



AOSP Newsletter

Airspace Operations and Safety Program (AOSP)

JAN-MAR 2024 | Quarter 2



AOSP Well Represented at AIAA 3
SciTech Forum

SWS Researchers Invited to 11
Aviation Operations

AOSP IN THE NEWS

[NASA Awards Contract For Aviation, Railroad Safety Reporting Systems](#)

AP (1/27) reports “NASA has awarded a contract to Booz Allen Hamilton Inc. of McLean, Virginia, for the maintenance and operation of incident reporting programs and continuing development to improve current and future reporting systems. The Aviation Safety Reporting System

and Related Systems award is a cost-plus-fixed-fee indefinite-delivery/indefinite-quantity contract managed by the Human Systems Integration Division at NASA’s Ames Research Center in California’s Silicon Valley.”

[Why AI Can’t Replace Air Traffic Controllers](#)

Government Executive (1/30) reports “after hours of routine

operations, an air traffic controller gets a radio call from a small aircraft whose cockpit indicators can’t confirm that the plane’s landing gear is extended for landing. The controller arranges for the pilot to fly low by the tower so the controller can visually check the plane’s landing gear. ... NASA and the FAA are leading the development of a traffic control system for drones and other uncrewed aircraft.”

TECHNICAL AND PROGRAMMATIC HIGHLIGHTS



Top Left: Lance Prinzel and Paul Krois. Top Right: Evan Dill, pictured with AIAA president Laura McGill, became an AIAA associate fellow at a ceremony during SciTech.

AOSP Well Represented at AIAA SciTech Forum

POC: [NIPA PHOJANAMONGKOLKIJ](#), [JEFF HOMOLA](#), [KYLE ELLIS](#), [MARCUS JOHNSON](#) AND [PATRICIA GLAAB](#)

Digital Platform is a concept being developed that ties the workflows of project managers, principal

investigators, and system engineers together across organizational boundaries. In addition, Phojanamongkolkij participated in a panel titled “Compelling Content Corner: AI and the Future of Systems Engineering.”

Researchers from the recently completed Automated Flight

and Contingency Management (AFCM) and High Density Vertiplex (HDV) subprojects also presented papers at the conference. The presentations were part of the planned closeout activities for each of the subprojects. Related to AFCM, the papers documented aspects of Flight Path Management (FPM) automation technologies

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that were integrated and tested as part of the recent Integration of Automated Systems flight-testing activities in collaboration with Sikorsky Aircraft in Connecticut between June and October 2023. One paper, “Sim to Flight: Evaluating Flight Path Management Automation in High Density Urban Environments” (Bryan A. Barrows, Mark G. Ballin, Terique L. Barney, Stewart L. Nelson, Matthew C. Underwood, and David J. Wing), provided an overview of a series of interdependent simulation-to-flight research activities involving large-scale batch simulations, human-in-the-loop verification, and flight test validation of a research prototype FPM automation system. The automation system contributed to its functional assessment in a live-virtual-constructive operating environment characterized by two live aircraft and hundreds of virtual aircraft interacting in a modeled complex urban airspace. Presented also was “An Experimental System for Strategic Flight Path Management in Advanced Air Mobility” (David A. Karr, James L. Sturdy, Bryan A. Barrows, and Mark G. Ballin), discussing anticipated characteristics of Urban Air Mobility operations, modifications that were made to NASA’s Autonomous Operations Planner to adapt to that environment to support the flight test, and observations of software and aircraft performance during the flight test. The last

paper, “Designing a Flight Test of a Flight Path Management System for Advanced Air Mobility Research” (Stewart L. Nelson, Mark G. Ballin, Bryan A. Barrows, Matthew C. Underwood, David J. Wing, James L. Sturdy, and Ethan R. Williams), presented the design, methodology, and challenges overcome to conduct a successful flight test and identified remaining challenges, future work, and recommendations to improve the flight test capability for future efforts. In support of HDV, a total of four publications were presented: three from HDV and one as part of a collaboration between HDV and the Transformational Tools and Technologies project in the Transformative Aeronautics Concepts Program. The topics covered through the presentations were based on the Scalable Autonomous Operations Work Package and focused on the buildup simulation activity, culminating flight test, fleet management system development, and human factors assessments of vertiport management. The collection of publications represented quality research and development by HDV that significantly advanced capabilities for service-oriented airspace research through the ecosystem developed and tested. The work has advanced the level of insight into the potential paradigm shift that the HDV concept and associated technologies will facilitate. Taken together, the presentations

at an international forum such as AIAA SciTech helped to further establish continued U.S. leadership across Advanced Air Mobility. A NASA technical memorandum for the final flight test report is in progress and final publications have been submitted for additional venues in fiscal year 2024. Advanced Air Mobility publications included:

1. Petty, B. et al.’s “High Density Vertiplex: Scalable Autonomous Operations Prototype Assessment Simulation”;
2. Schaefer, J. et al.’s “High Density Vertiplex: Scalable Autonomous Operations Flight Test”;
3. Hodell, G. et al.’s “Progressive Development of Fleet Management Capabilities for a High Density Vertiplex Environment”; and
4. Unverricht, J. et al.’s “Simulated Vertiport Management and Ground Control Station Operations: Continued Human Factors Assessment of Vertiport Operations.”

System-Wide Safety (SWS) project researchers Natasha Neogi and Irene Gregory co-organized a workshop titled “Using Machine Learning for Safety Critical Systems: Technologist and Regulator Perspectives.” This workshop brought together technologist and regulator perspectives on introducing learning-based technologies into

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aerospace vehicles to enable autonomous flight. SWS project leadership and researchers presented at least five papers and participated in numerous tracks as session chairs and panel moderators. Neogi also served as the AIAA Intelligent Systems Technical Committee (ISTC) chair, overseeing the entire Intelligent Systems track with over 30 sessions, and chaired the AIAA ISTC meeting. Evan Dill, SWS subproject manager, ran the digital avionics track and chaired both sessions as a member of the Digital Avionics Technical Committee. Additionally, Dill formally received his AIAA associate fellowship during the awards ceremony.

