



# AOSP Newsletter

Airspace Operations and Safety Program (AOSP)

JUL-SEP 2024 | Quarter 4



AMP Team Completes Midterm 3  
UAM Operations Class B Airspace  
SimEval

SWS-Developed Technology 16  
ODIN-RS Fire Alarm Decreased  
Critical Warning Time

## AOSP IN THE NEWS

### [NASA Pod Helps Self-Flying Aircraft “See” Surroundings](#)

Flying Magazine (8/29) reports “Advanced air mobility (AAM) aircraft, including electric air taxis and drones, are beginning to hit the skies, and NASA has skin in the game. On Monday NASA introduced the

Airborne Instrumentation for Real-world Video of Urban Environments, or AIRVUE—a specially designed pod that attaches to the bottom of a helicopter and can train AAM aircraft to ‘see’ obstacles in their path. The technology is designed to hone computer vision systems for autonomous flight.”

## TECHNICAL AND PROGRAMMATIC HIGHLIGHTS



*Air Traffic Operations Lab - midterm operations, medium-demand scenario.*

### AMP Team Completes Midterm UAM Operations Class B Airspace SimEval

POC: [JASON PRINCE](#)

The Air Mobility Pathfinders (AMP) project completed the second session of a real-time, immersive, distributed simulation evaluation (SimEval) on Sep. 24–26. The AMP project's Integrated Airspace team within the Airspace Operations subproject conducted the SimEval and represented midterm Urban Air Mobility (UAM) operations in a Class B airspace using the NASA/FAA Laboratory Integrated Test

Environment. An initial dry run of a real-time, immersive, distributed SimEval was completed Aug. 27–29. As in the Aug. dry run session, the purpose of the test was to understand how strategic conflict management strategies (airspace organization, demand capacity balancing, and sequencing) can be effectively implemented to manage midterm UAM traffic demand and the necessary information exchanges between the pilot-in-command/Air Traffic Control (ATC) emulated Provider of Services to UAM, fleet management, and vertiport management

under nominal and off-nominal conditions. The research objectives of these activities included assessing throughput and capacity constraints of the scenarios, evaluating the implementation of strategic conflict management approaches to manage potential UAM operations demand, and exploring extensible traffic management and air traffic management interoperability in a high fidelity live-virtual-constructive environment. This test continued to the inclusion of multiple nominal UAM mission types for cooperatively managed operations within a complex metropolitan

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*Top: UAM Flyers - midterm operations, medium-demand scenario.*

*Middle: UAM Flyers - midterm operations, medium-demand scenario.*

*Bottom: Flight managers - midterm operations, medium-demand scenario.*

airspace. The Sep. SimEval included:

1. new variations of low- and medium-demand traffic levels for midterm operations;
2. addition of two piloted UAM flyers;
3. a runway configuration change use case to evaluate the ability of controllers to adequately manage the legacy traffic and UAM operations after a traffic flow change and determine when rerouting is necessary to alleviate workload increase;
4. managing of unanticipated contingencies such as inoperable digital communications and voice communication failures for specific flights; and
5. out-the-window and digital communication visual enhancements.

The Aug. and Sep. activities included a cooperative environment to reduce ATC interaction, digital communications to reduce frequency congestion and reduce pilot/ATC workload, and enhanced flight deck technologies to improve pilot navigation precision, route conformance, and traffic awareness. Feedback from participants is expected to assess the feasibility of the procedures to reduce workload and support increased scalability. NASA personnel who are FAA-certified pilots volunteered as UAM Flyer pilots while FAA personnel at the William J. Hughes Technical Center participated as ATC and piloted virtual legacy traffic.

## TECHNICAL AND PROGRAMMATIC HIGHLIGHTS

### ACERO Briefs CALFIRE on Airspace Management System Development

POC: [HILLARY SMITH](#)

The Advanced Capabilities for Emergency Response Operations (ACERO) project and representatives from the California Department of Forestry and Fire Protection (CALFIRE) held a meeting at NASA's Ames Research Center in California on Jul. 2. Parimal Kopardekar, director of the NASA Aeronautics Research Institute and NASA's mission integration manager for Advanced Air Mobility, organized and hosted the meeting. Acting ACERO project manager Min Xue and ACERO chief project engineer Joey Mercer attended the meeting. Xue provided presentations on Unmanned Aircraft Systems (UAS) Traffic Management (UTM) concepts, and the project's airspace management system known as UTM-in-a-Box, developed for wildfire operations. Project management also shared ACERO's partnership and field validation plans, technology transfer goals, and desired outcomes. ACERO and CALFIRE discussed technical features that could enhance the project's airspace management system and provided feedback on field testing and validation. Both parties expressed a keen interest in deepening collaboration and technology integration – agreeing

to establish a non-reimbursable Space Act Agreement soon and to continue engaging CALFIRE on future technology integration opportunities. Huy Tran, director for aeronautics at NASA Ames, attended the meeting and provided programmatic guidance. CALFIRE attendees included Chris Willson, assistant chief for Tactical Air Operations - UAS Program; Peter York and Scott Eckman, battalion chiefs for Tactical Air Operations - UAS Program; Marcus Hernandez - deputy chief for the Office of Wildfire Technology Research and Development; and Josh Silveira, battalion chief for CALFIRE's San Benito-Monterey unit.

### SWS Researcher Provides Briefing to JIMDAT

POC: [MICHAEL VINCENT](#)

On Jul. 9, NASA Ames Fatigue Countermeasures Lab director and System-Wide Safety (SWS) project subject matter expert Erin Flynn-Evans provided a briefing of the panel report, "Assessing Fatigue Risk in FAA Air Traffic Operations," to the Commercial Aviation Safety Team Joint Implementation and Data Analysis Team (CAST/JIMDAT). The panel report involved a wide review of FAA documentation as well as 25 meetings and interviews with FAA personnel. The report provides 58 opportunities to improve air traffic controller fatigue including

staffing, scheduling, policy, and health changes. During 2023, the FAA administrator selected Flynn-Evans to participate on the panel with two other leading fatigue researchers from outside NASA. CAST/JIMDAT was founded in 1997 to employ an integrated, data-driven strategy to reducing the risk of fatalities in commercial aviation and includes representatives from commercial airlines, unions, and the FAA.

### AMP Holds Internal Technical Challenge Concept Review

POC: [NICOLE DAWKINS](#)

On Jul. 10, the Air Mobility Pathfinders (AMP) project held an internal technical challenge concept review (TCCR) in support of its first technical challenge (TC-1): Urban Air Mobility Midterm Strategic Planning and Deconfliction in Cooperative Areas. The AMP System Engineering and Integration team facilitated the virtual briefing. The review was attended by all AMP team members, members of line management, and stakeholders from the four NASA Aeronautics centers. The purpose of the review was to examine the proposed research areas, technical objectives, stakeholders, and other deliverables that contribute to meeting AMP's mission goals and objectives related to TC-1. The briefing included an overview of AMP by its project manager Karen

## TECHNICAL AND PROGRAMMATIC HIGHLIGHTS

Cate, an introduction by AMP’s chief engineer Colin Theodore, and a TC-1 overview presented by AMP’s deputy project manager for technology Ken Goodrich. The AMP team will address actions and questions resulting from the review in the coming weeks.

### SWS Conducts Technical Interchange with Alaska Airlines

POC: [MICHAEL VINCENT](#)

On Jul. 11, members of the System-Wide Safety (SWS) project met with members of Alaska Airlines safety management group to discuss collaborative opportunities for an In-Time Aviation Safety Management System (IASMS). The SWS project team included project manager Kyle Ellis, associate project manager Michael Vincent, subproject managers Chad Stephens and Nikunj Oza, and project researchers Lance Prinzel, Jon Holbrook, and Erin Flynn-Evans. The SWS team discussed avenues for potential partnership for data analytics, human performance and fatigue, human contributions to safety, and the potential for an IASMS dashboard to monitor, assess, and mitigate safety hazards in Alaska Airlines operations. Members of the Alaska Airlines management team expressed enthusiasm and interest in partnering during the meeting. The SWS team will continue discussions with Alaska going forward.



“Air Line Pilot” cover for June/July 2024 issue and image from the April Human Contributions to Aviation Safety article.

### ALPA Magazine Features Invited SWS Project Articles

POC: [KAITLYN FOX](#)

NASA’s System-Wide Safety (SWS) project was invited to author a series of articles for the Air Line Pilots Association’s (ALPA’s) magazine last week. ALPA represents more than 78,000 pilots at 41 U.S. and Canadian airlines – making it the world’s largest airline pilot union. ALPA provides three critical services to its members:

1. airline safety, security, and pilot assistance;
2. representation; and
3. advocacy.

The magazine audience reaches an impressive 100,000+ digital readers and 90,000 print issues circulated. More than 70,000 pilots are part of the readership. This is the third of five articles SWS will author for

### The Important Data You Don’t See

Human Contributions to Aviation Safety

By Human Contributions to Safety Team, NASA System-Wide Safety Project



the magazine in 2024. SWS’s April article, “The Important Data You Don’t See: Human Contributions to Aviation Safety,” was well received by ALPA members. Additionally, SWS worked with AOSP director Akbar Sultan for a series kickoff guest commentary on “Working Collaboratively to Ensure a Safe National Air Transportation System.” Upcoming article topics include fatigue risk management and industry stakeholder engagement.

### SWS Project Awards Phase III SBIR Contract to ResilienX

POC: [STEVE YOUNG](#)

The System-Wide Safety (SWS) project awarded a Phase III Small Business Innovation Research (SBIR) contract to ResilienX, Inc., on Jul. 15. ResilienX, based in

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*ResilienX will integrate and demonstrate NASA-developed IASMS capabilities within the FRAIHM-WORK® platform.*

upstate New York, is a leading developer of safety assurance solutions for autonomous systems. This contract will enable ResilienX to work closely with the SWS project. “We’ve enjoyed a close relationship with NASA around In-Time Aviation Safety Management System (IASMS) development, from early concept of operations development to years of research and development and commercialization of the concepts,” said Andrew Carter, CEO of ResilienX. “This program gives NASA a platform to discover and resolve challenges of technology transfer, identify where standards may be needed, and leverage numerous features of our platform that they do not have to develop themselves. For ResilienX, we can access NASA developed technology and deploy it to commercial

environments. This program is a first step to leverage innovative NASA technology within the emerging IASMS realm, out of the lab and into application, where it can more directly and rapidly make our future skies safer.”

