAR](#) AND [BANAVAR SRIDHAR](#)

Parimal Kopardekar, senior technologist for Air Transportation Systems at NASA's Ames Research Center in California, was invited by the FAA to give a keynote talk at the International Conference on Research in Air Transportation (ICRAT) on June 26. Kopardekar's talk, entitled "Innovate Relentlessly: Embracing Innovation in Aviation While Respecting Its Safety Tradition," addressed the need for change and vision in the approach towards a future air transportation

system. In addition, Banavar Sridhar, senior scientist for Air Transportation Systems at Ames, was invited to present a tutorial on "Air Traffic Metrics to Quantify Disruption from Natural (Weather) and Man-made (Cyber) Causes" at the conference on June 27. The tutorial described research in the development of air traffic metrics to guide responses to weather and explored the development of metrics needed to model and mitigate man-made events. This research led to the development of the Weather Impacted Traffic Index as a regular metric computed daily by the FAA. The 2018 conference was held in Barcelona, Spain, and Kopardekar's talk was presented remotely. ICRAT is jointly organized by the FAA and Eurocontrol, and is a biennial event in Air Transport Research, alternating with the USA-Europe Air Traffic Management Research and Development Seminar. This year's conference was hosted by Universitat Politècnica de Catalunya (Barcelona Tech) and sponsored by Boeing. ICRAT is a forum for young researchers in the air transportation field to share their work, expand their professional network, and gain new knowledge and inspiration.

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