In addition, Marcus Johnson, project manager of Advanced Capabilities for Emergency Response Operations, presented a paper titled “Flight Test Exploration of Integrated Wildfire Response Operations with Crewed and Uncrewed Air Assets.” The flight test paper focused on the safe integration of uncrewed aircraft systems (UAS) and helicopters in active wildfire disaster response operations. Through UAS simulations and a flight test conducted last year, researchers demonstrated the efficacy of a new situational awareness tool that enables helicopter pilots to stay safely separated from UAS wildfire operations while conducting their own fire suppression missions in

tandem. With additional research, engineers will be able to provide recommendations to standards development organizations to support crewed and uncrewed interactions for disaster response operations. In collaboration with Johnson, the paper was coauthored by NASA researchers Parimal Kopardekar and Jeff Homola, as well as researchers from the Japan Aerospace Exploration Agency.

ATM-X NExCT Conducts Technical Interchange Meeting

POC: [KENNETH FREEMAN](#)

On Jan. 10–11, the Air Traffic Management – eXploration (ATM-X) project’s National Airspace System Exploratory Concepts and Technologies (NExCT) subproject gathered at NASA’s Ames Research Center in California. The purpose of the meeting was to replan milestones related to an ATM-X Extensible Traffic Management (xTM) technical challenge: “Develop technologies and requirements for xTM system

framework and services and demonstrate complex interactions of xTM operations and conventional ATM operations in overlapping airspace.” The goal of NExCT is to “catalyze airspace integration of diverse and scalable cooperative xTM operations.” The meeting also included facility tours that will be used by the subproject, primarily the Airspace Operations Lab.

DIP Hosts United Airlines for Houston Operational Demonstration Plan

POC: [SWATI SAXENA](#) AND [YOON JUNG](#)

On Jan. 16, the Air Traffic Management – eXploration project’s Digital Information Platform (DIP) subproject team hosted Roberta Zimmerman from United Airlines at NASA’s Ames Research Center in California. The purpose of the meeting was to discuss potential collaboration opportunities. Swati Saxena and Jeremy Coupe represented DIP. Zimmerman is the United point of contact for the



ATM-X NExCT members posing for group photo.

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From Left: Roberta Zimmerman, Swati Saxena, Sarah Youlton, and Jeremy Coupe.

DIP Sustainable Flight National Partnership (SFNP) operational demonstration of pre-departure rerouting capability in the Houston area. The SFNP-Operations demonstration will demonstrate the capability of pre-departure reroute of flights for both flight operator partners and air traffic control within Houston Terminal Radar Approach Control that includes George Bush Intercontinental Airport and William P. Hobby Airport. The DIP team presented Zimmerman a live demonstration of NASA's pre-departure rerouting tool in the Verification and Validation laboratory. The DIP team also showed a live demonstration of the real-time monitoring tool of NASA's Airport Surface Predictive Engine that provides predictions of flights and demand/capacity imbalances in the modeled terminal airspaces. The teams discussed deployment of a NASA tool at United's facilities for shadow evaluation as a near-term plan for a SFNP-Operations demonstration. The DIP team also



From Left: Jaren Duensing, Roberta Zimmerman, Swati Saxena, and Jeremy Coupe.

arranged a tour of NASA Ames's research facilities including the Vertical Motion Simulator, the Airspace Operations Laboratory, and the High-End Computing Center.

AOSP Participates at Future Skies Workshop

POC: [RAJ PAI](#)

On Jan. 17–19, representatives from AOSP's projects participated at the Future Skies Workshop held at NASA's Ames Research Center in California. The event was hosted by the NASA Aeronautics Research Institute and was a government/industry workshop involving the NASA, the FAA, Civil Air Navigation Services Organization, Single European Sky Air Traffic Management Research, and International Forum for Air Research. The goal of the event was to share and align global strategic visions for transformed aviation operations and to begin to establish an outline for a community-vetted strategic roadmap. Additionally, Raj Pai, the Air



Raj Pai presenting at the Future Skies Workshop.



Raj Pai (L) and other panel members (R).

Traffic Management – eXploration project's "Sky for All" lead, chaired a panel titled "Roadmap to scale-up Advanced Air Mobility Operations."

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DIP Hosts TIM with NY/ NJ Port Authority

POC: [SWATI SAXENA](#)

On Jan. 18, the Air Traffic Management – eXploration project’s Digital Information Platform (DIP) subproject team hosted a technical

interchange meeting (TIM) with the Port Authority of New York and New Jersey. The meeting was held at NASA’s North Texas facility. Representing the NASA team were Jeremy Coupe, the Sustainable Flight National Partnership (SFNP) Operations demonstration lead,

and Eric Chevalley, the DIP Field Demonstration Requirements and Activities lead, and representing the Port Authority was Ralph Tamburro. The purpose of the meeting was to discuss challenges in New York’s airspace, flight operations, and potential solutions to address those identified challenges by leveraging NASA’s airport surface predictive engine. The engine provides accurate predictions of takeoff times of departure flights and imbalance at terminal airspace boundaries using machine learning techniques. The interchange included a live demonstration of SFNP-Operations-1 Collaborative Digital Departure Rerouting (CDDR) capability – currently being evaluated with the FAA and airline partners in the North Texas area. The Port Authority presented traffic flows in and out of major airports in the New York Terminal Radar Approach Control and challenges associated with it, as well as flow restrictions imposed by air traffic control due to inclement weather and volume. The interchange came up with a list of topics for collaboration under the existing Space Act Agreement between the two organizations including:

1. absorb real-time John F. Kennedy International Airport departure metering data for use as input to NASA’s airport surface predictive engine;



From Left: Jeremy Coupe (NASA Ames), Daniel Mulfinger (NASA Ames), Shawn Engelland (NASA Ames), Greg Juro (NASA Ames), Ralph Tamburro (Port Authority), Eric Chevalley (NASA Ames), and Yoon Jung (NASA Ames).



Discussions between DIP team and the Port Authority.

