



# AOSP Newsletter

Airspace Operations and Safety Program (AOSP)

JUL-SEP 2023 | Quarter 4



UAM Team Completes AIS 3  
this Quarter

PAAV Data Collection Runs 15  
Complete at NASA Langley

## AOSP IN THE NEWS

### [Reliable Robotics Gets FAA Approval To Test Automated Aircraft Systems](#)

Reuters (7/20) reports “Reliable Robotics, a Silicon Valley startup aiming to automate conventional fixed-wing planes, has received approval from the Federal Aviation Administration to proceed with its plan to test and certify fully automated aircraft systems, the company said on Thursday. ‘We’re three to four years out from being able to remotely operate these aircraft at any kind of reasonable scale,’ said Robert Rose, co-founder and chief executive of the Mountain View, California-based company which aims to license its autonomous flight system to other companies. ... NASA is also working with Reliable systems engineers on advanced air mobility research and said test data will be used to evaluate flight path procedures for future aircraft.”

### [Want to Hop on An Electric Air Taxi? U.S. Officials Urge More Attention on Vertiports, Community Acceptance](#)

Aerospace America (7/24) reports “as electric air taxi developers get closer to certification of their aircraft, a host of U.S. government

agencies and departments are working to lay the groundwork to ensure the airspace and American society are ready to accommodate them. Complicating matters, use cases for electric vertical and takeoff landing (eVTOL) vehicles are still speculative, said Peter Irvine, the executive lead for aviation policy at the U.S. Department of Transportation. ... Parimal (PK) Kopardekar, director of NASA’s Aeronautics Research Institute in Washington, D.C., said air taxi developers and operators will fail financially unless they can quickly build up to high-frequency flights requiring capable infrastructure and air traffic management.”

### [Deadline Approaches For Drone Identification Rule](#)

Aerospace America (8/3) reports “the Remote Identification technology that all operators of business and hobbyist drones in the United States must have on their aircraft starting next month is primarily meant to aid police and citizens who want to know who owns a drone flying nearby that might be maneuvering unsafely. Technologists, however, see the approach as the potential precursor to a tool for managing the long-predicted explosion of drone traffic for package delivery,

infrastructure monitoring and other applications. ... But FAA and NASA have researched ways to use Remote ID data to create an unmanned aerial system (UAS) traffic management, or UTM, network.”

### [Polaris Aero Receives NASA Small Business Innovation Research Award](#)

AP (8/14) reports “Polaris Aero LLC, a leader in aviation safety software, has received a NASA Phase I Small Business Innovation Research (SBIR) award in support of NASA’s System-Wide Safety Project within the Airspace Operations and Safety Program. With the award, Polaris Aero will research the integration of artificial intelligence (A.I.) into its cloud-based VOCUS Safety Intelligence Platform.”

## TECHNICAL AND PROGRAMMATIC HIGHLIGHTS



*The AIS simulation activity.*

### UAM Team Completes AIS this Quarter

POC: [KENNETH FREEMAN](#) AND [SAVVY VERMA](#)

The Air Traffic Management – eXploration project’s Urban Air Mobility (UAM) subproject team successfully completed its Air Traffic Management Interoperability Simulation (AIS) this past quarter. During the week of Aug. 7–11, the

UAM Airspace Procedures and Design team conducted human-in-the-loop shakedown testing. The test was conducted at the FutureFlight Central facility at NASA’s Ames Research Center in California. Shakedown testing followed an AIS technical interchange meeting and tabletop exercise where procedures and information exchange requirements were explored between

air traffic control and the pilot in command for current-day and mid-term UAM operations. The exercise focused on use cases and routes developed jointly by NASA and Joby Aviation for the Dallas area. Preliminary data analysis from the AIS shakedown showed that corridors and modified procedures can contribute to scalability and reduced communication



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requirements for some chosen use cases. Following shakedown testing, data collection runs commenced and were completed on Sep. 22. The data collection exercise evaluated notional UAM procedures and information exchange requirements with the goal of testing the experiment matrix that included current-day and mid-term conditions. Data collected consisted of track data, audio, videos, surveys, and debriefs. The team will analyze the data and report out in the next few months.

### DIP Team Releases Platform Version 1.5

POC: [GILBERT WU](#)

On July 5, the Air Traffic Management – eXploration project’s Digital Information Platform (DIP) subproject team released Version 1.5 of DIP to its internal and external partners. The DIP team aims to establish an easily accessible cloud-based digital information platform that a community of data and service providers and operators use to gather and access both real-time and historical data. The platform enables users to leverage advanced data-driven digital services to promote efficient aviation operations. The new features in this version include fused National Airspace System data based on event processing and filtering, access to data to support timeline views, and a catalog redesign. The team will continue to incrementally update

the software and push out future releases to stakeholders and the aviation community. DIP can be found at the following URL: <https://dip.amesaero.nasa.gov>.

### Wisk Aero Visits NASA Ames for Briefings on ATM-X

POC: [JEFF HOMOLA](#)

On July 7, representatives from Wisk Aero visited NASA’s Ames Research

Center in California, where they met with the Air Traffic Management – eXploration (ATM-X) project team. Their discussions focused on potential collaboration on human factors research related to the Wisk operational use case and included various laboratory demonstrations. Given that Wisk is pursuing a fully automated vehicle, the Wisk and ATM-X teams discussed user interface requirements for automated



*Wisk Aero team visits FutureFlight Central.*



*Wisk Aero visits the Airspace Operations Lab.*

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operations as well as information flow needs for increasingly Multi-Vehicle Control (m:N) operations. The Wisk team were given tours of FutureFlight Central, the Airspace Operations Lab, the Human-Autonomy Teaming Lab, and the Vertical Motion Simulator. The day concluded with a brainstorming discussion of the next steps for a future collaboration between Wisk and NASA.

### **ATM-X Conducts NASA/FAA Quarterly Review**

POC: [SHAWN ENGELLAND](#) AND [KEN FREEMAN](#)

On July 11–12, the Air Traffic Management – eXploration (ATM-X) project conducted a two-day quarterly review with the FAA. The review was a hybrid meeting the NASA Aeronautics Research Institute hosted at NASA's Ames Research Center in California. The first day consisted of various briefings from the FAA, including "Info-Centric National Airspace System (NAS) Landscapes." This was followed by presentations on their Flight Information Exchange Model, Flight and Flow Information for a Collaborative Environment, Natural Language Processing, Responsible Artificial Intelligence, Multi-Regional Trajectory Based Operations Live Demonstration project, and Connected Aircraft Trajectory Information activities. This was followed by the ATM-X project's Digital Information Platform subproject briefings, and

a Sky for All technical interchange meeting. The second day began with the FAA briefing their Urban Air Mobility (UAM) concept of operations and providing an overview of their UAM Airspace Management Demonstration project, including their Low Density Unmanned Aircraft Systems (UAS) Communication Evaluation and UAS Service Supplier-Provider of Services for UAM Capability Gap Analysis. These were followed by presentations on the ATM-X project's UAM subproject, including updates on the Operational Integration Assessment, the ATM Interoperability Simulation, Provider of Services for UAM Prototype development, and flight activity between NASA, Joby, and the U.S. Air Force's Agility Prime team. The meeting wrapped with an overview of the Advanced Air Mobility project's High Density Vertiplex subproject flight test. The next quarterly review is planned for autumn 2023.

### **Four New Technologies Result from WSDM Multi-Phase SBIR**

POC: [RICHARD MOGFORD](#), [ROBERT MAH](#) AND [STEVE YOUNG](#)

On July 12, the System-Wide Safety project received final combined presentations for Phase II, Phase II-E, and Phase III Small Business Innovation Research (SBIR) efforts, all focused on Weather Sensor and Data Monitoring (WSDM). ResilienX led this activity with

support from TruWeather Solutions and The Longbow Group. The technical point of contact for this research is Richard Mogford, who has served in this role since Phase I began in 2020. Hazardous weather and winds, thermals, and turbulence pose an ever-present challenge to small drones and future Urban Air Mobility systems. This SBIR effort resulted in the development of four new technologies, including: 1) SPOT-ON, which leverages computational fluid dynamics models in computing an optimal wind sensor deployment configuration, thereby enabling more accurate wind monitoring both at and near a vertiport; 2) FASTWIND, a machine learning based emulator of a custom computable document format model; 3) WSDM, a software application that ingests data from a network of sensors, and determines which, if any, are behaving "poorly"; and 4) BE-WindEE, a battery estimator for wind energy efficiency. This software service is designed to utilize technology from ResilienX and NASA – along with micro-weather data models and forecasting from TruWeather – to predict the impacts of urban winds on the battery life for commercial drone operations. This project has since been selected for NASA's Civilian Commercialization Readiness Pilot program with matching funds being provided by the Air Force's Agility Prime program. This effort directly

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supports all current technical challenges in the System-Wide Safety project.