“Working with ResilienX aligns extremely well with our project’s goal to investigate, develop, test, evaluate, and apply safety risk mitigation solutions for the rapidly evolving aviation landscape,” said Steven Young, SWS subproject manager for IASMS capabilities for emerging operations. “Their expertise and innovative approach to safety assurance will be invaluable as we work together to address the challenges and opportunities presented by future classes of increasingly autonomous aviation systems and aircraft.”

### DIP Attends FAA CATI Final Evaluation TIM

POC: [MIWA HAYASHI](#)

Air Traffic Management – eXploration project researcher Miwa Hayashi attended the FAA’s Connected Aircraft Trajectory Information (CATI) Technical Interchange Meeting (TIM) on Jul. 17. Hayashi, in her role as the deputy subproject manager for the Digital Information Platform (DIP), represented the NASA team at the Embry-Riddle Aeronautical University Florida NextGen Testbed facility in Daytona Beach. The CATI TIM provided an opportunity to present and share the final simulation evaluation findings about the benefits of exchanging aircraft operational intent (AOI). MITRE engineers presented their fast-time simulation results using the AOI data from the Boeing and Honeywell flight management system simulators. In addition, Boeing, LS Technologies, and Embry-Riddle personnel provided a real-time simulation demonstration of a hypothetical flight from Salt Lake City to Washington, DC, to showcase several AOI use cases. Members from the Aeronautical Radio of Thailand, Civil Aviation Authority of Singapore, Vietnam Air Traffic Management Corporation, and the Civil Aviation Authority of the Philippines attended the hybrid

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TIM. CATI evaluation findings will support the developments of the International Civil Aviation Organization Connected Aircraft and Flight and Flow Information for Collaborative Environment Release 2 services. For DIP, the exchange of AOI data is of interest and relevant to the planned DIP Sustainable Flight National Partnership Operations 2 flight demonstration.

### DIP Contrails Working Group Lead Attends Workshop

POC: [DOUG CHRISTENSEN](#)

Doug Christensen, the NASA Contrails Working Group lead within the Air Traffic Management – eXploration project’s Digital Information Platform (DIP) team, attended a contrails roadmap workshop organized by Airlines for America in Washington, DC, on Jul. 17. Representatives from Delta, United, American, Alaska, Southwest, NASA, FAA, the Department of Transportation, Department of Energy, Breakthrough Energy, General Electric, Pratt and Whitney, Boeing, Massachusetts Institute of Technology, and more attended the workshop. This was a first in what is expected to be a U.S. industry coalition to support the path going forward in addressing the rising concerns about how to manage contrails. There is significant activity around contrails management in Europe and this gathering and the coal-

ition in the United States will be used to guide U.S. research plans.

### DIP Team Holds TIM with BCG

POC: [ERIC CHEVALLEY](#)

The Air Traffic Management – eXploration project’s Digital Information Platform (DIP) team introduced the Sustainable Flight National Partnership Operational Demonstration series Collaborative Digital Departure Reroute (CDDR) reroute request concept and use case during a Technical Interchange Meeting (TIM) with Boston Consulting Group (BCG) on Jul. 17. BCG has established a non-reimbursable Space Act Agreement with NASA’s System-Wide Safety project. BCG is exploring areas of interest in aviation that could benefit from machine learning models and artificial intelligence research and development. BCG was onboarded and introduced to DIP on Jul. 7 and since has shown interest in CDDR technology. BCG and DIP exchanged discussions about potential areas of development that could benefit the aviation community. The DIP team offered to provide feedback on potential work.

### AOSP Participates in NASA/FAA Quarterly Review

POC: [KENNETH FREEMAN](#), [SHIVANJLI SHARMA](#), [JOEY RIOS](#) AND [KAREN CATE](#)

Representatives from AOSP projects participated in the NASA/

FAA Quarterly Review on Jul. 22–25. The NASA Aeronautics Research Institute (NARI) hosted the review at NASA’s Ames Research Center in California. The first day focused on activities related to the Advanced Air Mobility research transition team (RTT) and automation workshop. The second day focused on the FAA’s Low-Density Unmanned Aircraft System Communication Evaluation project and on AOSP project activities including the Digital Information Platform, NAS Exploratory Concepts & Technologies activities such as extensible Traffic Management and Upper Class E efforts, Pathfinding for Airspace with Autonomous Vehicles, and also Aviation Large Language Modeling. The third day included discussions on the Unmanned Aircraft Systems (UAS) Traffic Management (UTM) Key Site operational evaluation, implementation discussions, the near-term approval process, UAS Service Supplier criteria, and UTM RTT discussions. The final day’s discussions focused on Digital Constraint, NARI Large Language Modeling efforts, Flight Data-Collaborative Decision Making, Advanced Methods, Adaptive learning for Flow Management and Routing Decision, and responsible artificial intelligence. In addition, wildfire discussion planning activities also occurred.



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*Daniel Mulfinger briefing the AirVenture attendees about how NASA's CDDR tool works.*

### SWS Project Awards Phase III SBIR Contract to ResilienX

POC: [DANIEL MULFINGER](#) AND [HILLARY SMITH](#)

The Air Traffic Management – eXploration (ATM-X) and Advanced Capabilities for Emergency Response Operations (ACERO) projects were featured in the NASA Pavilion at EAA's AirVenture in Oshkosh, WI, on Jul. 22–28. Representing the ATM-X project's Digital Information Platform (DIP) subproject team, Daniel Mulfinger showcased the successful results from DIP's Collaborative Digital Departure Reroute (CDDR) tool, which is presently in use operationally by American Airlines and other carriers at Dallas-area airports. The CDDR tool uses machine learning to

identify flights suitable for rerouting around weather-related issues and heavy air traffic and was met with positive feedback from those in attendance. General aviation

pilots were particularly keen to learn whether CDDR functionality could be made available for their use in the future. Mulfinger made connections with pilots, dispatchers, airport personnel, and data scientists – all of whom expressed a positive reception to the project. Also participating at the event, Spencer Monheim, the ACERO project's Second Shift Capabilities subproject manager, shared how the ACERO project will improve wildfire operations during a forum on Jul. 23. Monheim and ACERO public affairs lead Hillary Smith helped staff the exhibit present at AirVenture – an event that typically receives more than 600,000 attendees. Along with other ACERO team members, they showed visitors ACERO's "Uncrewed Aircraft Systems Traffic Management In a Box" and



*ACERO's Spencer Monheim speaks with NASA Administrator Bill Nelson on the project's goals.*

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explained how it could reduce the negative impact wildfires have on our communities and climate. Both Monheim and Smith spoke with NASA Administrator Bill Nelson and Associate Administrator for Aeronautics Bob Pearce on the value of ACERO's mission. During the event, Monheim conducted an interview with EAA Radio on how ACERO concepts and technologies will enable crews to fight fires 24 hours a day. Collectively, the ACERO team engaged thousands on the value of ACERO at this year's EAA AirVenture show.

### **ProgPy Selected as 2024 NASA Software of the Year**

POC: [CHRIS TEUBERT](#)

Last week, it was unofficially announced ProgPy has been selected as the recipient of the 2024 NASA Software of the Year award. It will be announced publicly on Jul. 31 at the ASCEND (Accelerating Space Commerce, Exploration, and New Discovery) Conference in Las Vegas. ProgPy has been developed as a cross-project and cross-mission directorate software package supporting prognostics and health management research over the last 4 years. It is an open-source Python package supporting research and development of prognostics, health management, and predictive maintenance tools. NASA's

System-Wide Safety (SWS) project has contributed greatly to the overall design and development of ProgPy. Specifically, the prog\_server wrapper (currently used in the SWS Safety Service), system of system modeling capabilities, trajectory simulation model, and the motor models are examples of contributions by the SWS project team. SWS is one of the largest contributors to ProgPy. Prognostics is the science of prediction, and the field of Prognostics and Health Management aimed at estimating the current physical health of a system (e.g., motor, battery) and predicting how the system will degrade with use. The results of prognostics are used across industries to prevent failure, preserve safety, and reduce maintenance costs. Prognostics, and prediction in general, is a very difficult and complex undertaking. Accurate prediction requires a model of the performance and degradation of complex systems as a function of time and use, estimation and management of uncertainty, representation of system-use profiles, and ability to represent impact of neighboring systems and the environment. Any small discrepancy between the model and the actual system is compounded. The ProgPy architecture can be thought of as three innovations: the Prognostic Models, the Prognostic Engine,

and Prognostic Support Tools. These three innovations of ProgPy implement architectures and widely used prognostics and health management functionality, supporting both researchers and practitioners. ProgPy combines technologies from across NASA's mission directorates and external partners into a single package to support NASA missions and U.S. industries. Its innovative framework makes it applicable to a wide range of applications, providing enhanced capabilities not available in other, more limited state-of-the-art software packages. ProgPy offers unique features and a breadth and depth of capabilities that are unmatched compared to other software in the field. It is novel in that it equips users with the tools necessary to do prognostics in their applications as-is, eliminating the need to adapt their use case to comply with the software available. This feature of ProgPy is an improvement on the current state of the art, as other prognostics software are often developed for specific use cases or based on a singular modeling method (Dadfarina and Drozdov, 2013; Davidson-Pilon, 2022; Schreiber, 2017). ProgPy's unique approach opens a world of possibilities for researchers, practitioners, and developers in the field of prognostics and health management, as well as NASA missions and U.S.

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industries. SWS researchers who contributed include Katy Griffith, Matteo Corbetta, Chetan Kulkarni, Jason Watkins, Portia Banerjee, Adam Sweet, and Chris Teubert.