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2. provide the Port Authority with NASA's web-based airspace status map and timeline displays of New York's airports;
3. use access of the New York hotline for airspace restrictions information, and investigate methods to extract restrictions data;
4. explore ways to support New York's air traffic control to improve National Traffic Management Log entries; and
5. explore leveraging NASA's CDDR capability for rerouting decision support for general aviation flights.

ATM-X Conducts Offsite Strategy Meeting

POC: [FAISAL OMAR](#)

On Jan. 23–24, the Air Traffic Management – eXploration (ATM-X) project held an offsite strategy meeting at NASA's North Texas facility. Attendees

at the meeting included the ATM-X leadership team and subproject managers from the Digital Information Platform, Unmanned Airspace Systems Traffic Management Beyond Visual Line of Sight, Pathfinding for Airspace with Autonomous Vehicles, and the National Airspace Systems Explorative Concept Technologies teams. Participating also were the leads for the Sky for All and Integrated Concepts and Interim Architecture groups. ATM-X leadership presented the project-level vision, strategy, and priorities to the team. Each of the subproject and tech area leads shared their updated plans and milestones with the project management team and received constructive feedback. There were several objectives the project leadership planned and successfully achieved for the meeting. The first goal was to align project vision and priorities with the subprojects and technical areas

with updated plans and approaches. The second goal was to prepare for Delta Key Decision Point – Continuing Assessment review and Unmanned Aircraft Systems Traffic Management Beyond Visual Line of Sight tollgate meeting at NASA Headquarters on Feb. 15. The third goal was to discuss and identify collaboration opportunities between the subprojects and relevant technical areas. A follow-on offsite meeting is planned sometime at the end of March.

DIP SFNP-Ops Leadership Briefs FAA, NATCA, ATC, and Airline Partners

POC: [JEREMY COUPE](#)

On Jan. 24, the Air Traffic Management – eXploration project's Digital Information Platform (DIP) subproject team met with key stakeholders in Houston. Stakeholders included representatives from several FAA organizations, Air Traffic Control (ATC) facilities, the National Air Traffic Controllers Association (NATCA), and airline partners. The DIP team presented potential new capability and use cases DIP could support for the Sustainable Flight National Partnership (SFNP) Operations 1b demonstration in the Houston airspace. The meeting culminated rounds of observations at Houston's ATC facilities and the United Airlines



Discussions between DIP team and the Port Authority.

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DIP team members interacting with stakeholders.

Station Operations Center, as well as months of research and ongoing discussions with partners. The innovative capability and use cases have received support from the airline partners and ATC facilities. The proposal would greatly expand the existing Collaborative Digital Departure Reroute system to support flight reroutes and reduce demand capacity imbalances across airspaces. It would also support airlines to use Trajectory Option Sets more widely in their operations, while leveraging existing FAA Time Based Flow Management and Terminal Flight Data Manager deployments. DIP leadership will meet with representatives from FAA Headquarters to finalize NASA's engagement in Houston.

PAAV Participates in the RTCA SC-228 Quarterly Meeting

POC: [JORDAN SAKAKEENY](#), [CONRAD RORIE](#), [ANDREW GUION](#) AND [DEVIN JACK](#)

On Jan. 22–26, researchers from the Air Traffic Management – eXploration project's Pathfinding for Airspace with Autonomous Vehicles (PAAV) subproject attended the RTCA SC-228 (Minimum Performance Standards for Uncrewed Aircraft Systems) quarterly meeting at RTCA headquarters in Washington, DC. Representing the PAAV team were Jordan Sakakeeny, Conrad Rorie, Andrew Guion, and Devin Jack. Work from the Integration of Automated Systems and Automated Flight and Contingency Management teams, which has since merged with the PAAV team, was presented that showcased results for their Airborne Collision and Avoidance System for Advanced Air Mobility operations (ACAS Xr) flight test campaign with Sikorsky. The SC-228 leadership responded positively to the presentation and are eager to have a PAAV 2.0 presentation at a future meeting. PAAV members also participated in discussions regarding Working Group 1 ACAS Xr developments. They also attended an FAA presentation on the Part 108 rulemaking effort and discussed with SC-228 leadership how PAAV can work

with the SC-228 committee to further ACAS Xr, traffic pattern integration, and lost command and control links. PAAV members plan also to meet with the government authorized representative to SC-228 regarding his team's work on the Part 108 rules and how they might be extended to large Uncrewed Aircraft Systems.

AMP Explores Candidate UAM Midterm Capabilities

POC: [JASON PRINCE](#) AND [TOM WHITE](#)

On Jan. 30–31, researchers from the Air Mobility Pathfinders (AMP) project presented and led discussions exploring candidate Urban Air Mobility (UAM) midterm capabilities to inform design choices for the Operational Integration Assessment at the Boeing Vertical Life Facility in Pennsylvania. Representing the AMP team were Jason Prince and Tom White from the Integrated Airspace team. The capabilities they discussed included aspects of a cooperative environment, aircraft equipped with emerging technologies, and modified procedures enabled by digital communications. A deeper dive into notional aircraft transfer mission use cases for a New York Class-B airspace adaptation allowed open discussions on how the interoperability of those midterm capabilities would

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contribute to a foundational system for enabling operations of increased tempo. Feedback from those discussions will be used to build a simulated letter of agreement for a future tabletop exercise. Participating organizations included representatives from NASA, Boeing, Joby Aviation, Wisk Aero, the FAA, Johns Hopkins Applied Physics Lab, Massachusetts Institute of Technology Lincoln Laboratory, MITRE, National Air Traffic Controllers Association, Port Authority of New York and New Jersey, Skygrid, and the Department of Transportation.