### HDV Completes VIP Demo Day

POC: [LOU GLAAB](#)

On July 14, the Advanced Air Mobility project's High Density Vertiplex (HDV) subproject team completed a highly successful VIP Demo Day for the recently completed Scalable Autonomous Operations (SAO) flight test. The demonstrations showcased two scenarios used for the SAO test and included approximately 25 in-person attendees along with another 20 virtual attendees, including NASA management. Demonstrations included the nominal baseline and the off-nominal missed-approach scenarios using three live small drones augmented with simulated aircraft.

### SWS Participates on Task Force for Multi-Vehicle Operations Resource Guide

POC: [NATASHA NEOGI](#)

On July 14, Natasha Neogi and other System-Wide Safety (SWS) project researchers attended the kickoff meeting for the American Institute of Aeronautics and Astronautics (AIAA) Advanced Air Mobility task force. This meeting was a follow-on activity focused on supporting multi-vehicle operations, with Kelley Hashemi as

the lead. The goal of the activity is to create a "resource guide" that is delivered to AIAA for distribution by spring 2024. Other SWS project researchers attending the meeting included Mike Politowicz, Ken Goodrich, Megan Chandarana, Corey Ippolito, and Jay Shively.

### SWS Project Collaborating with ODOT

POC: [EVAN DILL](#), [RUSSELL GILABERT](#)  
AND [STEVE YOUNG](#)

System-Wide Safety (SWS) project researchers are leveraging a Space Act Agreement with the Ohio Department of Transportation (ODOT) through the National Advanced Air Mobility Center of Excellence. The primary goal is to conduct a set of collaborative flight operations in Ohio focused on advancing the concept of an In-Time Aviation Safety Management System. SWS researchers are working on defining flight test system requirements, development of relevant scenarios, and gaining all necessary internal approvals toward a full flight campaign during summer 2024. As a secondary goal of this collaboration, SWS subject matter experts are participating in a set of virtual drone flight scenarios and providing feedback on ODOT's draft procedures for flight operations as well as valuable insight to ODOT to help craft relevant, well-informed guidelines for flight operations.

### IASMS Closeout Event Conducted at NASA Ames

POC: [NIKUNJ OZA](#), [CHAD STEPHENS](#)  
AND [ABIGAIL GLENN-CHASE](#)

On July 18, the System-Wide Safety project conducted a closeout of its Technical Challenge 1, In-Time Terminal Risk Management. The event was hosted by the NASA Aeronautics Research Institute at NASA's Ames Research Center in California and was broadcasted virtually via YouTube. The purpose was to highlight the research and progress toward an In-Time Aviation Safety Management System (IASMS) for commercial operations. The agenda included an overview of the System-Wide Safety project; perspectives from the FAA, airlines and airframers; briefings on human performance and fatigue and human contributions to safety; roundtable discussions on "Integrating Human Factors Work in the New Era of Aviation" and "Building on NASA's Safety Foundation in a New Era of Commercial Aviation"; and a discussion on machine learning algorithms. There were more than 200 registrants at the event with approximately 40 people attending in person. New technologies developed in Technical Challenge 1 identified emerging risks and monitored safety margins before an accident occurs, not after. Powered by prognostic and predictive risk assessment algorithms and human



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*In-Time Terminal Area Risk Management closeout event.*

factors research, this work will both improve today's safety management systems and help us shape future operational systems.

### **AAM Research Capabilities Identified to Help Enable FAA Implementation Plan**

POC: [IAN LEVITT](#)

The Air Traffic Management – eXploration project's Urban Air Mobility Airspace Management subproject is leading a joint effort with the FAA's William J. Hughes Technical Center (WJHTC) and industry representatives to conduct an operational integration assessment. The purpose of this effort is to define a mature Advanced Air Mobility (AAM)

architecture and to identify where more research is needed for safe integration. An update for this work was presented to the WJHTC and NASA management on July 18. The operational integration assessment is conceptualizing and evaluating a realistic evolution of Urban Air Mobility operational scenarios fully integrated into the National Airspace System – leveraging a joint simulation environment in which NASA research software and concepts can interact with the FAA's high-fidelity, high-technology-readiness-level operational software and procedures. NASA will provide the joint test environment, as well as the Advanced Trajectory Services Toolkit for Integrated Ground and Air Research (ATS-TIGAR). This

allows for rapid prototyping and evaluation of new operational concepts, including new aspects such as vertiport operations, fleet management, and strategic conflict management for multiple operators managing hundreds of operations. Per the FAA's request, ATS-TIGAR is in the process of completing the technical transfer process to fill critical gaps in the WJHTC's test and evaluation infrastructure.

### **ATM-X Hosts a UAS ATC Voice Communication Meeting**

POC: [KURT SWIERINGA](#)

On July 19, the Air Traffic Management – eXploration (ATM-X) project hosted an Uncrewed Aircraft System (UAS) Air Traffic Control (ATC) voice communication technical interchange meeting at NASA Headquarters in Washington, DC. Participants included Reliable Robotics, FAA partners, and RTCA and discussions occurred on voice communication requirements and limitations, as well as test results. The next steps include discussions to establish voice requirements and plans for future demonstrations.

### **AOSP Hosts Meeting for Remotely Supervised Operations**

POC: [SHIVANJLI SHARMA](#)

On July 20, representatives from AOSP met with industry

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partners at NASA Headquarters in Washington, DC to discuss future collaboration opportunities with the Air Traffic Management – eXploration project’s Pathfinding for Airspace with Autonomous Vehicles (PAAV) subproject. Industry partners included Collins Aerospace, Reliable Robotics, Wisk, and ITS America. The PAAV team updated its objectives to reflect an updated skill set that is now present given the consolidation of the PAAV, Automated Flight and Contingency Management, and National Campaign Integration of Automated Systems activities, as well as a much tighter scope with a focus on requirements and standards needed to enable remotely supervised fixed-wing operations for cargo and passenger transport. To support these new objectives, this meeting had a goal to discuss forming a coalition of partners to create a swath of airspace and infrastructure at a key site – enabling consistent research and development flight testing for increasingly automated operations. The use cases include remotely supervised cargo operations, remotely supervised passenger regional operations, increasingly automated integrated flight concepts that require an integrated air/ground architecture for detect and avoid, and the associated key infrastructure services that are required to enable routine operations for these use cases.

### SWS Researcher Participates at SAE’s Committees Meeting

POC: [STEVE YOUNG](#), [LILLY SPIRKOVSKA](#)  
AND [EVAN DILL](#)

On July 24–28, System-Wide Safety (SWS) project researcher Mallory Graydon participated in the 2023 Quarter 2 plenary meeting of SAE’s S-18, S-18A, and S-18H committees at SAE’s headquarters. S-18 has completed revisions to two well-known aviation safety standards: ARP4754A “Guidelines for Development of Civil Aircraft and Systems” and ARP4761 “Guidelines and Methods for Conducting the Safety Assessment Process on Civil Airborne Systems and Equipment.” Revised versions of these standards, ARP4754B and ARP4761A, are likely to be released later this year. S-18, S-18A, and S-18H committees are also writing reports on:

- 1) the subject of “generic errors,” including the meaning of the “no single failure” requirement for critical functions and whether this can be addressed by development assurance or diversity;
- 2) the use of the Systems Theoretic Process Analysis in a civil aviation context;
- 3) the applicability of ARP4754B and ARP4761A processes to drones;
- 4) the interaction between human factors-related assurance activities and the safety assessment process; and
- 5) the use of tools and modeling in aircraft development.