### **DIP and American Airlines Researchers Present as Co-Keynote at FAA ATO DELT**

POC: [JEREMY COUPE](#)

Jeremy Coupe from the Air Traffic Management – eXploration project’s Digital Information Platform (DIP) subproject and Tim Niznik, director of Analytics at American Airlines, were co-keynote speakers at the FAA’s Air Traffic Organization (ATO) Data Evolution Leadership Team (DELT) meeting on Jul. 30. The DELT is a group of directors who facilitate data sharing and collaborate on data topics. The presentation was a kick-off for the “Let’s Connect Our Data Speaker Series,” which ran during the end of Sep. The data-focused speaker series is an FAA-wide, ATO-sponsored event focused on data education and centered on the DELT pillars of “Inform, Integrate, and Inspire.” Each month the series features data-centric speakers from government, industry, or academia. The kickoff presentation was attended in-person by 35 ATO executives at FAA Headquarters and more than 220 remote ATO researchers. The DIP team provided a presentation on

the “Use of Artificial Intelligence and Machine Learning (AI/ML) Deployed in Cloud Environment for Real-time Decision Support Systems.” The presentation covered the DIP work on digital transformation of the Airport Surface Model from a monolithic decision support tool to a service-oriented architecture leveraging machine learning and deployed in a cloud environment. The audience showed a strong interest in DIP’s use of machine learning applied to modeling unimpeded trajectories. This can replace physics-based methods requiring detailed adaptations and DIP’s use of machine learning operations that enable scalable, repeatable, and maintainable development of machine learning models in a production environment.

### **ARMD Leadership Shares Wildfire and ATM Efforts at FAA Symposium**

POC: [SHIVANJLI SHARMA](#)

Leadership of NASA’s Aeronautics Research Mission Directorate (ARMD) participated at the 2024 FAA’s Drone/Advanced Air Mobility (AAM) Symposium in Baltimore on Jul. 30–Aug. 1. This annual event brings together government and industry members of the drone and AAM communities. NASA’s AAM mission integration manager Parimal Kopardekar participated

on multiple panels including “The Good, the Bad: Wildfires and Drones/AAM.” This panel covered how drones are supporting wildland fire management efforts as well as the hazards of unauthorized drones flying in the vicinity of wildland fires. During the panel, Kopardekar shared how through the Advanced Capabilities for Emergency Response Operations (ACERO) project, NASA is closing a 94-year gap in aerial firefighting by enabling aerial fire suppression, communications and monitoring 24 hours a day – versus the historic 6-8 hour operations window. Kopardekar also discussed a related enabling technology under the ACERO project called “UTM in a box,” a cooperative airspace management system to improve integration of uncrewed and crewed aircraft during a wildfire, among other capabilities. During the symposium, Kopardekar was presented with a DRONERESPONDERS Public Safety Leadership award. Other NASA attendees included Akbar Sultan, AOSP director; Shivanjli Sharma, Air Traffic Management – eXploration (ATM-X) project manager; Kelley Hashemi, associate director of the Transformative Aeronautics Concepts Program; Steve Weidner, wildland fire and “Sky for All” team member; and Trish Gilbert, ATM-X project senior advisor.

# TECHNICAL AND PROGRAMMATIC HIGHLIGHTS

## Flight Testing of IASMS Capabilities by External Partner Teams

POC: [EVAN GILL](#) AND [STEVE YOUNG](#)

Two partner teams are completing 3-year projects resulting from a NASA solicitation in 2021. Each one focuses on novel In-Time Aviation Safety Management System (IASMS) capabilities that mitigate safety risks anticipated for Advanced Air Mobility operations – including highly automated small uncrewed aircraft systems (UAS) and electric vertical takeoff and landing air taxis. Team 1 is led by George Washington University (GWU) and addresses three challenges:

1. methods to manage the impact winds will have on operational conformance and safety;
2. methods to manage/mitigate risks associated with electric propulsion systems (e.g., vehicle system health prognostics); and
3. how to manage situations where the automation/autonomy becomes non-cooperative if aircraft are highly automated or even partially autonomous.

Developed capabilities apply machine learning techniques and, in some cases, novel design assurance methods. This is done at three levels: mission and trajectory level (Function 1); vehicle and component level (Function 2); and



*Operator Control Station at Ft. Devens Test Range near MIT/LL in Massachusetts.*

airspace/system level (Function 3). The Massachusetts Institute of Technology/Lincoln Laboratory (MIT/LL) team conducted the flight testing near their campus in Massachusetts using UAS and a live virtual constructive simulation environment to test multivehicle interactions. Flight testing was complementary to previous simulation testing and focused on a machine-learning-augmented flight controller and separation assurance agent. Supportive of the testing, a high-fidelity low altitude wind modeling/forecast service was also demonstrated.

Team 2 is led by Virginia Commonwealth University

(VCU) and develops a pervasive monitoring capability. This includes a strong emphasis on cybersecurity-related issues such as developing security solutions to protect from data errors caused by faults or cyberattacks that could lead to system malfunctions or unexpected unsafe behavior. Flight testing was conducted using UAS in Virginia – evaluating monitoring of embedded functions within the flight control system. Independent monitoring can help to mitigate risk due to a diverse supply chain for sensors and processors and the inability to always ensure the trusted delivery of verified firmware updates to the end user; both increase vulnerability to various

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types of cyberattacks. Flight testing evaluated a cybersecurity monitor called the Hierarchical Embedded Cyber-Attack Detection, which is designed to monitor for the effects of cybersecurity attacks and system faults at all levels of the implementation from the physical component interconnect level to the information level. As the project goal implies, several other types of monitors are also part of the pervasive monitoring capability including monitoring for hazards in the operational environment. Some of these were also evaluated. Both teams will deliver final reports summarizing results and findings and computer codes used for testing. Multiple publications have been produced over the period of performance, including papers to be presented at the 2024 American Institute of Aeronautics and Astronautics Aviation Forum. All findings contribute to a Level 1 milestone of NASA's System-Wide Safety project in fiscal year 2025. Team 1 members and points of contact are principal investigator Peng Wei (GWU), Vanderbilt University, University of Texas at Austin, and MIT Lincoln Labs. Steve Young is the NASA POC. Team 2 members include principal investigator Carl Elks (VCU) and the National Institute of Standards and Technology. Evan Dill is the NASA technical point of contact.

### DIP Intern Presents Work at NASA Ames

POC: [ERIC CHEVALLEY](#)

Talin Guliani, a summer intern under the NASA-University of California Berkeley Summer Scholars Intern Program, presented the results of his research supporting the Air Traffic Management – eXploration project's Digital Information Platform (DIP) subproject during two events this past summer at NASA's Ames Research Center in California. The first presentation was to members of NASA Ames senior management on Jul. 25 including Eugene Tu, Ames center director; Dave

Korsmeyer, deputy center director for research and technology; and Panos Papadopoulos, UC Berkeley aerospace engineering program director. Papadopoulos also toured and met with summer interns during the day. Guliani presented his analysis work that culminated with the creation of a post-operational daily report generated with Python language. The report provides important analyses of flight time, distance flown, and vertical and horizontal trajectories between arrival flights on Required Navigation Performance (RNP) versus non-RNP approaches to the George Bush Intercontinental Houston Airport. Guliani's work contributes



*Guliani presents to Panos Papadopoulos, Eugene Tu, and Dave Korsmeyer.*

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to the evaluation of whether RNP approaches could be used more frequently during the Sustainable Flight National Partnership Operational Demonstration in Houston. The second presentation was during a capstone poster session event on Aug. 7. Guliani's work has helped to assess potential benefits for future development of a decision support tool for the traffic management coordinators at the I90 facility in Houston.

### ACERO Team Attends NWCG Fire Tour

POC: [HILLARY SMITH](#)

Several researchers from NASA's Aeronautics Research Mission Directorate and Science Mission Directorate travelled to Idaho for a Fire Tour the National Wildland Fire Coordination Group (NWCG) hosted the week of Aug. 12. The event included tours of incident command posts on multiple fires near the Great Basin area as well as various facilities at the National Interagency Fire Center (NIFC). NASA representatives also met with the NWCG program manager and observed the National Geographic Area Coordination Center and National Multi-Agency Coordinating Group meetings – as well as the daily briefing held at NIFC. The purpose of the trip was to familiarize NASA personnel involved with wildland fire research projects with the day-to-day fire

management operations and fire agency logistics and decision-making structure. ACERO associate project manager for partnerships Kathryn Chapman attended the tour alongside four other NASA attendees.

### AOSP Conducts Ames Center Visit

POC: [HANBONG LEE](#) AND [HILLARY SMITH](#)

AOSP conducted a visit to NASA's Ames Research Center in California on Aug. 12–14. The first day of the visit, AOSP director Akbar Sultan conducted open meetings. Day 2 included AOSP representatives Cheryl Quinn, Michele Dodson, and Jeff Farlin. The day began with an AOSP town hall meeting

conducted by Sultan and lunch with early-career employees. Following lunch, a series of technical demonstrations were provided by researchers working in several projects within the program including the National Airspace System Digital Twin use cases and the ACERO project's Second Shift Capabilities (SSC) team, which presented an xERO case (also known as "UTM in a box"). Alexey Munishkin, a research engineer working for ACERO SSC, and other team members described how an xERO case can provide integrated airspace management and situational awareness for the teams working on wildland fire monitoring and suppression in real time. The software and hardware



*The ACERO project's SSC team presenting an xERO case to AOSP leadership.*

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in the xERO case leverages and adapts previous capabilities developed under the Scalable Traffic Management for Emergency Response Operations activity and Uncrewed Aircraft Systems Traffic Management (UTM) project and takes into account the special needs and constraints present in the wildland fire environments. Additionally, Hanbong Lee presented an overview of NASA's Provider of Services to Urban Air Mobility development status and provided a demonstration of the prototype simulations to the AOSP visitors. After the demonstrations, Sultan provided positive feedback and useful comments regarding the future research and development direction to the Air Mobility Pathfinders project team. On the third day, the AOSP representatives visited four Launch Recover Zone locations that will be used during the ACERO project's upcoming testing and demonstration. The site is located at La Selva Beach in California and managed by the Monterey Bay Test Site. During the visits, ACERO subproject manager Jonas Jonsson presented the test objectives, initial plans, and capabilities to be evaluated – highlighting the role of each zone location in the upcoming Technology Capability Level 1 (TCL-1) shakedown scheduled for Nov. 2024 as well as the final TCL-1 field evaluation test

scheduled for Mar. 2025. This visit provided AOSP with a comprehensive understanding of TCL-1 and the technical capabilities and goals of the mission. With this visit, ACERO aimed to demonstrate the team's ability to successfully advance aviation technologies for firefighting operations. The visit was also attended by NASA Ames director of aeronautics Huy Tran, deputy director Leighton Quon, and acting ACERO project manager Min Xue, with additional support from the Ames aeronautics office.