PAAV Conducts TIM #4

POC: [RAQUEL REDHOUSE](#) AND [ARWA AWEISS](#)

On Jan. 30–31, the Air Traffic Management – eXploration (ATM-X) project management office, together with members of the ATM-X Pathfinding for Airspace with Autonomous Vehicles (PAAV) subproject team, participated in a PAAV technical interchange meeting (TIM) in California. The meeting was the fourth in a series. The ATM-X project management office presented realigned PAAV priorities and goals for the next 2 years and key upcoming dates. This resulted in more detailed group discussions regarding milestones in the areas of contingency management, ecosystem assessment, conflict

management, and terminal pattern integration. The focus of the meeting was on revisiting the Level 1 through Level 3 milestones for future re-baselining of PAAV plans. Overviews of Dynamic Path Planning, Autonomous Operations Planner, Expandable Variable Autonomy Architecture, Contingency Management Research with National Airspace System Digital Twin, Air Traffic Management Testbed and Smart Mobility Mission Control Center, Traffic Pattern Integration Planner, and the Northrop Grumman Flight Activity were also presented.

UTM BVLOS Conducts TIM #3

POC: [JOSEPH RIOS](#)

On Jan. 31, the Air Traffic Management – eXploration (ATM-X) project’s Unmanned Aircraft Systems Traffic Management (UTM) Beyond Visual Line of Sight (BVLOS) subproject conducted a third technical interchange meeting (TIM). The purpose of the meeting was to update the Request for Information service supplier partners on the key site and opportunities to get involved as service suppliers. There were good discussions overall, including input from the FAA on the Near-Term Approval Process, and good questions from participating partners.

SWS Participates in SAE S-18 Committee Meetings

POC: [MALLORY GRAYDON](#)

On Jan. 29–Feb. 2, System-Wide Safety (SWS) project researcher Mallory Graydon participated in the 2024 Quarter 1 Plenary Meeting of SAE’s S-18, S-18A, and S-18H committees in Arizona. S-18 recently released ARP4754B, “Guidelines for Development of Civil Aircraft and Systems,” and ARP4761A, “Guidelines and Methods for Conducting the Safety Assessment Process on Civil Airborne Systems and Equipment.” These documents are revised versions of the committee’s well known and widely used aviation safety standards. Following the release of ARP4754B and ARP4761A, researchers from S-18, S-18A, and S-18H 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 uncrewed aircraft systems;
4. the interaction between human-factors-related assurance

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- activities and the safety assessment process; and
- 5. the use of tools and modeling in aircraft development.

SWS Researchers Invited to Aviation Operations

POC: [CHAD STEPHENS](#)

On Feb. 6, System-Wide Safety (SWS) project representatives participated in “Between Two Ferns” – an Aviation Operations Seminar at NASA’s Langley Research Center in Virginia. Representing the SWS project were Daniel Kiggins and Chad Stephens. The subject was “Commercial Aviation Flight Deck

Operations.” Kiggins discussed his experience as a pilot for a major U.S. air carrier and described the evolution of commercial aviation operations he witnessed and participated in during his aviation career from the flight deck. Kiggins also shared his thoughts on research to support current and future commercial aviation operations and answered questions from the in-person and virtual audience. Commercial aviation operations exemplify complex safety-critical systems with exceptional safe operation records. Accomplishing highly safe operations requires human operators and automated

capabilities within the context of the National Airspace System infrastructure that are both reliable and flexible. Also, the operations and agents conducting the operations must continually evolve to keep pace with new entrants in the National Airspace System. Commercial transport pilots are at the pointy end of the operation and apply their skills gained through experience and training to enable safe and efficient operations to transport passengers to their destinations. Kiggins has 40,000+ hours of commercial airline flying experience and 15 years of experience supporting human participant research investigating

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aviation safety and flight deck technologies with NASA. Kiggins's role as a subject matter expert in NASA research includes advising and ensuring efficacy of simulated aircraft operation, commercial airline procedures, and simulated flight scenarios.

NASA and MITRE Hold TIM

POC: [NIKUNJ OZA](#)

On Feb. 8, several members of the System-Wide Safety (SWS) project participated in a technical interchange meeting (TIM) with MITRE. The meeting was held

at MITRE Headquarters in Virginia. Representing the SWS team were Nikunj Oza, Chad Stephens, Bryan Matthews, Jon Holbrook, Lance Prinzel, and Dan Kiggins. SWS presented an overview of the new subproject Technical Challenge 6 (In-time Aviation Safety Management System for Traditional Commercial Air Operations), as well as work on machine learning and human contributions to safety. MITRE gave the SWS staff a tour of their Immersive Lab, which allows exploration of augmented reality and virtual reality technologies for

various applications. The goal of the meeting was to discuss how the SWS project and MITRE could collaborate on machine learning work as part of the Aviation Safety Information Analysis and Sharing (ASIAS) partnership's plan to improve the process of deriving analytics results on the data airlines voluntarily upload. The attendees plan to have follow-up meetings to allow SWS access to MITRE's Collaborative Research Environment, which would allow SWS to test machine-learning algorithms on redacted ASIAS data.

SWS Participates in Development of ICAO Safety Intelligence Manual

POC: [KYLE ELLIS](#)

On Feb. 5–9, System-Wide Safety (SWS) project manager Kyle Ellis attended a regularly scheduled International Civil Aviation Organization (ICAO) Safety Management Panel working group meeting at EUROCONTROL in Brussels. Ellis serves as a U.S.-nominated advisor to ICAO. Ellis currently holds a leadership role within the ICAO Safety Management Panel as co-rapporteur for the Safety Intelligence Working Group charged with developing a safety intelligence manual. The manual represents a key addition to the ICAO Annex 19 guidance



SWS team interacting with MITRE.

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Top: Safety Management Panel (SMP) attendees at EUROCONTROL. Bottom: Kyle Ellis presents safety intelligence working group debrief to the SMP.

material set for ICAO member states to reference when developing their state safety plans and civil aviation authority requirements. The SWS project's research has directly contributed to the concepts captured in the Safety Intelligence Manual and will be used by ICAO member states and service providers from around the world to improve aviation safety on a global scale. The manual is currently scheduled for publication in December 2024.