### AOSP Participates at EAA AirVenture Oshkosh

POC: [WILLIAM CHAN](#), [MICHAEL VINCENT](#)  
AND [KAREN CATE](#)

AOSP’s projects were well represented at the Experimental Aircraft Association (EAA) AirVenture Oshkosh event. Approximately 677,000 people attended and 10,000 aircraft flew in. Teams from the Advanced Air Mobility (AAM), Air Traffic Management – eXploration (ATM-X), Advanced Capabilities for Emergency Response Operations (ACERO), and System-Wide Safety (SWS) projects staffed the NASA pavilion, which had close to 43,000 visitors during the week-long event. AAM project representation included Jake Schaefer and Faisal Omar, who provided a series of briefings discussing High Density Vertiplan research, test, and evaluation. Feedback was extremely positive.

ATM-X staff showcased research in sustainable aviation in the Digital Information Platform and the Urban Air Mobility (UAM) Airspace Management subprojects. The Digital Information Platform team showed how their work improves departure operations using the Collaborative Digital Departure Routing capability, which was supported with a short video. Visitors were able to fly in a fixed-base UAM simulator used to show how UAM aircraft could fly in the National Airspace System. The simulation setup included not only



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the Flyer, but also the Toolkit for Integrated Ground and Air Research, which simulates a UAM fleet operator, mission planner, and vertiport scheduler as well as the Detect and Avoid in the Cockpit research tool.

ACERO team members Bushara Dosa and Vince Varouh discussed the project's efforts with the public. Each day, they presented a 10-minute ACERO spotlight talk featuring the

Unmanned Aircraft System Pilot kit (UASP-kit), which helps increase drone pilot airspace awareness in or near wildland fires. The UASP-kit was developed using off-the-shelf technologies and NASA expertise with the intent to support situational awareness in making live drone operations safer and more effective around wildland fires, which could significantly advance aviation operations. The UASP-kit was well

received by the aviation community at the show. The team collected suggestions for other aerial-operations support tools, including monitoring the sky for drones flying at low altitude for agricultural crop-dusting missions and railroad track safety inspections. ACERO is leading an interagency working group to assess future wildland fire needs and identify the concepts and technologies needed to address these challenges for wildland fire response.

SWS project members shared with the public the experience of a new virtual reality scenario and answered questions about the need for safety in the future of aviation. The virtual reality experience demonstrates how an In-Time Aviation Safety Management System (IASMS) could enable small drones to perform public good missions. The project hosted an interactive daily demonstration presenting the topic "How will air taxis and drones be safe?" that covered how services, functions, and capabilities work; how SWS is testing them; and how they would be used in future safety assessments for AAM. The SWS project's virtual reality IASMS experience, along with streaming video B-roll, showcased safety software developed using SWS research. Bob Cabana, NASA's associate administrator, stopped by to experience the SWS virtual demonstration, initiating a very positive discussion on the safe transformation of aviation.

# TECHNICAL AND PROGRAMMATIC HIGHLIGHTS

## SWS Attends August JIMDAT Meeting

POC: [LANCE PRINZEL](#)

On July 21–Aug. 2, the System-Wide Safety (SWS) project's senior technical advisor Lance Prinzal attended the Joint Implementation Measurement Data Analysis Team (JIMDAT) meeting at Boeing's headquarters in Virginia. JIMDAT monitors the implementation and effectiveness of Commercial Aviation Safety Team (CAST) safety enhancements and recommends modifications and changes to the CAST Safety Portfolio (<https://www.cast-safety.org>). JIMDAT, in conjunction with the FAA's Aviation Safety Information Analysis and Sharing (ASIAS) system, also identifies emerging risks and additional areas of study. Although the proceedings of the JIMDAT meetings are sensitive and details are not reportable, it can be reported that the SWS project provided several critical briefings to JIMDAT to secure new research safety enhancements. SWS's primary role is to provide subject matter expertise addressing current aviation safety issues and supporting JIMDAT's activities and assigned actions. At this past meeting, Prinzal presented a briefing on text data mining and natural language processing of diverse aviation safety data sources to include NASA's

ongoing and planned research and development and future JIMDAT recommendations. At the meeting, SWS was invited to serve on the CAST Safety Management System tiger team. In addition, plans for a technical interchange meeting with the ASIAs team was tentatively scheduled for Sep. 13 at MITRE's headquarters in Virginia. The meeting will be focused on machine learning and advanced data analytics of aviation safety data. Finally, through continued stakeholder engagement with the Air Line Pilots Association (ALPA), SWS was invited to contribute ALPA journal articles on SWS research and participate in the ALPA Annual Safety Summit to be held Sep. 14–15. A meeting between SWS and ALPA leadership is planned for August. NASA continues to work multiple safety enhancements and other actions in support of JIMDAT and CAST, leveraging the SWS project's (and NASA's generally) internationally renowned experts in aviation safety.

## ATM-X Participates in the FAA Drone Symposium

POC: [JOSEPH RIOS](#), [ABHAY BORADE](#)  
AND [JEFF HOMOLA](#)

On Aug. 1–2, the Air Traffic Management – eXploration (ATM-X) project team attended and supported the FAA and Association for Uncrewed Vehicle

Systems International's Drone Symposium in Baltimore. Members of multiple government agencies, community organizations, and broad segments of industry were in attendance. The event consisted of a number of panels and information sessions related to the integration of small drones into U.S. airspace along with the challenges and opportunities of moving toward an info-centric National Airspace System. The primary highlight of the event was the announcement by the FAA's Jeffrey Vincent and NASA's Parimal Kopardekar regarding the establishment of an Unmanned Aircraft System Traffic Management (UTM) key site in the North Texas region. The site will serve as an operational environment where multiple operators and service suppliers can begin routine Beyond Visual Line of Sight operations through a coordinated process between the FAA and NASA. The key site announcement was followed by a dedicated session on early details of the site where NASA's anticipated contributions were clearly highlighted. Joseph Rios, Abhay Borade, and Jeff Homola of NASA's UTM subproject were present to observe the announcement and engage in direct discussions with FAA partners and leadership as well as potential industry participants. For the announced effort, NASA will develop and implement a



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test harness that will serve as foundational infrastructure at the key site for service deployment, as well as data systems necessary for operational analysis. These contributions will be central to provide necessary environment and supporting data to make routine, persistent Beyond Visual Line of Sight operations by multiple operators a reality in the National Airspace System.

### IASMS/FSF/Sky for All Alignment Meeting

POC: [MICHAEL VINCENT](#) AND [KURT SWIERINGA](#)

On Aug. 3–4, an In-Time Aviation Safety Management System (IASMS)/Flight Safety Foundation (FSF)/Sky for All alignment meeting was held at NASA's Langley Research Center in Virginia. The purpose was to help the System-Wide Safety project integrate the IASMS into NASA's Sky for All concept. Participants worked through the four primary safety research and development needs categories for the Sky for All vision, including: 1) Ecosystem Architecture and Performance; 2) Cooperative and Highly Automated Operations; 3) Distributed Information Infrastructure; and 4) In-Time Safety Assurance. Key safety needs and outstanding questions were captured. The outcome of this workshop will inform FSF's effort to develop a roadmap for the Sky for All concept.

### DIP Visits United Airlines Operation Center

POC: [KURT SWIERINGA](#) AND [GILBERT WU](#)

In preparation for the Sustainable Flight National Partnership Operational Demo 1b (Ops-1b), members from the Air Traffic Management – eXploration project's Digital Information Platform (DIP) subproject team were invited by United Airlines to visit their Station

Operation Center and virtual ramp tower at George Bush International Airport (IAH) in Houston on Aug. 8. United Airlines is a DIP partner for the Ops-1b test to be held in Houston's airspace, and was granted access to DIP after signing a NASA information technology security agreement. This allows United the opportunity to provide feedback to improve accessibility and also determine and evaluate how they



*Ron Kline of United Airlines explains IAH's traffic flows to the DIP team.*



*United Airlines' virtual ramp tower at IAH.*



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can use DIP data and services. The DIP team discussed operational challenges and opportunities to collaborate with United to improve sustainability of flights. A few areas of collaboration that could benefit from prototype DIP services include mitigating the impact of thunderstorms in the summer and space launch operations in the Gulf of Mexico. The meeting was productive for both teams. As a next step, the United Airlines team will be visiting North Texas to see DIP services in operational use in early September.