### SWS Hosts FAA for RTT Planning

POC: [MICHAEL VINCENT](#)

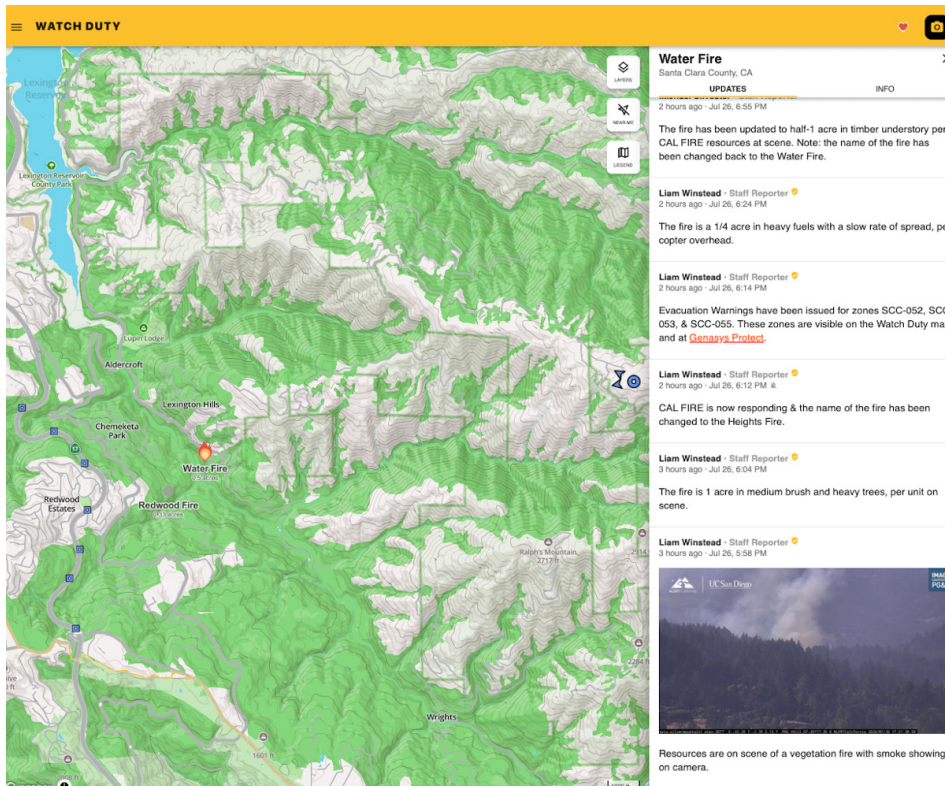
The System-Wide Safety (SWS) project hosted members of the FAA at NASA's Langley Research

Center in Virginia on Aug. 14–15. The purpose of the meeting was to discuss the future of the SWS/FAA research transition team (RTT) working groups. The meeting included a meet-and-greet from NASA Langley acting center director Dawn Schaible and tours of NASA Langley's facilities. Representatives from the FAA's Office of Accident Investigation and Prevention, and Airport Certification Service – as well as senior technical experts Bruce Declean, Kathy Abbott, and Trung Pham – discussed how the RTT working groups could produce deliverables that align to both NASA's and the FAA's strategic goals for the National Airspace System and aviation safety. The attendees concluded the meeting with a plan to meet again remotely to finalize RTT plans.



*Meeting included a meet-and-greet from NASA Langley acting center director Dawn Schaible and tours of NASA Langley facilities.*

# TECHNICAL AND PROGRAMMATIC HIGHLIGHTS



*ODIN-RS Fire Alarm decreased critical warning time by 30 minutes in its first real-world fire alarm.*

## SWS-Developed Technology ODIN-RS Fire Alarm Decreased Critical Warning Time

POC: [HANNAH WALSH](#)

A System-Wide Safety (SWS) project-developed technology, ODIN-RS Fire Alarm, decreased critical warning time by 30 minutes for its first real fire alarm via a Delphire sensor in Lexington Hills – a community in the Santa Cruz mountains. The sensor picked up a fire that threatened the community and relayed the warning to residents 30 minutes faster than the fire was reported on WatchDuty, the current standard for this type of warning.

Delphire is a private company that deploys camera-based early-warning detection systems across fire-prone areas in the western United States. They have partnered with the SWS project to leverage NASA's ODIN-RS software, which is a tailored software architecture to connect sensors with advanced algorithms and integrate data outputs with other third-party services. Jessica McCarty, a wildfire researcher who leads the Biospheric branch at NASA's Ames Research Center in California, said "...this is impactful. Essentially, Delphire-ODIN beat the WatchDuty app, which is considered the

standard for communities right now, and satellite data."

## AMP Team Provides FFC AIS Demonstration for MMAC Visitors

POC: [JILLIAN KEELER](#) AND [ROBERT WOOD](#)

Representatives from the Air Mobility Pathfinders (AMP) project provided a demonstration of the Air Traffic Management Interoperability Simulation (AIS) to visitors from the FAA's Mike Monroney Aeronautical Center (MMAC), including the MMAC director, on Aug. 20. The demonstration was conducted by the Airspace Procedures team under the AMP project's Airspace Operations subproject and was showcased at the FutureFlight Central (FFC) air traffic control tower simulation facility. The demonstration discussed the evaluation of the proposed air traffic control and pilot communications and procedures to support simultaneous



*FFC AIS demonstration.*



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traditional and Urban Air Mobility operations within the Dallas Fort Worth and Dallas Love Field airports under nominal conditions. Participants were shown routes and corridors designed for this research and displays the controllers used to evaluate feasibility and scalability of procedures for both initial and mid-term operations – as well as details on the location of vertiports, design of procedures, controller feedback, and other results related to the test that focused on nominal operations. The demonstration resulted in interest in the FFC facility and its capabilities and generated questions pertinent to the experiment and procedures designed.

### **DIP Team Attends IAH Quarterly Meeting and Visits I90 TRACON**

POC: [ERIC CHEVALLEY](#)

United Airlines invited the Air Traffic Management – eXploration project’s Digital Information Platform (DIP) team to attend the George Bush Intercontinental Houston Airport (IAH) quarterly meeting on Aug. 22. Representatives at the meeting included Houston FAA air traffic control facility personnel and other participating flight operators. The IAH meeting reviewed the operations over the spring and recent weather events that disrupted those operations, as well as providing useful constructions

and United Airlines’ schedule for the next quarter. The DIP representative had opportunities to introduce himself to FAA partners, as well as having fruitful side conversations with United Airlines representatives on the preparation of the Sustainable Flight National Partnership Operations pre-departure rerouting operational evaluation scheduled to start in fiscal year 2025. The DIP team is also invited to attend the next quarterly meeting in Nov. 2024 and present an update on the operational evaluation activities. The DIP representative also visited the FAA Houston I90 Terminal Radar Approach Control (TRACON) facility to observe and discuss operations with the traffic management coordinator. The discussion revolved around DIP’s planned capability to provide a decision support tool to identify potential arrival flights to fly more efficient Required Navigation Performance arrival routes. The discussion within the context of the operations was particularly informative to further understand use cases and the operator’s needs.

### **DIP, Partners Agree on Requirements for SFNP-Ops Evaluation**

POC: [JEREMY COUPE](#) AND [ERIC CHEVALLEY](#)

In a major milestone, the Air Traffic Management – eXploration project’s Digital Information

Platform (DIP) team and field demo partners agreed to a plan of required capability, use cases, schedule, and support and logistics to conduct the Sustainable Flight National Partnership Operation (SFNP-Ops) predeparture rerouting operational evaluation scheduled for fiscal year 2025. This milestone, called “Operational Evaluation Requirement Freeze,” capped nearly 12 months of shadow system evaluation, observations, and discussions of operational opportunities and challenges with field demonstration partners. DIP is proceeding with finalizing software development and deployment as well as collaborating with partners to finalize the preparation for the operational evaluation. Forty-five people attended the meeting, including representatives of the FAA NextGen office, Houston air traffic control facilities, and five airline partners.

### **SWS-Developed fmdtools Approved for Release, Being Used in Industry**

POC: [HANNAH WALSH](#)

As a part of System-Wide Safety’s (SWS) Technical Challenge 5’s (TC-5) design assurance research, the fmdtools python library 2.0 version has been approved for final opensource release. The goal of the fmdtools python library is to support the design of resilient complex engineered

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README License



## Overview

Python 3.11 pypi v1.3.3 GitHub Release v1.3.3 tag v2.0-rc-6 codefactor A tests 301 coverage 88.40% License NOSA  
Software Class E

**fmdtools** (Fault Model Design tools) is a Python library for modelling, simulating, and analyzing the resilience of complex systems. With **fmdtools**, you can (1) represent system structure and behavior in a model, (2) simulate the dynamic effects of hazardous scenarios on the system, and (3) analyze the results of simulations to understand and improve system resilience.

*The updates to fmdtools will enable more accurate modeling.*

systems by providing modeling constructs, simulation capabilities, and built-in analyses that let one rapidly consider the dynamic effects of hazardous scenarios on system performance and safety over time. The 2.0 milestone advances the overall goals of representing human systems and distributed situation awareness in the context of systems-of-systems simulations while rationalizing the underlying modelling formalism and increasing the maturity of the codebase. Final release of the opensource software in August follows an SWS TechTalk that was given on Feb. 8 on the software. The updates to **fmdtools** will enable more accurate modeling for the safety demonstrator series — notably for the upcoming SD-2 simulations.

**fmdtools** has additionally been used in a collaborative project with Boeing to analyze hazards in autonomous systems with artificial intelligence and machine learning perception components.

### SWS Flight Tests In-Time Safety Assurance Capabilities for sUAS by External Partner

POC: [LILJANA SPIRKOVSKA](#) AND [STEVE YOUNG](#)

A team of researchers from the University of Notre Dame (lead) and Iowa State University performed a System-Wide Safety (SWS)-sponsored project (2021–2024) titled “Safe Deployment of Small Unmanned Aerial Systems through On-Board Monitoring and Assessment.” The research addressed three challenges:

1. develop and evaluate automated techniques for predicting, detecting, diagnosing, and mitigating diverse configuration problems and runtime failures in small uncrewed aircraft system (sUAS);
2. deploy these techniques onboard for real time analysis of critical sUAS failures, and off-board via services to aggregate data over time and across multiple sUAS; and
3. assemble and release annotated data sets from flights to support ongoing research by NASA and other researchers.