Sky for All Conducts Workshop with the FSF

POC: [RAJ PAI](#)

On Feb. 8–9, Raj Pai, lead for the Air Traffic Management – eXploration project's Sky for All

vision, hosted a team from the Flight Safety Foundation (FSF) at NASA's Ames Research Center in California. Discussions included key milestones, joint activities for Sky for All under a current FSF grant with NASA, and next steps with roles and responsibilities. The joint team also discussed collaboration opportunities to align a draft technical roadmap for Sky for All.

fmdtools Team Conducting Reviews for Final Release

POC: [HANNAH WALSH](#)

As a part of the System-Wide Safety project's design assurance research, developers of the fmdtools Python library are conducting their final preparations for releasing a version 2.0. The goal of the fmdtools Python library is to support the design of resilient complex engineered 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 modeling formalism and increasing the maturity of the codebase. Final release of the opensource software is expected to

occur by the end of January and was accompanied by a TechTalk on Feb. 8. The updates to fmdtools will enable more accurate modeling for the safety demonstrator series, notably for the upcoming Safety Demonstrator-2 simulations.

SWS Invited to Meet with ALPA Director of Engineering and Air Safety

POC: [JON HOLBROOK](#)

On Feb. 9, System-Wide Safety (SWS) project researchers were invited to meet with the Air Line Pilots Association (ALPA) director of engineering and air safety, Stacey Bechdolt, at ALPA Headquarters in Virginia. Members from the Human Contributions to Safety (HC2S) team and SWS commercial aviation safety subproject managers participated in the meeting. The purpose of the meeting was to brief the ALPA director on SWS research being done collaboratively with the Flight Safety Foundation under their "Learning from All Operations" initiative, and with major airline and academic partners. An objective of the HC2S research is the exploration of novel data types and analysis techniques focused on expanding the range of safety-relevant events to include not just rare safety failures, but frequent safety successes. The HC2S initiative is part of broader SWS efforts aimed at developing

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future integrated In-Time Aviation Safety Management Systems. Presently, the SWS project is actively involved in several ALPA stakeholder engagement activities and has multiple active and pending agreements with ALPA member airlines. The ALPA director invited the SWS team to provide an overview of the research and discussed implications for better understanding of safety data, new data types, and NASA research to advance the state of the art in data analysis methods. Opportunities for ALPA to help collect these types of data were discussed and potential collaboration will be explored.

SWS Holds Kickoff for MIT Collaborative Research

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

On Feb. 12, a virtual kickoff meeting was held between the System-Wide Safety (SWS) project and the Massachusetts Institute of Technology (MIT). This work is occurring under NASA's Research, Science, and Engineering Services contract with MIT and is being conducted by a collaborative research team under professor John Hansman. The research will be conducted in the MIT International Center for Air Transportation (<https://icat.mit.edu/>) with the goals of improving traditional safety management systems data analysis capabilities and developing novel In-Time

Aviation Safety Management System concepts (e.g., risk prediction and mitigation technology in traditional aviation operations). The agreement was signed earlier this year and extends the contract from Jan. 2–Dec. 31, 2024.

Development may involve testing machine-learning-based methods for in-time risk monitoring and detection, hazard prioritization and mitigation, safety-assurance decision support, and in-time integrated system analytics. Data to be analyzed will be system-wide data including, but not limited to, Automatic Dependent Surveillance – Broadcast, Flight Operations Quality Assurance, and/or System Wide Information Management. Furthermore, data fusion and analysis of system-wide data will be examined to inform the SWS project's future aviation operations and safety technologies. Results of the research will be disseminated in quarterly reports to SWS and a journal publication or conference paper and associated conference presentations will document the findings. SWS subproject managers Chad Stephens and Nikunj Oza are technical monitors for the collaboration.

DIP Attends NASA Contrails Intra-Agency Working Group

POC: [SWATI SAXENA](#)

On Feb. 15, Swati Saxena, subproject manager of the Air Traffic

Management – eXploration project's Digital Information Platform (DIP) attended the NASA Contrails Intra-Agency Working Group Meeting at NASA Headquarters. The purpose of the meeting was to bring the working group together to update the team on each program's current work and involvement in contrail research and mitigation plan. There were representations from different NASA areas of focus such as operations (DIP), combustion, Advanced Air Vehicles Program, and Transformative Aeronautics Concepts Program projects: Transformative Tools and Technologies; Convergent Aeronautics Solutions; and University Leadership Initiative; as well as atmospheric science modeling and emissions research groups in NASA's Science Mission Directorate. Saxena represented the airspace operations team and presented the current DIP Sustainable Flight National Partnership Operations demonstration plan and the Department of Energy's Advanced Research Projects Agency-Energy's Predictive Real-Time Emissions Technologies Reducing Aircraft Induced Lines in the Sky project work that NASA will be involved in. The team worked on developing a roadmap for contrail prediction research and readiness to implement contrail management strategies in current National Airspace System operations. The team was joined by the FAA's Office of

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Environment and Energy group (Chris Dorian, Prem Lobo, and Nicole Didyk-Wells) in the afternoon for a joint discussion.

SWS Participates in Preliminary NASA/FAA RTT Working Group Meeting

POC: [SAMANTHA INFELD](#)

On Feb. 16, System-Wide Safety (SWS) project systems engineer Samantha Infeld participated in an internal Future Airspace Architecture Strategy Integration Team kickoff meeting. The meeting was with the full joint NASA/FAA Advanced Air Mobility (AAM) Research Transition Team (RTT) Architecture Working Group. The focus was on introduction of the core team members and a scope-setting discussion for joint architecture development. The definition of AAM was kept open and the definition of the architecture is to be of the airspace broadly, describing in more detail the vehicles, airports, and management processes AAM introduces as the work develops. Infeld met with the NASA organizers, Jeanne Yu and Jim Murphy, after the meeting. The purpose was to review more details on the architectural approach through functions that can be allocated to airspace, aircraft, and service providers per operational scenario, using the In-Time Aviation Safety Management System architecture as an example.