### ATM-X Visits Honeywell Lab in Arizona

POC: [SHIVANJLI SHARMA](#)

On Aug. 8–9, the Air Traffic Management – eXploration (ATM-X) project management team visited the Honeywell Flight Operations Center and Laboratories in Arizona. The purpose of the visit was to exchange information and objectives associated with small drones Beyond Visual Line of Sight routine operations, as well as understand the avionics and airborne radar capabilities needed to support increasingly automated flight operations. Both the NASA and Honeywell teams shared emerging plans and initiatives to determine potential collaboration opportunities. Honeywell’s research and development efforts were found to be in line with a number



*Honeywell’s flight simulation facility.*

of ATM-X project goals. Next steps include a regular series of meetings to share information and updates as well as targeted technical interchanges on a few key topics.

### ATM-X and NARI Visit UAM Demonstration

POC: [KEN FREEMAN](#)

American Airlines’ director of training reached out to the System-

Wide Safety (SWS) project to help address an identified issue that American Airlines pilots were experiencing. As part of the NASA and American Airlines collaboration, the teams worked together to produce a nine-minute human factors video that is being shown to more than 14,000 pilots during recurrent training – required training which started on June 1. Kyle Ellis, Chad Stephens, and Kaitlyn Fox of SWS coordinated with Dan Kiggins, a NASA subject matter expert and American Airlines pilot, to develop a script and shoot the footage remotely and also in the studio at NASA’s Langley Research Center in California. This project was a collaborative effort involving the NASA Langley Media Solutions Branch and Public Affairs, as well as NASA Headquarters in Washington, DC. Content presented in the video demonstrates the feasibility of the concept of the In-time Aviation Safety Management System. Feedback



*Members from the ATM-X project and NARI at Hollister Municipal Airport.*

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from American Airlines regarding the production has been positive. After the video was shown to pilot management, the American Airlines director of training gave feedback that the NASA video is “the most popular part of the training class.” The video is titled “The Future of Aviation Safety.”

### AAM Discussions with AFWERX

POC: [BRYAN BARMORE](#) AND [KYLE ELLIS](#)

On Aug. 17, the Advanced Air Mobility (AAM) Mission Integration Office, associated AOSP projects, and representatives from NASA’s Langley Research Center in Virginia and Ames Research Center in California met with the U.S. Air Force’s AFWERX Agility Prime and Autonomy Prime. The purpose of the meeting was to discuss potential research areas for collaboration. AFWERX conducted a series of center visits earlier this year. This meeting reviewed findings from those visits and identified center facilities that AFWERX would be interested in supporting as in-kind contributions to their Small Business Innovation Research recipients. The meeting also shared some ongoing collaboration areas and NASA project activities that AFWERX is interested in. Follow-on discussions for facility use and collaboration are expected to continue among the appropriate parties.

### ATM-X Visits California Governor’s Office of Planning and Research

POC: [SHIVANJLI SHARMA](#)

On Aug. 18, Shivanjli Sharma of the Air Traffic Management – eXploration (ATM-X) project joined other NASA leaders on a visit to the California Governor’s Office of Planning and Research in Sacramento. Huy Tran, director of Aeronautics at NASA’s Ames Research Center, and Parimal Kopardekar, director of the NASA Aeronautics Research Institute, accompanied Sharma. State of California representatives presented relevant programs of interest to NASA’s research, including zero-emission vehicles, wildfire taskforces, and economic resilience. Discussions were conducted on the sustainable air mobility innovation mission with state representatives, plans for next steps, and NASA’s expected advisory roles in strategic collaboration.

### HDV Conducts Flight Operations this Quarter

POC: [LOU GLAAB](#) AND [JACOB SCHAEFER](#)

The Advanced Air Mobility project’s High Density Vertiplex (HDV) subproject team conducted flight operations in August. The purpose of the tests was to evaluate radio frequency links at increasing ranges in preparation for Beyond Visual Line of Sight flights at NASA’s City Environment Range Testing for

Autonomous Integrated Navigation (CERTAIN) range. The team reached new distances of 1.3 km (0.81 mi) by flying out over the back river, where the vehicle is no longer visible from the takeoff location, and maintained solid signal strength on both command and control links. This was only possible by flying without a safety/visual pilot and relying solely on a remote ground control station pilot. The current limiting factor in distance and routes is the requirement within the Beyond-Visual-Line-of-Sight safety case to be capable of landing within two minutes. The team plans to establish additional landing locations in addition to the current three vertiports to allow for more complex mission routes with increasing distance and scale.

The team received a certificate of authorization from the FAA on Aug. 21 for Beyond Visual Line of Sight operations. The certificate allows NASA researchers to conduct drone operations at the CERTAIN range without visual sight of the aircraft or the airspace. The safety case developed by the Advanced Air Mobility project and the subsequent certificate of authorization issued allows for the project to meet 14 CFR 91.113 see-and-avoid requirements from a remote location through the use of ground-based surveillance systems (Automatic Dependent Surveillance – Broadcast complemented by radar systems)



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as well as onboard autonomous Detect-and-Avoid technologies. The Remote Operations for Autonomous Missions facility within the Air Traffic Operations Lab at NASA's Langley Research Center in Virginia is used as a base of operations and houses the remote-ground control station operator pilot in command, a radar operator, airspace monitor, flight test lead, and range safety officer. Beyond Visual Line of Sight flights are scheduled to begin in September 2023.

### ATM-X Project Office Visits NASA Glenn and Armstrong

POC: [SHIVANJLI SHARMA](#)

Members of the Air Traffic Management – eXploration (ATM-X) project management office team conducted center visits this past quarter. On Aug. 3, the team travelled to NASA's Glenn Research Center in Cleveland to meet with technical leads and researchers, tour facilities, and view capabilities leveraged by the project. The ATM-X team discussed priorities for communications and surveillance research needs across updated objectives to support remotely supervised and increasingly automated operations. Additionally, the team toured NASA's PC-12 aircraft that is being used to collect performance data for existing cellular communications infrastructure to determine its



*PC-12 aircraft at NASA Glenn.*



*Left to right: Kurt Swieringa, Shivanjli Sharma, and Adam Yingling.*



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potential to support a range of Advanced Air Mobility operations and associated flight profiles.

On Aug. 23, the ATM-X team visited with branch chiefs at NASA's Armstrong Flight Research Center in California to provide an overview of upcoming ATM-X activities and discuss resources and planning activities for fiscal year 2024.

Approximately 12 representatives from NASA Armstrong participated. An overview of ATM-X's subprojects was presented, with special attention given to the Pathfinding for Airspace with Autonomous Vehicles subproject, where approximately 75-percent of Armstrong's support to ATM-X will be focused. The primary goal of this meeting was to ensure that the ATM-X planning is well coordinated with NASA Armstrong. Feedback from the branch chiefs indicated that the planned work aligned well with NASA Armstrong's expectations and that they would be able to support the requested resource allocations.

### **PAAV Meets with Northrop Grumman**

POC: [ARWA AWEISS](#)

On Aug. 24, the Air Traffic Management – eXploration project's Pathfinding for Airspace with Autonomous Vehicles (PAAV) subproject team met with Northrop Grumman at their facility in Rancho Bernardo, California. The purpose

of the meeting was to plan a 2023 demonstration toward Unmanned Aircraft Systems in the National Airspace System. Discussions included the status of current flight activity plans, an introduction to Northrup Grumman's Firebird and System Integration Lab, and an overview of their automatic contingency generator.

### **PAAV Data Collection Runs Complete at NASA Langley**

POC: [HEIDI GLAUDEL](#)

On Aug. 29, in support of the Air Traffic Management – eXploration project's Pathfinding for Airspace with Autonomous Vehicles (PAAV) subproject, batch runs have been completed for the Traffic Pattern Integration (TPI) Verification Simulation milestone activity. This work was completed in the Air Traffic Operations Lab at NASA's Langley Research Center in Virginia, and included a year of algorithm and software development and integration in conducting the batch runs. This checkpoint in the milestone activity was achieved after the development and integration of the TPI prototype algorithm into the Urban Air Mobility simulation environment. The PAAV TPI operational focus area is researching ways to enable an uncrewed aircraft to safely and properly enter and fly the traffic pattern in visual-flight-rules conditions at airports without towers.