The flight tests demonstrated automatically detecting and diagnosing a configuration problem in the sUAS software and deploying a reconfiguration strategy to regain flight stability – allowing the sUAS to continue its mission. The University Leadership Initiative (ULI) sponsored project (2023–2026) within the Transformative Aeronautics Concepts Program leverages these advancements and applies them to an expanded scope of safety management. This project is titled “A Safety-Aware Ecosystem of Interconnected and Reputable sUAS.” The team is also expanded to include Saint Louis University, the University of Texas El Paso, DePaul University, and the DRONERESPONDERS Public Safety Alliance. Year 1 versions of developed capabilities for the ecosystem concept were also demonstrated during the flight tests.

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The ULI-sponsored project has an independent advisory board, three of whose members (from Governors State University, University of Nebraska-Lincoln, and Oklahoma State University) indicated interest in bringing their own sUAS and participating in future flight tests. Both NASA projects (SWS and ULI) anticipate a continued and productive collaboration over the coming years via this team.

### SWS Signs Space Act Agreement with Envoy Air

POC: [LAWRENCE PRINZEL](#), [NIKUNJ OZA](#)  
AND [CHAD STEPHENS](#)

NASA and Envoy Air signed a non-reimbursable Space Act Agreement on Aug. 5. The stand-alone agreement is titled “For

Commercial Air Operator In-Time Aviation Safety Management and Safety Intelligence” (#SAA1-40816). A virtual kickoff was held between the System-Wide Safety (SWS) project and Envoy leadership on Aug. 26 to review details of the draft Space Act Agreement language and confirm focused tasks for Year 1 effort that include: (a) research and application of NASA-developed machine-learning algorithms for data analytics of flight operations (e.g., Flight Operations Quality Assurance) focused on etiologies and mitigations of go-arounds, un-stabilized approaches, and procedural conformance (specific to Envoy Air comparative to domestic industry) and (b) human factors assessments.

Planned extensions in out years include other data analytics methods (e.g., natural language processing) and addition of other safety management system data sets (e.g., Aviation Safety Action Program reports; Line Operations Safety Assessments). Other identified potential out-year collaborative efforts involve research and practice of (a) SWS project collaborative efforts with the Flight Safety Foundation to examine positive contributions to safety and how these data types can inform “in-time” risk management and safety assurance and (b) SWS expertise and advanced data analytic capabilities for fatigue risk management and enhanced human performance. The kickoff meeting provided an overview of candidate approaches



*Flight tests demonstrated automatically identifying a configuration problem in the sUAS software and deploying a strategy to regain flight stability, allowing the sUAS to continue its mission.*

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and general collaboration objectives that provided initial airline inputs to help the NASA team develop a more detailed methodology plan and identify various approaches in preparation for an in-person visit to Envoy Air. Envoy Air is a wholly owned subsidiary of the American Airlines Group, of which the SWS project has an active umbrella agreement (#SAA2-403551) with multiple annexes that has similar scope of tasking efforts. The advantage of the agreement with the regional carrier includes the different operations of Envoy Air, compared to American, with both common and unique safety risks and challenges. The collaborative efforts, with both mainline and regional airlines, together is anticipated to yield a more comprehensive analysis of the diversity of operations reflective of the Part 121 operations in the National Airspace System.

### Senior NASA Leaders Visit Airspace Operations Laboratory

POC: [JEFFREY HOMOLA](#)

On Aug. 28, NASA's Associate Administrator James Free, Deputy Associate Administrator Casey Swails, and director of cross-agency strategy John Keefe visited the Airspace Operations Laboratory as part of a visit to NASA's Ames Research Center in California. During their visit, the leaders received an overview of

the Unmanned Aircraft Systems Traffic Management (UTM) efforts NASA has led and the progress being made today under the Air Traffic Management – eXploration project's UTM Beyond Visual Line of Sight (BVLOS) subproject. The foundation the UTM work provided for broader airspace management applications in wildland fire management was discussed and served as a segue for a discussion of the work underway as part of the Advanced Capabilities for Emergency Response Operations project. Central to the discussion was the key enabler that BVLOS operations and autonomous capabilities are for missions ranging from commercial to wildfire and how UTM technologies are making it possible.

### ATM-X Signs Space Act Agreement for ETM Research with Sceye

POC: [KENNETH FREEMAN](#)

The Air Traffic Management – eXploration (ATM-X) project signed a non-reimbursable Space Act Agreement with Sceye, Inc. to conduct research, development, testing, and the evaluation of a prototype NASA Upper Class E Traffic Management (ETM) system. Members of the High-Altitude Platform System alliance are interested in ETM and are willing to collaborate with the ATM-X project's National

Airspace System Exploratory Concepts and Technologies (NExCT) subproject to develop safe, scalable operations within the National Airspace System at high altitudes. Sceye will be working with NExCT on experiments during 2025 on the use of the ETM system to enable cooperative operations in upper Class E airspace through data exchange.

### SWS Completes IASMS Shakedown Flight Campaign with ODOT

POC: [EVAN DILL](#)

The System-Wide Safety (SWS) project, in partnership with the Ohio Department of Transportation's (ODOT's) National Advanced Air Mobility Center of Excellence, successfully completed a flight campaign to test onboard elements of an In-Time Aviation Safety Management System (IASMS) instantiation tailored to contingency management for UAS operations. The goal of the flight campaign was to advance the concept of an IASMS for future highly autonomous operations. These tests evaluated selected elements of the concept over a set of seven scenarios, each designed to elicit desired behavior of onboard capabilities needed for IASMS in-flight mitigation of risk. This was accomplished through stressing the system using a set of off-nominal conditions to confirm expected outputs from highly

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assured functions that perform in-flight safety/risk assessment using an integrated set of safety metrics, traffic collision avoidance, and automated contingency selection. In addition to several developmental tests, 28 full-functionality flights were jointly completed during the months of Jun. and Jul. in Ohio. Lessons-learned and data collected from these flights will play an important role in informing recommendations for IASMS requirements and guidelines – as well as establishing an efficient path to future joint testing with additional external partners as planned for the SWS project’s Safety Demonstrator Series. This work completed a significant milestone in support of the SWS project’s Technical Challenge 5: Advanced Air Mobility IASMS Safety Demonstrator Series, on Aug. 30.

### **NExCT COP Framework Milestone Completion**

POC: [WILLIAM GROSVENOR CUMMINGS-GRANDE](#)

The Air Traffic Management – eXploration project’s National Airspace System Exploratory Concepts and Technologies (NExCT) subproject element milestone, Cooperative Operating Practices (COP) Framework, was completed on Aug. 31. The COP Framework is targeted to future concept of operations in which diverse, optionally crewed operations occur in cooperative

areas. The framework is intended to be implemented in three categories, including airspace management, information management, and traffic management. The goal of the COP Framework is to contribute to enhanced access to the airspace, allowing beyond visual line of sight operations at higher densities than possible with the conventional air traffic management capabilities employed today.

### **ACERO and Ames Aeronautics Team Visit Canada’s National Research Council**

POC: [HILLARY SMITH](#)

Advanced Capabilities for Emergency Response Operations (ACERO) project manager Min Xue, along with other NASA representatives, visited the National Research Council (NRC) in Canada on Sep. 4–5. NASA Aeronautics leadership and project managers from NASA’s Ames Research Center in California accompanied Xue. The group toured two campuses in Ottawa and Montreal. The visit aimed to enhance mutual understanding of each organization’s research activities and to accelerate collaboration between NASA Aeronautics, NASA Ames, and the Canadian NRC in the areas of wildland fire operations and other aeronautics research. During the visit, Xue presented the ACERO project’s advancements in developing an airspace management system specifically for wildland fire

management. NRC senior research officer George Leblanc discussed their work on wildland fire detection and prediction models using satellite and aerial imagery and progress on developing effectiveness measures for wildfire suppression. The discussions included revisiting technical responsibilities outlined in the current draft agreement and exploring how both organizations could synergize their efforts in future collaboration. Both sides expressed a commitment to expedite the process and finalize the collaboration agreement promptly. The visit offered a valuable opportunity to gain a comprehensive understanding of research progress on both sides. Both NASA and NRC teams agreed further collaboration would be mutually beneficial – particularly in the field of wildland fire management. Other NASA Ames attendees included Aeronautics director Huy Tran, chief of the Aviation System Division William Chan, and deputy project manager of the Air Traffic Management–eXploration project Kenneth Freeman. NRC attendees at Uplands in Ottawa included: Mouhab Meshreki, director general of the Aerospace Research Center at the NRC; Heather Wright, director of the Flight Research Lab; Charles Vidal, Integrated Autonomous Mobility program leader; Catherine Clark, acting director of the Aerodynamics Lab; Ali Benmeddour, senior

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*ATM-X attends the second ICAS Digital Pioneering Initiative Workshop in Florence.*

research officer; George Leblanc, senior research officer; and June Sun, client relationship lead. Council attendees in Montreal included Karen Stoeffler, director of the Aerospace Manufacturing Technology Centre.

### **ATM-X Participates at Second ICAS Digital Pioneering Initiative Workshop**

POC: [SHIVANJLI SHARMA](#)

Air Traffic Management – eXploration (ATM-X) project manager Shivanjli Sharma supported the second workshop focused on Digital Pioneering Initiatives at the International Council of the Aeronautical Sciences (ICAS) 34th Congress meeting held in Florence on

Sep. 5–6. The Digital Pioneering Initiative was developed to foster innovative methods of collaboration and cohesion using digital methods to allow researchers and scientists to share knowledge in a more agile fashion. NASA; participants from international agencies such as the German Aerospace Center, Netherlands Aerospace Center, and French Aerospace Laboratory; as well as a number of universities attended the workshop. ATM-X was able to participate in the workshop and share the methodologies it has been developing to share data digitally through a reference platform and an ecosystem of third-party services to support sustainable aviation operations. The workshop allowed for sharing

of the broader sustainable aviation state space and enabled ATM-X to highlight the role of operations in enabling sustainable aviation goals in the near term.

### **NExCT ETM Operational Intent Milestone Completion**

POC: [PAUL LEE](#)

The Air Traffic Management – eXploration project's National Airspace System Exploratory Concepts and Technologies (NExCT) subproject element, Upper Class E Traffic Management (ETM), Operational Intent milestone was completed on Sep. 10. The Operational Intent concept incorporates an application programming interface and a data collection capability that were

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evaluated in the Collaborative Evaluation 1 (CE-1) activity, which explored the notional procedures and information exchange requirements associated with sharing vehicle telemetry and Operational Intent data. CE-1 successfully demonstrated vehicles were able to operate within the ETM arena safely and cooperatively. NASA benefited from CE-1 by gaining a better understanding of the end-user requirements for the ETM system and obtained valuable operational test data to verify service efficiency and accuracy.