PAAV Team Visits Northern Plains Test Site

POC: [KURT SWIERINGA](#)

On Feb. 21, the Air Traffic Management – eXploration project’s Pathfinding for Airspace with Autonomous Vehicles (PAAV) subproject team visited the Northern Plains Uncrewed Aircraft Systems (UAS) test site in North Dakota. The purpose of the visit was to discuss and observe their Vantis UAS network. The Vantis UAS network includes ground-based surveillance systems and a common operational picture of UAS operations to facilitate operations without visual observers for operations ranging from small to large UAS. Vantis has successfully been used for large UAS operations without visual observers or a chase aircraft and is designed to be scalable to new surveillance and communication services. The Vantis team is also part of an exploratory activity to investigate the use of FAA radar information for detect and avoid. Overall, the trip provided useful information that will help the PAAV team scope future collaborations with industry to assess the ecosystem for large UAS operations.

ACERO Presents to Commercial Drone Alliance

POC: [MARCUS JOHNSON](#)

On Feb. 21, Marcus Johnson, the Advanced Capabilities for Emergency Response Operations (ACERO) project manager,

presented an overview of the project’s scope and goals to the Commercial Drone Alliance executive board. The discussion was intended to raise awareness of ACERO’s plans to support future collaboration with the commercial drone industry. The Commercial Drone Alliance is an independent nonprofit organization led by key members of the commercial drone industry. It works with the federal government and industry to promote U.S. global leadership in advanced aviation. The group also works to enhance understanding between industry and the federal government by merging safety and security policy with innovation. ACERO will remain connected with the Commercial Drone Alliance throughout the life of the project.

ACERO Participates in NWCG

POC: [JOEY MERCER](#)

On Feb. 21–22, Joey Mercer, chief engineer of the Advanced Capabilities for Emergency Response Operations (ACERO) project, Parimal Kopardekar, director of the NASA Aeronautics Research Institute, and Akbar Sultan, AOSP director, attended the National Wildfire Coordinating Group (NWCG) at the National Interagency Fire Center in Idaho. The purpose of the meeting was to establish NASA’s membership as part of the NWCG role to provide national leadership in the various

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functional areas of wildland fire management. NASA's inclusion in the coordination group is a step toward enhancing interagency collaboration. As a member, NASA will have opportunities to develop solutions with wildland fire management agencies as partners to share its research and technologies to aid in the development of standards for wildland fire management. To support the NWCG, NASA is leveraging the combined contributions of research and development, data gathering and distribution, and technology transfer from three NASA mission directorates in the areas of Earth science, space technologies, and aeronautics. The interagency group membership will help augment NASA's Wildland Fire Management Initiative, which supports the development, demonstration, and commercialization of wildland fire technology through awards to small businesses, research institutions, and other technology innovators.

NASA Participates in ASIAS IAT Meeting

POC: [NIKUNJ OZA](#)

On Feb. 21–22, System-Wide Safety subproject manager Nikunj Oza represented NASA at the quarterly Aviation Safety Information Analysis and Sharing (ASIAS) Issues Analysis Team (IAT) meeting. The meeting was held at American Airlines Headquarters near Dallas-

Fort Worth International Airport. The IAT routinely discusses safety issues of current interests, potential safety vulnerabilities, and how to analyze available data to study these issues. This meeting also included discussions of potential new safety metrics to be used to monitor the National Airspace System and dashboards that can provide information of relevance to airline management. Oza also met with Scott Trepinski of Envoy Air to discuss potential problems NASA and Envoy could conduct collaborative work on under a non-reimbursable Space Act Agreement, which is being prepared.

DIP Team Members Participate in FAA CATI TIM #2

POC: [JEREMY COUPE](#) AND [SWATI SAXENA](#)

Researchers from the Air Traffic Management – eXploration project's Digital Information Platform (DIP) subproject team attended the second FAA technical interchange meeting (TIM) for the Connected Aircraft Trajectory Information (CATI) project. The TIM was conducted at Embry-Riddle Aeronautical University's NextGen Test Bed facility in Florida on Feb. 21–22. Jeremy Coupe and Swati Saxena represented the DIP team and other attendees included representatives from Boeing, Honeywell, MITRE, and LS Technologies. The meeting participants discussed the Flight and Flow Information for a Collaborative

Environment Release 2 prototype use cases that will be tested during the CATI project. Some of the candidate R2 services include trajectory update, reevaluation process, trial request, and notification service. The use cases include addressing the need to update trajectories due to tailwinds and turbulence as well as confirming arrivals. The DIP team participated in discussions with the attendees and gained knowledge about R2 services that will help in aligning Sustainable Flight National Partnership Operations 2 demonstration activities with the FAA's CATI project.

DIP Hosts Boeing Global Services Technical Fellow

POC: [SWATI SAXENA](#)

On Feb. 22, the Air Traffic Management – eXploration's Digital Information Platform (DIP) team hosted Boeing Global Services technical fellow Steve Altus at NASA's Ames Research Center in California. The team provided a tour of the facilities at NASA Ames and made progress on building the One NASA-Boeing Partnership Roadmap for the DIP Sustainable Flight National Partnership Operations (SFNP-Ops) demonstrations. The DIP team organized tours of FutureFlight Central (FFC) and the Vertical Motion Simulator (VMS) for Altus and engaged in conversation about the capabilities of these facilities. Swati Saxena,

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Brian Barrientez and Steve Altus at FFC.



Steve Altus in the VMS.

DIP's subproject manager, had a one-on-one meeting with Altus to discuss about the SFNP-Ops demonstration plan and potential areas of collaboration. In addition to DIP-related activities, Altus also attended the Advanced Modeling and Simulation seminar at Ames.

ACERO Participates in Cross-Mission Directorate Meeting

POC: [MARCUS JOHNSON](#)

On Feb. 26, Marcus Johnson participated in the NASA Aeronautics Research Mission Directorate Cross-Mission Directorate Wildland Firefighting Face-to-Face Meeting at NASA's Ames Research Center in California. Johnson presented the Advanced Capabilities for Emergency Response Operation's (ACERO's) plan for the public rollout of activities across the agency, as well as demonstration planning and project governance.