### **DIP and UAM Provide Updates and Demos**

POC: [GILBERT WU](#) AND [KENNETH FREEMAN](#)

On Aug. 30, the Air Traffic Management – eXploration (ATM-X) project's Digital Information Platform (DIP) subproject provided an update on recent accomplishments and a demonstration to the AOSP management team during a visit to NASA's Ames Research Center in California. The demonstration showed DIP's Collaborative Digital Departure Reroute (CDDR) tool currently being deployed at NASA's North Texas Research Station. Recent updates regarding the partnership engagement, platform development, marketing activities, and Sustainable Flight National Partnership Operations first and second demonstrations were also shared. In addition, the CDDR Airport Surface Model implementation to New York's airspace was presented. This work is in preparation for the third operational demonstration. The updates were well received, and the AOSP team provided good input on DIP's near-term focus and priorities. Gilbert Wu, Swati Saxena, and Jeremy Coupe represented DIP. The ATM-X project's Urban Air Mobility (UAM) Airspace-Management subproject team demonstrated a simulated UAM use case based on Dallas-Fort Worth International Airport. The UAM airspace simulation shows how new

## TECHNICAL AND PROGRAMMATIC HIGHLIGHTS

traffic constructs can help evolve the airspace toward integration with the National Airspace System.

### SWS Holds Annual Leadership Retreat

POC: [KYLE ELLIS](#)

On Aug. 29–31, the System-Wide Safety (SWS) project held their



*SWS planning meeting participants at NASA Langley.*

annual project leadership retreat at NASA's Langley Research Center in Virginia. Day one kicked off with a welcome from Kyle Ellis, SWS's project manager, and a presentation from the keynote speaker, Robert Sumwalt, executive director of the Boeing Center for Aviation and Aerospace Safety at Embry-Riddle Aeronautical University. Sumwalt provided historical perspectives, trends, and justifications for aviation

safety checks while emphasizing and lauding the importance of the SWS project's efforts on in-time aviation safety management. Day two focused on planning and resource allocation for the different technical challenges within the project. Day three concluded with discussions on emerging operations, future strategy, and the paths to



milestone completion. SWS team members visiting from other NASA centers, as well as NASA Langley personnel, enjoyed tours of the various Langley facilities including the hangar, aircraft and flight operations simulators, National Transonic Facility, and a drive-by of the Landing and Impact Research Facility and City Environment Range Testing for Autonomous Integrated Navigation test range.

### UAM Conducts Lessons Learned Meeting at NASA Glenn

POC: [KENNETH FREEMAN](#)

On Aug. 31, the Air Traffic Management – eXploration project's Urban Air Mobility (UAM) subproject held a meeting at NASA's Glenn Research Center in Cleveland. This meeting began the process of documenting the subproject's "Lessons Learned," focusing on research accomplishments, subproject challenges, partnership experiences, and FAA relationships.

### SWS Invited to Participate on Multiple CAST Tiger Teams

POC: [LANCE PRINZEL](#) AND [KYLE ELLIS](#)

The System-Wide Safety (SWS) project was invited to serve on the Commercial Aviation Safety Team (CAST) Safety Management System (SMS) tiger team with additional membership on the steering committee. CAST has established the SMS steering committee and formed four tiger teams: SMS Integration, Data/Metrics, Governance, and Communications and Promotions. SWS has membership on the steering committee for the Subject Matter Expert Integration tiger team. Four working groups have been established: Safety Enhancement

## TECHNICAL AND PROGRAMMATIC HIGHLIGHTS

Effectiveness, SMS Process, SMS Interaction, and Cross-Tiger Team Interaction/Coordination. Nikunj Oza has been proposed for additional membership on the Data/Metrics team. This activity will be an ongoing effort as CAST tiger teams meet multiple times weekly. The objective is to develop CAST with a national-level perspective. An integrated SMS vision is planned with potential modified CAST processes and practices aligned to SMS framework elements. SWS efforts toward development of In-Time Aviation Safety Management Systems in support of FAA and NASA future visions and NASA Strategic Implementation Plan Thrust 5, “In-Time System Wide Safety Assurance,” are expected to help inform CAST efforts as well as further the stakeholder outreach on how safety management will be done in the future airspace.

### **SWS Participates in DARPA ARCOS Meeting**

POC: [LANCE PRINZEL](#) AND [NIKUNJ OZA](#)

Embry-Riddle Aeronautical University was awarded a cooperative agreement to support System-Wide Safety (SWS) research in the area of Human Contributions to Safety. The research is focused on understanding how humans routinely contribute to everyday

operations in the National Airspace System under different operational domains. These include traditional commercial aviation and disaster response operations. The goal of this activity is to explore new data sources and analytical tools (e.g., machine learning and natural language processing) for extracting learning opportunities from all aviation operations. The cooperative agreement will also support other SWS efforts to examine both existing mishap/incident data, experimentally collected data, and line operational data to identify realistic, actionable methods to support and encourage continuous learning at the operator, organizational, and national levels.

### **ACERO Releases RFI for Wildland Firefighting Solutions**

POC: [MARCUS JOHNSON](#)

On Sep. 6, the Advanced Capabilities for Emergency Response Operations (ACERO) project released a request for information (RFI) to identify technologies that address current challenges facing the wildland firefighting community. The RFI seeks information on decision-support capabilities, airborne connectivity and communications solutions, uncrewed aircraft systems traffic management, aircraft operations, autonomy, and others. The request has a response

deadline of Oct. 15, 2023, and was shared across the Aeronautics Research Mission Directorate’s [Twitter](#), [Solicitations page](#), and on NASA’s [LinkedIn](#). The response to this RFI will support development of a partnership strategy for future collaborative demonstrations under the ACERO project.

### **SWS Meets with MITRE on PNT for Emerging Aviation Operations**

POC: [EVAN DILL](#)

On Sep. 6–7, System-Wide Safety (SWS) project researchers conducted a two-day technical interchange meeting with subject matter experts from MITRE. The meeting focused on positioning, navigation, and timing (PNT) for emerging aviation operations. Topics covered included: 1) a refinement of the SWS project’s Navigation Quality Prognostic service (NavQ) to include estimates of multipath; 2) leveraging NavQ to increase position solution accuracy during urban aviation operations; and 3) developing receiver specification recommendations for low-altitude aviation operations. Resulting discussions will be key in collaborations of work going forward. Since 2018, SWS has been collaborating with MITRE on various PNT capabilities.



# TECHNICAL AND PROGRAMMATIC HIGHLIGHTS

## UTM BVLOS Releases RFI

POC: [JOSEPH RIOS](#)

On Sep. 8, the Air Traffic Management – eXploration project’s Unmanned Aircraft Systems Traffic Management (UTM) Beyond Visual Line of Sight (BVLOS) subproject released a Request for Information (RFI). The purpose of the RFI is to gain a better understanding of readiness and willingness of service operators that have built software, publish Unmanned Aircraft Systems Service Supplier (USS) standards, and participate in an initial, operational USS network. Another purpose of the RFI release is to solicit other service suppliers that are building services out of the scope of the current American Society for Testing Materials USS standards.