### SWS/DoD Collaboration Receives Notice of Allowance from Patent Office

POC: [CHAD STEPHENS](#)

System-Wide Safety (SWS) project researchers, in collaboration with the Department of Defense (DoD), have developed a brain-computer interface (U.S. Patent Application No: US 2024/0264669 A1 (NASA Case No.: LAR-19816-1)) for which the U.S. Patent and Trademark Office has approved to issue a patent on Sep. 13. This new technology, titled “Display System Interface Using Visually-Evoked Cortical Potentials,” involves a new analysis approach to brain-computer capabilities enabling assessment of the user (e.g., attention) to tune the control system for improving performance of the human-computer

interface. The capability is aligned with SWS project research in human contributions to safety and human-autonomy teaming in support of development of an In-Time Aviation Safety Management System.

### UTM BVLOS Attends LEDA Conference

POC: [GITA HODELL](#) AND [JEFFREY HOMOLA](#)

Researchers from the Air Traffic Management – eXploration project’s Unmanned Aircraft System Traffic Management (UTM) Beyond Visual Line of Sight (BVLOS) team attended the Law Enforcement Drone Association (LEDA) conference in California on Sep. 10–11. The conference brought together representatives from public safety, NASA, industry, and multiple

public operators. The purpose was to gather members within LEDA to discuss proper methods for uncrewed aircraft systems (UAS) day-to-day operations and appropriate standards for how teams should build and continue to build their programs. The LEDA conference was a great outreach event for the UTM BVLOS team to hear and ensure the needs of public safety operators are being represented appropriately with UAS operations speedily increasing across the country. This vital feedback from public safety and public operators helped the team to gain an understanding of critical use cases that need representation at all levels. These use cases will help NASA research avenues toward safe and efficient UAS integration into the National Airspace System.



*LEDA conference outdoor flight session displaying drone training and National Institute of Standards and Technology qualification.*

## TECHNICAL AND PROGRAMMATIC HIGHLIGHTS

### DIP and PAAV Teams Attend First ICAO Symposium

POC: [ANDREW GUION](#), [ARWA AWEISS](#),  
[AL CAPPS](#) AND [DOUG CHRISTENSEN](#)

Representatives from the Air Traffic Management – eXploration project’s Digital Information Platform (DIP) and Pathfinding for Airspace with Autonomous Vehicles (PAAV) subprojects attended the 2024 International Civil Aviation Organization (ICAO) Symposium on Non-CO2 Aviation Emissions in Montreal on Sep. 16-18. Representing the DIP team were Al Capps and Doug Christensen. Other NASA representatives included Rich Moore and Jennifer Klettlinger. The primary objectives of the DIP team were to engage in discussions with U.S. leaders and

the international community on operational strategies to mitigate non-CO2 emissions. Additional objectives were to remain apprised of the scientific knowledge on non-CO2 effects and the work undertaken by ICAO and other stakeholders, as well as exploring future activities and measures potentially to mitigate and address these effects considering the existing scientific uncertainties. The ICAO event was reportedly attended by more than 1,500 people from across government, academia, international organizations, and industry and was said to have been the largest event ICAO has ever hosted. The symposium involved panel discussions and workshops that covered the advanced air mobility ecosystem including

electric vertical takeoff and landing aircraft, uncrewed aircraft systems, drones, vertiports, automation, and airspace integration. Representing the PAAV team, Andrew Guion attended as part of the U.S. delegation to the event; the full U.S. delegation included at least 44 individuals from the FAA, Department of Transportation, National Transportation Safety Board, Transportation Security Administration, U.S. Air Force, and NASA. The event discussed existing technologies, ongoing research and development efforts, current challenges, and future work. In conjunction with the official program, the event provided several valuable opportunities to interface directly with prospective PAAV partners in industry and other agencies. These face-to-face interactions were timely as PAAV is actively developing the collaborative planning and joint test and simulation objectives for PAAV’s ecosystem partnerships to resolve current standards gaps facing prospective uncrewed aircraft system IFR operations.

### SWS Researchers Participate at ION GNSS+

POC: [JULIAN GUTIERREZ](#) AND [RUSSELL GILBERT](#)

System-Wide Safety (SWS) project researchers Julian Gutierrez and Russell Gilbert met with MITRE at the Institute of Navigation (ION) Global Navigation Satellite



On the ICAO headquarters symposium floor. From left to right: Al Capps, Doug Christensen, Rich Moore, and Jennifer Klettlinger.



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System + (GNSS+) Conference on Sep. 16-20. The purpose of the meeting was to outline a strategic plan for fiscal year 2025 focusing on their ongoing collaboration titled “Global Navigation Satellite System Study for Improved Performance.” The discussion covered plans for publishing current research, as well as conducting future analyses on upcoming data. Additionally, they carried out a data collection effort around Baltimore using multiple GNSS sensors and radio frequency receivers to build a robust dataset for analyzing multipath effects. This expands on the existing dataset collected by Gilabert in Ohio. The new dataset will be critical for testing the analysis tools developed through this collaboration and will provide additional data points to evaluate tools such as NavQ and other algorithms developed under the SWS project’s Positioning Navigation and Timing effort. Russell Gilabert attended the pre-kickoff meeting for the University Leadership Initiative (ULI) project titled “Safe, Scalable, and Seamless SurfNav4UAS.” The ULI project is part of the Transformative Aeronautics Concepts Program. The meeting centered around introductions of the various partners as well as breakout sessions to discuss the technical challenges related to ULI. The official kickoff meeting is scheduled for Oct. 10. Russell Gilabert also met with a representative from the Technology

Advancement Group to discuss the details of the NASA patent titled “Location Corrections Through Differential Networks System” for potential licensing by the company.

### **SWS Holds MIT NRA Year 4 Final Brief**

POC: [NATASHA NEOGI](#)

The System-Wide Safety (SWS) project held its Year 4 Final Brief-Out for its NASA Research Announcement (NRA) topic, “Assuring Increasingly Autonomous Systems with Non-Traditional Human-Machine Roles,” with the Massachusetts Institute of Technology (MIT) on Sep. 18. The MIT team presented their work on the Systems Theoretic Process Analysis methodology, and they came to definite conclusions on how it could be applied to capture inimical human-machine interactions. They performed a thorough review of their work on identifying patterns related to collaborative templates for interaction paradigms between humans and machines. Additionally, they examined its potential use for flight test engineering. David Sizoo, FAA flight test pilot and program manager; George Romanski, FAA chief scientific and technical advisor for airborne software systems; Colleen Donovan, FAA senior technical specialist for flight deck human factors aviation safety; Johannes Van Houdt, FAA staff

engineer; and Kerianne Hobbs, Air Force Research Laboratory ACT3 safe autonomy and space lead were in attendance and engaged in deep discussions with the MIT team. The other two teams performing on the NRA, Pennsylvania State University and Collins Aerospace, were also present. Natasha Neogi, the NASA technical point of contact for these awards, arranged for the teams to engage interactively during the question-and-answer sessions – enabling a vibrant exchange of ideas across both award efforts. This set of awards fostered a complementary set of research executed across the NRAs to address a wide range of human-machine teaming challenges in emerging technologies and operations and has resulted in a NASA Technical Memorandum that is in the publication process.

### **PAAV and Wisk Hold a Workshop**

POC: [NANCY BACCCHESCHI](#) AND [ARWA AWEISS](#)

Members from the Air Traffic Management – eXploration project’s Pathfinding for Airspace with Autonomous Vehicles (PAAV) subproject team and Wisk convened to finalize the non-reimbursable Space Act Agreement between NASA and Wisk on Sep. 19. The agreement will cover joint activities over the coming years including simulations and flight activities in and around the Hollister Airspace Ecosystem.

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The three annexes build on each other to establish connectivity between the Wisk and NASA simulation laboratories, including development of Interconnection Security Agreements to support tabletops that will lead to air traffic control procedures and routes that will be exercised in simulation; flight testing with a surrogate and onboard safety pilot in the Hollister Airspace Ecosystem; and a capstone activity of flight tests in Edwards Air Force Base's airspace with remotely piloted production-representative vehicle. Flight test activities are also expected to include aspects of a Live Virtual Constructive using both Wisk and NASA assets to provide additional realism in each of the activities.

### DIP Awards Phase III SBIR Contract to ATAC

POC: [YOON JUNG](#)

On Sep. 23, the Air Traffic Management – eXploration project's Digital Information Platform (DIP) subproject awarded a Phase III Small Business Innovation Research (SBIR) contract to Airborne Tactical Advantage Company (ATAC). ATAC is a leading developer of aviation modeling and simulation tools, providing comprehensive analytical and subject matter capabilities to NASA, the FAA, and industry. The purpose of this 12-month contract is to provide a preliminary deployment of ATAC's

Explainable Artificial Intelligence capabilities with a connection to the DIP subproject to enable researchers with access to human-understandable explanations of reasoning behind decisions made by one or more artificial intelligence components of DIP's decision architecture. Through this contract, ATAC will develop explainable methods and apply them to DIP's Collaborative Digital Departure Reroute service subcomponents and demonstrate the explainable techniques for it.

### AMP Provides Demo to NASA Aeronautics' RMO Team at Ames

POC: [HANBONG LEE](#)

Representatives from the Air Mobility Pathfinders (AMP) project

provided an Urban Air Mobility demonstration to members of NASA Aeronautics' Resource Management Office (RMO) on Sep. 24. AMP airspace services team lead Hanbong Lee and AMP project manager Karen Cate conducted the demonstration, which was held at NASA's Ames Research Center in California. RMO representatives included RMO director Bill Harrison, RMO deputy director Marc Birckbichler, and several program analysts. The demonstration depicted how busy air traffic controllers could be if air taxi flights were added to the commercial airline traffic at Dallas Fort Worth International Airport under the current-day operational environment. They also described how new technologies NASA has been developing will be used to



*Urban Air Mobility demo is given to NASA Aeronautics' RMO visitors at NASA Ames Future Flight Central.*

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enable scalable air taxi operations and emphasized the collaborative efforts being conducted with both industry and the FAA.