AOSP Conducts Strategic Collaboration Discussions with Potential Industry Partners

POC: [CONRAD RORIE](#) AND [ARWA AWEISS](#)

On Feb. 27–28, AOSP hosted three separate half-day meetings with representatives from potential industry partners. Industry partners included Wisk, Reliable Robotics, and Xwing. Akbar Sultan, AOSP director, along with Parimal

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Kopardekar, NASA Aeronautics Research Institute director, together with senior management from Air Traffic Management – eXploration (ATM-X), Air Mobility Pathfinders, and System-Wide Safety projects and respective subprojects, attended the meetings. The meetings were organized by the ATM-X project's Pathfinding for Airspace with Autonomous Vehicles subproject. The meetings provided each industry partner an opportunity to discuss their multi-year development roadmap, which covered their approach to automation/autonomy, their path to certification, as well as potential areas of collaboration with NASA. The meetings highlighted the key areas of overlap between the industry partners' plans and research elements within AOSP. The meetings confirmed partnership agreements with each company at a program level would be beneficial since areas for collaboration existed across multiple projects for all three partners. A selection of possible research avenues with NASA and these potential partners includes flight testing and validation activities for surface operations, detect and avoid, and traffic pattern integration. Safety-based analyses on large uncrewed aircraft systems contingencies, and acceptable outcomes from those contingencies, and on systems with machine learning were also identified as future areas of collaboration. While most of the talks identified near-term research and flight testing

needs, all three partners were aware of the need to proceed with increasing levels of automation in mind, and of the potential for multiple uncrewed aircraft systems control in later stages of collaboration.

SWS and American Airlines Sign Extension for Safety Research

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

The System-Wide Safety (SWS) project and American Airlines signed an extension to their non-reimbursable Space Act Agreement on Feb. 28. This extension allows the SWS and American to continue work on collaborative research to improve aviation safety through 2026. It enables NASA and American to continue exploring various data sources individually and in combination to identify potential safety issues and their precursors using a combination of human expertise and machine learning methods. The goal of this work is to develop a real-time safety analysis capability that can be employed by an airline operations center to assess and mitigate potential risks.

UTM-BVLOS Participates in Key Site Operation Evaluation TIM

POC: [JOSEPH RIOS](#)

On Feb. 27-29, representatives from the Air Traffic Management – eXploration project's Unmanned

Aircraft Systems Traffic Management Beyond Visual Line of Sight (UTM-BVLOS) team participated at the Key Site Operational Evaluation technical interchange meeting (TIM) hosted by the FAA in Texas. The meeting included operators and service suppliers. UTM-BVLOS subproject manager Joseph Rios attended the meeting. Participants conducted detailed conversations about the progress to date, and the work still to come, to make the operational evaluation a success. All participants expressed excitement and positivity toward its direction.

DIP Team Presents SFNP-Ops Demo Plan at IAH Quarterly Meeting

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

The Air Traffic Management – eXploration Digital Information Platform (DIP) team was invited by United Airlines to attend the George Bush Intercontinental Airport (IAH) quarterly meeting held Feb. 29. The meeting was with Houston-area air traffic control personnel and other participating flight operators. The team presented the Sustainable Flight National Partnership Operations 1b (SFNP-Ops-1b) demonstration plan including proposed web user interfaces and presented analyses of surface data and recent reroutes opportunities that were detected during the internal testing of the Collaborative Digital Departure

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Reroute (CDDR) system. The team's presentation gathered interest and useful feedback from both FAA and airline representatives. The quarterly meeting provided an informative review of winter operations, weather impacts and a de-ice event day that disrupted the operation, as well as forecast of construction impacts, spring weather, and United's schedule. The DIP team had the opportunity for side conversations with FAA and airline representatives on CDDR-related matters. The team was also invited to attend the next quarterly meeting in May 2024.

AMP Conducts TIM and Facility Visits with Wisk

POC: [KAREN CATE](#)

On Feb. 29--Mar. 1, the Air Mobility Pathfinders (AMP) project (formerly the Advanced Air Mobility project) met with Wisk Aero for a 2-day technical interchange meeting (TIM) at the company's headquarters in California. The discussion focused on how



AMP project staff at the Wisk Facility.

operations with a remote pilot would be represented in the Urban Air Mobility reference architecture in terms of roles, responsibilities, and functional requirements. Discussed also were potential contributions by Wisk into the AMP project's Technology Capability Level series of flight test evaluations.

ATM-X Signs ISAs with Partners

POC: [KENNETH FREEMAN](#)

The Air Traffic Management – eXploration (ATM-X) project's National Airspace System eXploration Concepts and Technologies (NExCT) subproject has signed multiple Interconnection Security Agreements (ISAs) with potential partners this quarter. The first agreement was signed with Aerostar on Jan. 12 and the second agreement was signed with AeroVironment on Mar. 2. These agreements will enable the NExCT team to collaborate with these partners on an upcoming experiment in spring 2024. Aerostar is a designer, manufacturer, and operator of stratospheric balloon platforms and airships for near space applications. AeroVironment is a designer and manufacturer of uncrewed aerial vehicles. The intent of the experiment is to leverage a NASA upper Class E traffic management system to enable cooperative operations in upper Class E airspace through data exchange.