## DIP Hosts United Airlines Visit to NTX

POC: [JEREMY COUPE](#)

On Sep. 8, the Air Traffic Management – eXploration project’s



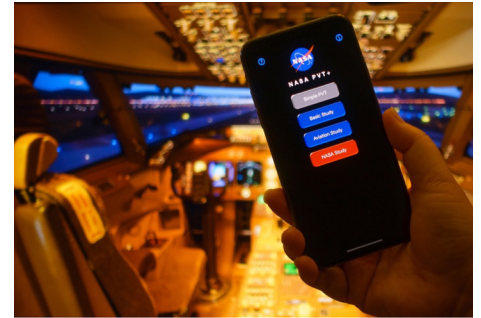
*NASA Glenn team conducting flight tests onboard the Pilatus PC-12.*

Digital Information Platform (DIP) subproject hosted visitors from United Airlines at NASA’s North Texas facility (NTX). United Airlines is one of five major airline partners working with the DIP team. The DIP team demonstrated its Collaborative Digital Departure Reroute tool suites and discussed United Airlines’ participation in the Sustainable Flight National Partnership Ops-1a demo in North Texas. United’s Flow Evaluation Team point of contact shared his perspective on the team’s work and discussed how DIP could be involved. The United team also visited American Airlines’ Integrated Operations Center and exchanged ideas with American’s representatives about improving efficiency of operations. The discussion was fruitful, and follow-on meetings will be held both virtually and in Chicago.

## PVT App Now in Use on the International Space Station

POC: [ERIN FLYNN-EVANS](#)

In early September, researchers from the European Space Agency incorporated the NASA Psychomotor Vigilance Task (PVT) application into systems on the International Space Station for evaluating human performance and circadian rhythms among astronauts. The application was originally developed by researchers in NASA’s Fatigue Countermeasures Lab as part of the System-Wide Safety project to assess human performance among airline



*NASA PVT application into systems on the International Space Station.*

pilots. It features a reaction-time test to gauge alertness and a streamlined process for gathering information that scientists need to understand the relationship between fatigue and operator performance. Operators working in complex real-world situations can use the application to collect valuable research data that will aid the development of reliable fatigue tests and countermeasures in the long term and help promote peak human performance during critical operations. NASA had previously used the app for spaceflight simulations, but this is the first time it will be used in space.

## SBIR Phase II-E Awarded to Robust Analytics for SWANS

POC: [NIKUNJ OZA](#)

Robust Analytics received a NASA Small Business Innovation Research (SBIR) Phase II-E award this September to further the System Wide Analysis Network for In-Time Safety (SWANS). SWANS continuously monitors

## TECHNICAL AND PROGRAMMATIC HIGHLIGHTS

and reports hazards and safety-related events in terminal airspace with trend detection to ensure safe flight operations. SWANS provides continuous airspace safety monitoring by identifying hazards and risk events every minute. This award will increase the scope of Robust Analytics' work to the surface and controllers by adding surface data, identifying anomalous air-ground interactions, constructing proxy controller workload metrics, demonstrating feasibility of capturing errors in controller-pilot audio communications, and developing and deploying methods to identify risk factor dependencies and estimate safety margins of aircraft and airport operations. This work will also advance the goal of the System-Wide Safety project to increase the scope of coverage of the In-Time Aviation Safety Management System to include the full National Airspace System.

### ATM-X Participates at NATCA Communicating for Safety Conference

POC: [SHIVANJLI SHARMA](#)

On Sep. 18–20, the Air Traffic Management – eXploration (ATM-X) project management team participated in the National Air Traffic Controllers Association (NATCA) Communicating for Safety Conference in Las Vegas. The conference is the aviation industry's leading conference focusing on safety,

technology, and relationship building. This three-day conference is the only one to focus specifically on the air traffic needs of all members of the aviation community who are affected within the National Airspace System. ATM-X hosted a booth that focused on its Digital Information Platform subproject and Sky for All. In addition, ATM-X project manager Shivanjli Sharma was a moderator for a panel titled "Meeting the Demands of Tomorrow."

### UTM BVLOS Hosts FAA and Industry Session at NTX

POC: [JOSEPH RIOS](#)

On Sep. 19–21, the Air Traffic Management – eXploration project's Unmanned Aircraft Systems Traffic Management (UTM) Beyond Visual Line of Sight (BVLOS) subproject supported a UTM Key Site Operational Evaluation set of meetings in Dallas. The meetings were hosted at NASA's North Texas Research Station (NTX). The meetings included discussions between FAA, industry small-drone operators, and NASA personnel. The meeting also included a kickoff event for the key site during which presentations were provided to the FAA regional administrator's office, as well as local FAA personnel and state, local, and tribal leadership. The NASA team provided an update and plans related to the UTM network installation and the current approach for testing and data collection.

### SWS Releases PRECiSA Software with New Floating-Point Formalization

POC: [TERRY MORRIS](#)

System-Wide Safety (SWS) project researchers have released the Program Round-off Certifier via Static Analysis (PRECiSA) software. The software is a fully automatic static analyzer for floating-point valued functions. It computes an over-approximation of the round-off error of a given floating-point expression along with a formal certificate that ensures the correctness of the estimated error. The current invention extends the previous invention disclosures (LAR-19010-1, LAR-19227-1, LAR-19739-1).

### SWS to Produce Another Training Video for American Airlines

POC: [CHAD STEPHENS](#) AND [KAITLYN FOX](#)

Based on the success of recent collaborations, American Airlines invited NASA's System-Wide Safety (SWS) project to produce another human factors video to be used for pilot training next spring. The video will examine the decision-making process. SWS researchers hope to interview a NASA astronaut to contribute to the topic. Chad Stephens, Kaitlyn Fox, and Dan Kiggins are working together to produce the approximately 10-minute video.

# TECHNICAL AND PROGRAMMATIC HIGHLIGHTS

## DIP Hosts FAA Visit to NTX and American Airlines

POC: [SWATI SAXENA](#)

On Sep. 21, the Air Traffic Management – eXploration project’s Digital Information Platform (DIP) subproject team hosted members of the FAA’s Systems Analysis and Modeling Division within its NextGen organization. The meeting was hosted at NASA’s North Texas Research Station (NTX) and the primary objective was to familiarize the FAA team with NASA’s Collaborative Digital Departure Rerouting (CDDR) capability, which is currently undergoing operational evaluations in several airline and air traffic control facilities in Texas. This familiarization included briefings, demonstrations, and observations of the CDDR tool in use at American Airlines’ Integrated Operations Center. The CDDR operational evaluation in North Texas is the first in a series of demonstrations that the DIP team is conducting in support of NASA’s Sustainable Flight National Partnership. In addition to the CDDR familiarization, meeting participants also discussed challenges associated with accurately assessing operational impacts of new air traffic management concepts and technologies. Following these discussions, the assembled group exchanged information from their experience applying

machine learning techniques to the prediction of air traffic system of systems behavior.

## SWS Human Machine Teaming NASA Research Announcement Review

POC: [NATASHA NEOGI](#)

On Sep. 21, the System-Wide Safety (SWS) project’s Human Machine Teaming NASA Research Announcement team presented a summary of their progress on the application of the Systems Theoretical Process Analysis technique to an Urban Air Mobility case study. The team is led by Nancy Leveson of the Massachusetts Institute of Technology (MIT), and

the approach focused on how novel hazard analysis techniques could be applied to capture inimical human-machine interactions. The briefing outlined a taxonomy for describing multiple common human-machine teaming paradigms in a control-theoretic framework, and demonstrated how these architectural patterns could be used to surface unsafe collaborative control actions that may otherwise have been undetected at the early phases of design. SWS researcher Natasha Neogi and the NASA technical point of contact for the award arranged for the participation of two other NASA Research Announcement teams from Collins Aerospace and Pennsylvania State University to engage



## Assuring Increasingly Autonomous Systems (IAS) with Non-Traditional Human–Machine Roles: **Interim Report**

Prof. Nancy G. Leveson  
Aeronautics and Astronautics  
MIT

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*SWS planning meeting participants at NASA Langley.*



## TECHNICAL AND PROGRAMMATIC HIGHLIGHTS

interactively during the question-and-answer sessions. This approach fostered a complementary set of research executed across the NASA Research Announcements to address a wide range of human-machine teaming challenges in emerging technologies and operations. These sessions were also attended by external subject matter experts from both the FAA and the Air Force Research Laboratory, who provided valuable feedback.