## **DIP Deploys Platform Software Release v.1.9.2**

POC: [PALLAVI HEGDE](#)

On Sep. 24, the Air Traffic Management – eXploration project’s Digital Information Platform (DIP) subproject successfully deployed Release v.1.9.2 to the platform. This release included key features to support the Sustainable Flight National Partnership Operational Demonstration 1b pre-departure rerouting field demonstration scheduled to start in Houston during fiscal year 2025.

## **ATM-X Subprojects, FAA Work on Space Launch Disruption Management Path**

POC: [KEN FREEMAN](#)

On Sep. 24–25, members of the Air Traffic Management – eXploration (ATM-X) project’s National Airspace System Exploratory Concepts and Technologies (NExCT) and Digital Information Platform (DIP) subproject teams met with the FAA’s Next Generation Air Transportation System office to discuss Space Launch Disruption Management. As the number of space launches increases, the FAA is interested in collaborating with NASA to research methods and tools that

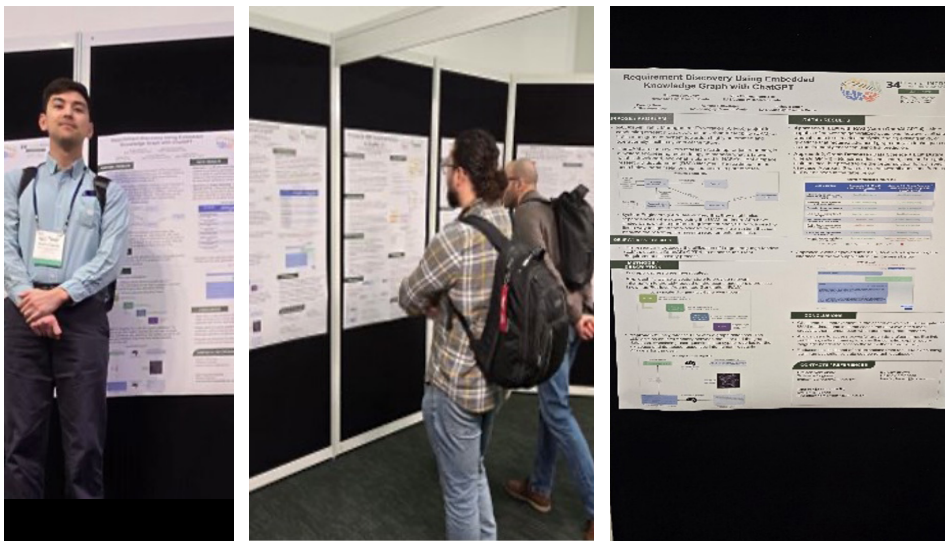
can be leveraged to reduce the impact of space launches on current air traffic. Both the NExCT and DIP teams will continue to work with the FAA to determine if there is a collaborative path forward.

## RECOGNITION

### AMP Team Presents at INCOSE 2024 International Symposium

POC: [BRAXTON VANGUNDY](#)

The architecture portal team within the Air Mobility Pathfinders (AMP)



*AMP team presenting their poster.*

project presented their poster titled “Requirement Discovery Using Embedded Knowledge Graph with ChatGPT” at the 2024 International Council on Systems Engineering (INCOSE) International Symposium held in Dublin on Jul. 2–6. This poster summarized the team’s work focusing on using large language models in conjunction with graph database technology to navigate requirements centered around urban air mobility. The poster was displayed to nearly 800 attendees at the conference and the team made connections with several interested parties from the private

sector including Mitsubishi, Philips, SIEMENS, and STRATA Systems Engineering during the interactive poster session. Attending the conference also allowed the team members to view presentations and

posters showcasing the latest trends in model-based systems engineering and artificial intelligence with system engineering integrations.

### SWS-Sponsored Formal Methods Retreat and Workshop

POC: [AARON DUTLE](#)

The formal methods team within the System-Wide Safety (SWS) project hosted a summer retreat and workshop at NASA’s Langley Research Center in Virginia on Jul. 9–11. The retreat was a combination of research presentations, tool demonstrations,

and formal methods educational talks. Approximately 35 formal methods practitioners attended, including civil servants, contractors, summer interns, and one retired NASA alumnus. The retreat offered the opportunity to present work, discuss projects, and share best practices and lessons learned in a relaxed, collaborative environment.

### SWS Researcher Presents at the IEEE SMC-IT/SCC

POC: [DANIEL HULSE](#)

System-Wide Safety (SWS) project researcher Daniel Hulse gave a presentation at the IEEE Space Mission Challenges for Information Technology/Space Computing Conference (SMC-IT/SCC) workshop in California on Jul. 15–19. His presentation was titled “Foundational Concepts in Simulation-Based Resilience Analysis and Design” at the “What is Resilience? A Workshop on Resilience, Adaptation, and Robustness to Design Resilient Space System Architectures” workshop. This workshop covered basic resilience concepts and had heavy participation from the Department of Defense – which have a strong interest in the protection and resilient operation of U.S. near-space infrastructure. Other researchers from the SWS project shared perspectives on the resilience field at large and the need for cross-domain research collaborations.

# RECOGNITION



SWS project sponsored research was featured in at least 13 authored papers. Researchers served as track and session chairs, and moderated panels.

## AOSP Projects Play Significant Role at AIAA Aviation 2024 Conference

POC: [MICHAEL VINCENT](#), [HANBONG LEE](#)  
AND [SWATI SAXENA](#)

AOSP projects played a significant role at the American Institute of Aeronautics and Astronautics (AIAA) Aviation 2024 Conference held in Las Vegas on Jul. 29–Aug. 2. System-Wide Safety (SWS) project-sponsored research was featured in at least 13 authored papers. SWS subproject manager Nikunj Oza moderated the panel, “Nowcast and

Forecast for Safety Data Analytics,” which brought together commercial aviation safety industry and discussed current developments in safety management systems as well as potential future improvements. Three SWS researchers were session chairs of sessions titled “ATS-18: System-Wide Safety I” (Portia Banerjee), “IS-06: Machine Learning Systems” (Chetan Shrikant Kulkarni), and “ATS-14: Small UAS Technologies and Operations I” (Sequoia Andrade). One SWS researcher was a technical discipline chair of the “Information

Systems Group” (Chetan Shrikant Kulkarni). Additionally, the Prognostics Python Packages team was presented the “NASA Software of the Year Award” at the co-located AIAA ASCEND (Accelerating Space Commerce, Exploration, and New Discovery) event.

Many researchers from NASA, including two team leads in the Air Mobility Pathfinders (AMP) Airspace Operations (AO) subproject, attended the conference to share their research findings, hear from experts in the aviation

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*Hanbong Lee presenting his research paper.*

industry, and connect with other participants from government, academia, and industry. At the conference, AO Airspace Services team lead Hanbong Lee gave a presentation on the Provider of Services to Urban Air Mobility prototype simulation results, served as a session chair for an advanced air mobility/urban air mobility technical session, and attended the air transportation systems technical committee meeting. The AO Airspace Procedures team co-lead Jillian Keeler also made a presentation on the Air Traffic Management Interoperability Simulation results.

Members from the Air Traffic Management – eXploration (ATM-X) project's Pathfinding for Airspace with Autonomous Vehicles (PAAV) subproject team participated at

multiple levels throughout the conference as well. Several members of the PAAV team attended multiple technical and integration committee meetings, which determine the direction of future AIAA meetings. Additionally, PAAV hosted a working group and panel discussion on multi-modal operations including the PAAV use case. PAAV members also participated in a conference working session on metrics relevant to aviation research and were able to disseminate metrics work performed within PAAV to the broader AIAA community. Finally, PAAV members served on a panel that discussed the findings from the Integration of Automated Systems (IAS) flight test series NASA performed in 2023 with Sikorsky and the Defense Advanced Research Projects

Agency. While that work occurred under the AMP project, multiple technologies that were tested under IAS are continuing under PAAV and being adapted to the large uncrewed aircraft system use case.

Also representing the ATM-X project, Digital Information Platform (DIP) subproject manager Swati Saxena participated on the NASA Sustainable Flight National Partnership (SFNP) panel and represented the airspace operations work NASA is doing to contribute to the SFNP mission. Between 200 to 300 people attended the panel, making it one of the largest panels at this year's AIAA Forum. Other panelists included SFNP mission integration manager Rich Wahls and management representatives from the Electrified Power Flight

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Demonstrator, Hybrid Thermally Efficient Core, High-Rate Composite Aircraft Manufacturing, and Sustainable Flight Demonstrator projects. The audience engaged in a lively question-and-answer session with the panelists. The DIP team also presented a technical paper on “A Comparative Study of Contrail Frequency Indices and GOES-16 Contrail Data Set.” Ryan O’Hara, Hok Ng, and Swati Saxena authored the paper. It was well received, and the audience engaged in good technical discussions.

### PAAV Researcher Presents to OTPS

POC: [ARWA AWEISS](#)

Air Traffic Management – eXploration project researcher Vivek Sharma presented at a NASA Office of Technology, Policy, and Strategy (OTPS) technical interchange meeting on Aug. 20. Representing the project’s Pathfinding for Airspace with Autonomous Vehicles (PAAV) subproject, Sharma presented specifically at the Unified Autonomy Technical Interchange Meeting a model-based systems engineering methodology he is developing to build a Dynamic Path Planning automation system in support of advanced air mobility research. His presentation, titled “A Generalizable System Architecture Development

Process,” was well received and generated interest among attendees representing aviation and space domains. The talk focused on the work in progress in developing a systematic process to architect an automation/autonomous system to achieve specified mission objectives. He showed the value of developing a model-based approach, as opposed to a document-based one, to architect complex autonomous systems. A follow-on meeting scheduled for Sep. 2024 will focus on streamlining NASA processes, including the one presented at this meeting, to accelerate the development of high-level autonomy across NASA programs. In addition, Sharma will share his methodology with the Lunar Command and Control Interoperability project team at NASA’s Johnson Space Center in Houston in Oct.

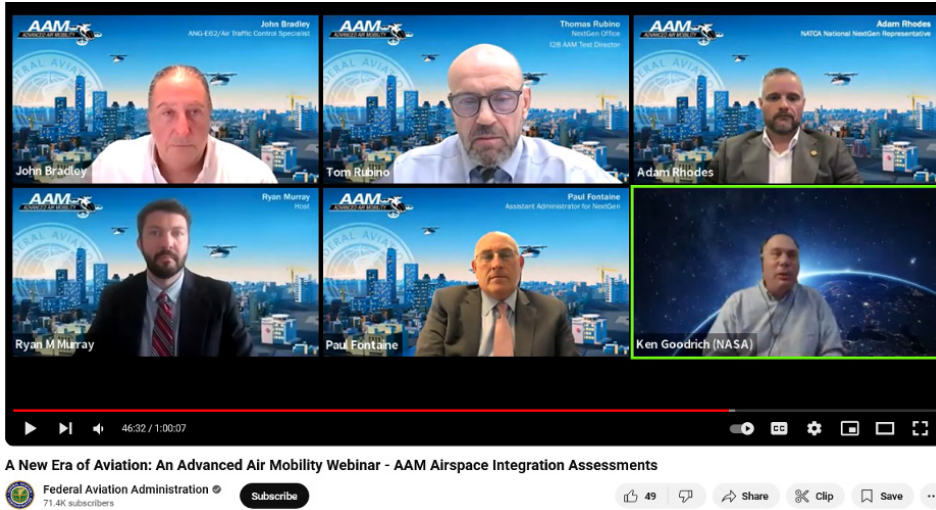
### SWS Researchers Present at ASME IDETC-CIE

POC: [HANNAH WALSH](#)

Members of the System-Wide Safety (SWS) project’s Hazard Analysis Designer team presented multiple papers at the American Society of Mechanical Engineers (ASME) International Design Engineering Technical Conferences and Computers and Information in Engineering (IDETC-CIE) Conference held Aug. 25–28 in

Washington, DC. IDETC-CIE is an academic conference with broad participation from the engineering design community, which focuses on design theory and methodology, design automation and optimization, and computational assistance to the design process (e.g., computer aided design/computer aided engineering). This year, IDETC-CIE hosted papers from authors at several NASA centers ranging from topics like risk analysis, spaceflight simulation, additive manufacturing, and artificial intelligence and machine learning applications. SWS researcher Daniel Hulse presented the paper, “Defining a Modelling Language to Support Functional Hazard Assessment,” authored by team members Daniel Hulse, Seydou Mbaye, and Lukman Irshad in the Design for Resilience and Failure Recovery session. Researcher Lukman Irshad presented the paper, “Identifying Human Errors and Error Mechanisms from Accident Reports Using Large Language Models,” written by team members Lukman Irshad and SWS subproject manager Hannah Walsh in the Systems Engineering and Complex Systems session. Presentations increased awareness of this work within academia and industry and provided opportunity for feedback on future directions.

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FAA livestream of the next installment of its AAM webinar series.

### AMP Researcher Participates in FAA Livestream of AAM Webinar Series

POC: [KEN GOODRICH](#)

On Sep. 11, the FAA live streamed the next installment of its Advanced Air Mobility (AAM) webinar series on the topic of AAM airspace integration assessments. At the invitation of the FAA, Air Mobility Pathfinders (AMP) deputy project manager for technology Ken Goodrich participated in the webinar and presented an overview of AAM integration capabilities and research at NASA – as well as served as a panelist for a question-and-answer session. The livestream is archived at [www.youtube.com/watch?v=3LWkTgxbCSs](http://www.youtube.com/watch?v=3LWkTgxbCSs). Within an hour of the livestream, a representative of the San Francisco International Airport reached out to Goodrich to learn more about

integration of AAM into the airport for future operations.

### SWS Participates at ICAO AAM 2024 Symposium in Montreal

POC: [SUMMER BRANDT](#) AND [NATASHA NEOGI](#)

System-Wide Safety (SWS) project representatives Natasha Neogi and

Summer Brandt participated in International Civil Aviation Organization's (ICAO's) first Advanced Air Mobility (AAM) Symposium in Montreal on Sep. 9–12. Neogi participated on the “Continuous AAM Safety Improvement” panel as an invited panelist. The theme was “Advanced Air Mobility Global Harmonization and Interoperability: Challenges and Opportunities.” The goal of the panel was to explore the role of safety intelligence and safety performance management in continuous improvement of safety across the developing AAM ecosystem. Using safety data and safety information to evaluate what is and what is not working in a system is a valuable and essential management practice. The panel sought to answer questions such as: what are the main steps in continuously improving systems and processes in the developing



Neogi was on the panel titled “Continuous AAM Safety Improvement” as an invited panelist in ICAO's AAM Symposium.



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AAM domain; how does collection and sharing of safety intelligence contribute to proactive safety improvement; and how could AAM stakeholders use safety performance management to improve safety.

### ATM-X Researchers Present at ICAS 2024

POC: [JEFFREY HOMOLA](#) AND [JEREMY COUPE](#)

Researchers from the Air Traffic Management–eXploration (ATM-X) project presented papers at the 34th Congress of the International Council of the Aeronautical Sciences (ICAS) in Florence on Sep. 9–13. Representing the ATM-X project’s Unmanned Aircraft Systems Traffic Management Beyond Visual Line

of Sight (UTM BVLOS) subproject, researcher Jeff Homola co-presented a paper titled “Enhancing Public Good Missions and Disaster Response with Advanced Aerial Technology: Opportunities and Challenges,” which was a joint paper with seven international coauthors submitted on behalf of the International Forum for Aviation Research. For NASA’s contribution, the paper included references to ongoing efforts within AOSP in support of public good missions through the application of assets from small uncrewed aircraft systems to electric vertical takeoff and landing, and high-altitude long-endurance vehicles – as well as the associated traffic management approaches.

The presentation was conducted jointly with a colleague from the Japan Aerospace Exploration Agency with whom NASA has held an agreement with since 2016 for collaboration on unmanned traffic management applications. Homola also served as a session chair for two sessions on optimal operations and Advanced Air Mobility operations, respectively. The event also served as an opportunity to engage with potential international partners as part of UTM BVLOS subproject’s external engagement focus area.

In addition, representing the Digital Information Platform (DIP) subproject, Jeremy Coupe presented a paper titled “Towards



*Jeff Homola at the 34th Congress of the ICAS.*

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Sustainable Aviation with Efficient Airspace Operations.” The paper was coauthored with DIP subproject manager Swati Saxena.

### SWS Participates at FM 2024 Conference

POC: [ALWYN GOODLOE](#) AND [IVAN PEREZ](#)

The System-Wide Safety (SWS) project participated in the planning of and actively participated at the 26th International Symposium on Formal Methods (FM) Conference in Milan on Sep. 9–13. SWS researchers were on the program committee, a full paper presenting SWS research was accepted and presented, titled “Rigorous Floating-Point Round-Off Error Analysis in PRECiSA 4.0,” and Ivan Perez, Alwyn Goodloe, and Frank Dedden presented a half-day tutorial on “Copilot” to researchers working in both industry and academia, titled “Runtime Verification of Hard Realtime Systems with Copilot: A Tutorial.” A paper is also in the proceedings. The symposium is the premiere conference in computer science focusing on formal methods and it is always held in Europe. FM presented an opportunity to introduce Copilot to new audiences, interact directly with end users, gather direct feedback about Copilot’s usability, and improve the training material. Several well-known researchers in the field of runtime monitoring and connected disciplines were in atten-

dance, which allowed discussion of the features of Copilot, use cases, and connections to other tools.

### NExCT Team and SJSU Awarded Best Paper Ahead of DASC Conference 2024

POC: [PAUL LEE](#)

The Air Traffic Management – eXploration project’s National Airspace System Exploratory Concepts and Technologies (NExCT) subproject team, along with representatives from San Jose State University (SJSU), have published student lead papers for both the Aviation Forum 2024 and upcoming Digital Avionics Systems Conference (DASC) 2024. Representing the Upper Class E Traffic Management team, Min Xue and Paul Lee have been working with SJSU professor Wenbin Wei and his students Shayna Gaulden, Tien Nguyen, and Michael Korens, who published student lead papers for conferences. Most notably, the DASC paper titled “Multi-Party Waypoint Plan Negotiation for Upper Class E Traffic Management” has been awarded the Best of Session and Best of Track award, having been identified as one of the top 10 papers in the conference, and will receive the “David Lubkowski Memorial for Advancement in Digital Avionics” best paper award. This is quite an accomplishment, especially for a first-time student-led paper. Korens presented at the Aviation Forum with very positive

feedback. Nguyen will be presenting the paper at DASC. The conference will announce which one of the 10 papers will be selected as the Best of Conference Paper at the award luncheon on Oct. 2.

### AMP Researcher Presents on PSU Research at 8th AAM Infrastructure Workshop

POC: [HANBONG LEE](#)

Airspace Services team lead for the Air Mobility Pathfinders (AMP) project Hanbong Lee was invited as a panelist to the 8th Advanced Air Mobility (AAM) Infrastructure Workshop on Sep. 17–18. The Vertical Flight Society sponsored the workshop in Washington, DC. Due to another commitment supporting the Aeronautics Innovation Forum, Hanbong provided a 10-minute recorded presentation in advance. In his presentation, he described the key elements of the Provider of Services to Urban Air Mobility (PSU), the status of the PSU standard development, and NASA’s contributions to PSU standards. Since his panel session title was the Weather Information for AAM Operations, he also talked about how weather data would be integrated into the system architecture to enable resilient operations. Additional event information can be found at: [https://vtol.org/events/2024-8th-workshop-on-aam-infrastructure/utm\\_source/Electric+VTOL+News/utm\\_campaign/9b73a27776-](https://vtol.org/events/2024-8th-workshop-on-aam-infrastructure/utm_source/Electric+VTOL+News/utm_campaign/9b73a27776-)

## RECOGNITION

### ACERO Project Participates at Miramar Air Show

POC: [HILLARY SMITH](#)

Numerous NASA Aeronautics projects participated as exhibitors at the annual Miramar Air Show in San Diego on Sep. 27–29. Representing the Advanced Capabilities for Emergency Response Operations (ACERO) project,

Hillary Smith engaged thousands of visitors in the ACERO booth and shared how the ACERO project is working to improve wildfire operations. Hillary also participated in a high-level interview about ACERO with a local aviation news outlet. The NASA booth received more than 19,000 visitors during the course of the event.



*ACERO exhibit table in the NASA booth at the Miramar Air Show.*

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