### PAAV Conducts Multiple TIMs this Quarter

POC: [PATRICIA GLAAB](#), [WANESSA PRIESMEYER](#),  
[DAVID THIPPHAVONG](#), [MIWA HAYASHI](#),  
AND [ARWA AWEISS](#)

Representatives from across the various NASA Aeronautics centers participated in multiple technical interchange meetings (TIMs) supporting the Air Traffic Management – eXploration (ATM-X) project’s Pathfinding for Airspace with Autonomous Vehicles (PAAV) subproject. The first TIM was held in Monterey, California on Aug. 21–22. It included representatives from the ATM-X Project Management Office (PMO) and both the directors of Aeronautics at NASA’s Langley Research Center in Virginia and Ames Research Center in California. Participating also were researchers from PAAV and the Advanced Air Mobility project’s Automated Flight and Contingency Management

subproject, including the Integration of Automated Systems effort as part of the Airspace Procedures and Design subproject. The TIM facilitated discussions between all of these organizations as a leadup to the fiscal year 2024 ATM-X realignment. The PMO presented their vision for PAAV including both top-level and near-term objectives, as well as future goals. This kickstarted more detailed group discussions. The TIM also aided in teambuilding for the emerging PAAV team since it was an opportunity for members of the existing subprojects to have face-to-face discussions. The meeting proved to be productive and provided a foundation for continued PAAV realignment planning.

The second TIM was held at the Bridgeport-Sikorsky Memorial Airport in Connecticut on Sep. 21-22. Shivanjli Sharma and Kurt Swieringa of ATM-X attended along with other project and subproject team members including Adam Yingling, Rafael Apaza, Miwa Hayashi, David Thipphavong, Jordan Sakakeeny, Arwa Aweiss, Patricia Glaab, Tod Lewis, Conrad Rorie, Casey Smith, Husni Idris, Rich Coppenbarger, and David Wing. The team worked diligently in refining and adding detail to the subproject plans. In addition, core planning teams for each of PAAV 2.0’s planned research areas (systems and concept analysis, conflict management, contingency management, and air/

ground service-oriented framework and testing) were formed to develop more detailed plans. These teams will reconvene later this year to integrate their plans into one cohesive plan for the subproject going forward. Finally, some of the in-person participants were briefed by Sikorsky engineers on their ongoing Defense Advanced Research Projects Agency flight test activities and observed the NASA Integration of Automated Systems-1 ground test verification and validation activities.

### DIP Kicks Off SFNP Ops-1b with Houston Air Traffic Control

POC: [SWATI SAXENA](#)

On Sep. 25–26, the Air Traffic Management – eXploration project’s Digital Information Platform (DIP) subproject team met with the FAA’s NextGen organization (ANG) and local Air Traffic Control leadership from Houston’s airspace. The purpose of the meeting was to kickoff discussions of the DIP team’s Sustainable Flight National Partnership Operations (SFNP Ops-1b) testing in Houston. The National Air Traffic Controllers Association national representative for ANG also attended the meeting. DIP leaders presented the subproject’s overall objectives and portfolio, engagement history with FAA, Collaborative Digital Departure Reroute tool and current deployment in North Texas, and

## TECHNICAL AND PROGRAMMATIC HIGHLIGHTS

the deployment and demonstration schedule in Houston airspace for SFNP Ops-1b. The DIP team will be observing Houston operations in their facilities for the next three months to better understand the operations in Houston. The first

three-hour observation session took place on Sept. 27 at the Houston Air Route Traffic Control Center, the FAA Houston Terminal Radar Approach Control Facility, George Bush Intercontinental Airport, William P. Hobby Airport, and

United Airlines' ramp tower. The second observation session is scheduled in early November. The results from these sessions will be presented in January 2024.

## RECOGNITION



*Courtyard of the Formal Structures for Computation and Deduction conference venue, in the building of Civil and Industrial Engineering on the campus of Sapienza University of Rome.*

### International Exposure for SWS Developed Plaidypvs

POC: [J. TANNER SLAGEL](#)

On July 1, System-Wide Safety (SWS) project researcher J. Tanner Slagel presented a paper at the 18th Logical and Semantic Frameworks with Applications Workshop in Rome. This workshop was a satellite event of the Formal Structures for Computation and Deduction. Slagel's paper, titled "Embedding Differential Dynamic Logic in PVS," is available at <https://sites.google.com/ufg.br/lfa2023/accepted-papers>. This work detailed and offered demonstrations of Plaidypvs, a new tool for the formal specification and reasoning of Hybrid Systems, which has been developed by members of the NASA Formal Methods

team under the SWS project. The conference was an opportunity for the presenter to establish new partnerships in industry and academia toward formally assuring cyber physical systems. The conference provided the opportunity to create a coalition with the researchers at the Carnegie Mellon University and Karlsruhe Institute of Technology that created differential dynamic logic, which is the underlying logic that the Plaidypvs tool is based on.

### SWS Manager New Deputy Chair for Large Vehicles Technical Committee

POC: [WENDY OKOLO](#)

Wendy Okolo, associate project manager of NASA's System-Wide Safety (SWS) project, has recently

been named the deputy chair of the American Institute of Aeronautics and Astronautics' Atmospheric Flight Mechanics Large Vehicles Technical Committee. This is an important group for SWS to be able to contribute to their body of work. In this role, Okolo will coordinate with appropriate organizations and agencies to determine the future needs for large atmospheric flight mechanics vehicles and systems while encouraging and supporting technical interchange between the appropriate government agencies, universities, and contractors to advance atmospheric flight mechanics technology for large vehicles. Okolo will also encourage and support the implementation and improvement of atmospheric flight mechanics-related education for large vehicles, as well as review submissions and organize sessions related to technical challenge work that involves larger vehicles such as fixed-wing airplanes and rotorcraft.

### SWS Participates on AIAA Intelligent Systems Technical Committee

POC: [NATASHA NEOGI](#)

System-Wide Safety (SWS) researcher Natasha Neogi served as the American Institute of Aeronautics and Astronautics (AIAA) Intelligent Systems Technical Committee chair at the biannual AIAA Intelligent Systems Technical



## RECOGNITION



*The AIAA Intelligent Systems Technical Committee meeting and AIAA Intelligent Systems Workshop: “New Frontiers in Autonomy” were held at the University of Colorado in Boulder.*

Committee held on July 24. The event was hosted at the University of Colorado in Boulder. Topics included selection of next year’s workshop site, arrangement of joint sessions with other technical committees such as the AIAA Guidance, Navigation, and Controls Technical Committee, and adoption of an official charter.

Concurrent with the Technical Committee meeting, the eighth annual AIAA Intelligent Systems Workshop was held and attended by approximately 50 researchers from industry, academia, and government. The workshop is an important part of the AIAA Intelligent Systems Technical Committee annual activities and provides an informal, unclassified, international forum for the exchange of ideas and information on intelligent systems. The workshop was supported by researchers from NASA’s Langley Research Center in Virginia, including Kasey Ackerman, Irene Gregory, Natasha Neogi, and

Steven Snyder. The workshop included keynote talks, plenary sessions, panel discussions, break out discussions, and laboratory tours. Gregory gave a keynote talk titled “Autonomous Flight: Challenges and Potential Approaches to Contingency Management.” Neogi hosted a breakout session on “Upcoming Standards Approaches for Enabling Autonomy” and participated in the open-mic session. Snyder assisted in the organization of the workshop and judged the student paper and poster competitions.

### **SWS Manager Invited to Fireside Chat at MIT Horizon**

POC: [WENDY OKOLO](#)

On July 25, Wendy Okolo, associate project manager of the System-Wide Safety (SWS)



project, was invited to participate as a guest speaker in a fireside chat with Massachusetts Institute of Technology (MIT) Horizon. Her talk, “Sustainability and Aerospace: Planes, Performance, and People,” provided Okolo the opportunity to discuss her aerospace research, project management, and workforce development perspectives on the sustainability of the aerospace industry and National Airspace System. MIT Horizon is a digital library with exclusive original content on emerging technologies, featuring the latest developments from MIT and beyond to help working professionals quickly understand and apply the latest developments to their work.

### **SWS Manager Presents at the SRLEEA Conference**

POC: [TERRY MORRIS](#)

On Aug. 1, Terry Morris of the System-Wide Safety (SWS) project served as an invited speaker at the Small and Rural Law Enforcement Executives Association (SRLEEA) Conference in Virginia. Morris was asked to discuss technology evolution of artificial intelligence and machine learning and its future impact on law enforcement leadership. The conference represented sheriffs and police departments from all 50 states as well as several Canadian provinces and tribal communities. In the near future, new paradigms and

## RECOGNITION

mental models for drone use will have to be adopted by sheriff and police departments to prepare for these technologies. Morris shared the stage with Alejandro Mayorkas, secretary of the U.S. Department of Homeland Security, and Vanita Gupta, associate attorney general of the United States.

### SWS Manager Gives Talk and Panel Discussion at DoD Conference

POC: [WENDY OKOLO](#)

On Aug. 3, Wendy Okolo of the System-Wide Safety (SWS) project served on a panel and gave an invited presentation at the 4th Annual National Defense and Engineering Graduate Fellowship Conference in San Antonio. Her presentation was titled “From Drones to Air Taxis: Modeling,

Predicting, and Mitigating Unsafe Autonomous Vehicle Operations in the National Airspace.” Sponsored by the U.S. Air Force Office of Scientific Research (AFOSR), the Army Research Office, and the Office of Naval Research under the direction of the Office of the Under Secretary of Defense for Research and Engineering, the 2023 conference was attended by senior Department of Defense (DoD) leaders including Bindu Nair, director for basic research at the Office of the Secretary of Defense; William Roach, the AFOSR chief scientist at the Air Force Research Laboratory; Patrick Baker, director of the Army Research Laboratory; and Michele Gaudreault, deputy chief scientist for the Space Force. The purpose of this conference was to “advance national defense through innovative DoD research

and collaboration by building and strengthening U.S. doctoral power.”

### SWS Researchers Present to ALPA Executive Safety Council

POC: [KYLE ELLIS](#) AND [LANCE PRINZEL](#)



On Sep. 11, System-Wide Safety (SWS) project researchers Kyle Ellis and Lance Prinzel were invited to give a presentation to the Air Line Pilots Association (ALPA) Executive Safety Council Annual Safety Summit in Chicago. SWS is engaged in several research and development collaborations with ALPA member airlines and is currently working to establish additional agreements in support of the project’s efforts toward the next evolution of safety management systems, labeled In-Time Aviation Safety Management System.

### AdaStress Paper Named “Most Visionary” at AAMAS Conference Workshop

POC: [RORY LIPKIS](#)

On Sep. 8, the System-Wide Safety project received word



*Wendy Okolo served on a panel and gave a presentation at the 2023 National Defense and Engineering Graduate Fellowship Conference.*

## RECOGNITION

that its AdaStress team's recent paper, "Discovery and Analysis of Rare High-Impact Failure Modes Using Adversarial Reinforcement Learning- (RL) Informed Sampling" was named "most visionary paper" by the chairs of the Adaptive Learning Agents workshop of the Autonomous Agents and Multiagent Systems (AAMAS) conference. The paper was presented in May 2023. The AdaStress team develops and maintains a set of tools related to adaptive stress-testing of autonomous systems in simulation. These tools attach to pre-existing software or artificial intelligence systems and use a novel blend of statistical and learning-based approaches to elicit and analyze failure modes. In the past, AdaStress has been used to find weaknesses in aircraft collision avoidance systems, providing an important role in the development cycle of these safety-critical components.

### SWS Manager Participates at ALPA International Air Safety Forum

POC: [NIKUNJ OZA](#)

In September, Nikunj Oza, deputy project manager for the System-Wide Safety (SWS) project, participated on a panel titled "Safety Multipliers for Future Operations" at the annual Air Line Pilots Association (ALPA) Air Safety Forum in Chicago. The

panel was moderated by Steve Jangelis, ALPA's aviation safety chair, and included representatives from airlines, manufacturers, the FAA, and MITRE. The panel focused on future technologies and tools to advance aviation safety. Oza presented a sample of NASA's current and long-term future work on developing new technologies for aviation safety. Kim Pyle, executive director for accident investigation and prevention at the FAA, and Sasha Johnson, vice president for corporate safety at United Airlines, will meet with Oza for follow-up meetings to discuss the range of work that he presented. The forum hosted approximately 800 in-person registrants.

### SWS Releases Important Code and is Published in Nature Scientific Reports

POC: [MATTEO CORBETTA](#) AND [CHETAN KULKARNI](#)

A System-Wide Safety (SWS) project research team, in collaboration with the University of Central Florida, presented a paper on a model for a battery discharge and degradation prognosis method. The method is based on physics-informed machine learning, where electrochemistry-based equations are combined with neural networks to take advantage of previous knowledge as well as tune the model with data streams from voltage and current sensors. The model can predict the discharge

profile of a battery given the load input as the battery ages over time. It can predict aging based on data from similar, older batteries and can also estimate the residual capacity based on partial capacity usage. The paper was presented on "Nature Scientific Reports" and the code was made available through the NASA Github repository.

### SWS Manager Selected as Associate Fellow by the AIAA

POC: [STEVE YOUNG](#)

Evan Dill, System-Wide Safety (SWS) researcher and subproject manager, has been selected as an associate fellow by the American Institute of Aeronautics and Astronautics (AIAA). Per the AIAA, "associate fellows are individuals of distinction who have made notable and valuable contributions to the arts, sciences, or technology of aeronautics or astronautics." Dill and his team were notified on Sep. 18 that he had been selected. AIAA will formally honor and induct the 2024 class of associate fellows during its 2024 AIAA SciTech Forum to be held on Jan. 8-12, 2024 in Orlando, Florida. The citation on Dill's selection states: "For outstanding and exemplary contributions to avionics systems engineering, run-time safety assurance applications, and unmanned aircraft navigation in challenging environments."



## RECOGNITION



*Ellis participating at IATA World Safety.*

### SWS Manager Provides Keynote Address at IATA Conference

POC: [KYLE ELLIS](#)

On May 18, Swati Saxena, Jeremy Coupe, and William Chan participated in a panel at the 2023 Artificial Intelligence and Big Data Expo in California. The NASA panel members discussed the application of machine learning to improving airline operations during the panel titled “Real World Application of Artificial Intelligence/Machine Learning (AI/ML) for Managing Airspace Operations.” A goal for the Digital Information Platform (DIP) team was to expand NASA’s connections within this community to accelerate the development and deployment of DIP’s ML/AI-based technologies. The approximately 100-person audience heard how NASA is working with the FAA and airlines to provide sustainable aviation benefits today by saving fuel upon departure out of the

Dallas-Fort Worth area. The panelists discussed NASA’s rich history of air traffic management research, DIP technology, and lessons learned in fielding NASA technology for operational use.

### SWS Participates at 2023 AUVSI Advanced Air Mobility Exposition

POC: [NATASHA NEOGI](#)

On Sep. 26–28, System-Wide Safety (SWS) project researcher Natasha Neogi served on the Advanced Air Mobility panel at the 2023 Association for Uncrewed Vehicle Systems International (AUVSI) Advanced Air Mobility Exposition in Virginia. The panel moderator was John Koelling, director of Aeronautics at NASA’s Langley Research Center in Virginia. Other panelists included Ken Goodrich, Matthew Coldsnow, and Benny Lunsford, all from NASA Langley. The goal was to convene industry, state, and federal officials in the emerging Advanced Air Mobility domain to

explore the exciting developments in the field. AUVSI Hampton Roads and the Virginia Aerospace Business Association hosted the event to explore these innovations, highlight the opportunity for state investment, and articulate paths forward for greater progress.

### ATM-X ICIA Presents ChatGPT at the SERC

POC: [NIPA PHOJANAMONGKOLKIJ](#)

On Sep. 27–28, representatives from the engineering directorate at NASA’s Langley Research Center in Virginia participated in a meeting at the Systems Engineering Research Center (SERC) in Washington, DC. The purpose of the meeting was to present a ChatGPT application in requirement discovery and analysis. Nipa Phojanamongkolkij, lead systems engineer for the Air Traffic Management – eXploration (ATM-X) project’s Integrated Concepts and Interim Architecture (ICIA), described how she and her colleagues are leveraging ChatGPT (a version approved for use by NASA) to improve how information is captured and synthesized for systems engineering. This innovative work was started as part of the Urban Air Mobility systems engineering research and is expected to be continued as part of the ICIA effort. The presentation was well received and initiated an insightful dialogue with the systems engineering community at large.

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