SWS and Envoy Air Working Agreement for Sharing Safety-Critical Data

POC: [LANCE PRINZEL](#) AND [MICHAEL VINCENT](#)

A non-reimbursable Space Act Agreement was signed between the System-Wide Safety (SWS) project and Envoy Air as part of a meeting conducted on Mar. 4–7. The meeting was held to discuss collaborative efforts for machine learning and other data mining approaches to apply to the airline's safety management system data. Envoy has agreed to share safety-critical flight and ground operations data to be integrated with NASA risk-precursor and vulnerabilities-detection algorithms. This work will directly support the NASA Aeronautics Research Mission Directorate's (ARMD's) Thrust 5 – In-Time System-Wide Safety Assurance Concept of Operations – under ARMD's Strategic Implementation Plan. Envoy has the capabilities to provide high-fidelity flight and ground operations data obtained from their day-to-day regional flight operations. Examples of this data may include de-identified flight and ground data (both operational and derived) such as, but not limited to, Line Operations Safety Assessments, Aviation Safety Action Program, Flight Operational Quality Assurance, Advanced Qualification Program, and other Safety Management System and associated safety-type data. Envoy also has the requisite

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commercial airline safety operational experience for collaborative in-time identification and mitigation of safety risks that will enhance NASA analytical methods, such as “active learning.” The SWS project has the capabilities to provide information, machine learning, and other advanced data-analytical tools and methods for in-time vulnerability and risk precursor analyses and prognostics. Examples may include opensource or other NASA-developed tools (under appropriate software usage agreements) for safety analysis, prognostics algorithms and development best practices, full or partial safety use cases, data integration portals and services, and access to safety scientists and engineers. This collaborative effort will serve to support the delivery of an initial capability that extends NASA’s previous precursor analysis to risk over multiple adverse events through data and/or decision fusion approaches. This capability is hypothesized to result in a significant increase of the safety margins of flight and ground operations for commercial air carriers such as Envoy Air. A collaboration with industry partners is essential to NASA’s success in developing, demonstrating, and validating an advanced data-analytical capability to include machine learning, deep learning, natural language processing, and other statistical methods applied to actionable safety data. The overarching objective is to

demonstrate quantifiable methods and metrics for in-time proactive and predictive risk assessment and safety assurance derived from existing and potential new and novel data types. The collaborative research will be conducted under the technical leadership of Nikunj Oza and Chad Stephens.

ACERO Conducts Face-to-Face Demonstrations Meeting

POC: [MARCUS JOHNSON](#)

On Mar. 5–6, members of the Advanced Capabilities for Emergency Response Operations (ACERO) project team conducted a face-to-face meeting at NASA’s Glenn Research Center in Cleveland. The purpose of the meeting was to discuss the

project’s first two demonstrations and included ACERO demonstration schedules, associated risks, and current partnership engagements. ACERO’s first demonstration, which will validate ACERO-developed air traffic management and communications technologies, is set for November 2024.

SWS Participates in FAA’s AI Roadmap and Technical Meetings

POC: [NATASHA NEOGI](#)

On Mar. 5–7, the System-Wide Safety (SWS) project participated in the FAA’s Artificial Intelligence (AI) Roadmap and Technical Exchange Meetings held at MITRE in Virginia. The objective of these meetings was



ACERO group tour of hangar at NASA Glenn Research Center.

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Neogi participated on the panel titled “Safety Concerns Briefing and Moderated Discussion.”



to engage with aviation stakeholders in an open conversation to identify safety concerns associated with having an AI or machine learning (ML) component onboard an aircraft or in a safety critical aviation system (e.g., air traffic management and Air Navigation Service Providers). The meeting was a follow-on activity to an FAA Technical Exchange Meeting held in January 2024 in which

speakers brought their experience to the discussion to stimulate active participation with the stakeholders in the virtual audience. That conversation proved to be the starting point for the meeting at MITRE. Natasha Neogi, NASA’s senior technologist for assured intelligent systems and SWS senior technical advisor of autonomy, presented a talk titled, “Considerations for

Developing and Assuring AI/ML Components in Aviation Systems.”

The talk had more than 150 attendees and synthesized contributions from Steven Young, Paul Miner, Mallory Graydon, Jeffrey Maddalon, Frank McCormick, Terry Morris, and others. Neogi also served as an invited participant on the panel titled, “Safety Concerns Briefing and Moderated Discussion.” Her co-panelists included Kimberly Wasson of Joby, Darren Cofer of Collins Aerospace, Earl Lawrence of Xwing, Dragos Margineantu of Boeing, Wes Ryan of Northrup Grumman, and Brandon Suarez of Reliable Robotics. The panelists brought their experience and expertise to the discussion to stimulate active engagement with the stakeholders and FAA regarding the key challenges and barriers to fielding AI or ML components in safety-critical aviation systems.

PAAV Hosts Kickoff Meeting with Collins Aerospace

POC: [MATT GREGORY](#) AND [ARWA AWEISS](#)

On Mar. 7, participants from the Air Traffic Management – eXploration project, including its Pathfinding for Airspace with Autonomous Vehicles (PAAV) subproject and the Smart Mobility team, held a half-day meeting with representatives from Collins Aerospace. Smart Mobility is a functional project area that was created to enable aeronautics

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ATM-X project management and PAAV leadership host Collins Aerospace at NASA Ames.

research activities involving live flight of vehicles. This meeting provided Collins Aerospace the opportunity to discuss their phased approach to installing a ground-based surveillance system (GBSS) at NASA's Ames Research Center in California in support of Smart Mobility – and at the ecosystem site in support of PAAV. Collins has committed to installing a GBSS solution that is compliant with the latest RTCA standards to support aircraft detection and tracking, conflict management, and integration pathways to multiple operators. Collins also discussed their deployment schedule, system architecture, deliverables, and preliminary siting considerations. NASA team

members used the meeting as an opportunity to socialize PAAV's updated objectives, milestones, and overall ecosystem partnership strategy as well as to cover Smart Mobility's needs and requirements. Next steps include establishing regular working meetings and documenting requirements for a new or updated Interconnection Security Agreement between NASA Ames and Collins Aerospace.

SWS Conducts Year-Four Midterm Review for MIT NRA

POC: [NATASHA NEOGI](#)

On Mar. 7, the System-Wide Safety (SWS) project's NASA Research Announcement (NRA) topic "Assuring Increasing Autonomous

Systems with Non-Traditional Human-Machine Roles" conducted its Year-Four midterm review for the Massachusetts Institute of Technology (MIT) team. The MIT team presented a summary of their progress as they continue efforts on their no-cost extension. The presentation focused on MIT's work on Systems Theoretic Process Analysis (STPA) methodology and demonstrated how it could be applied to capture inimical human-machine interactions. The MIT team performed a thorough review of their work on identifying patterns related to collaborative templates for interaction paradigms between humans and machines. Additionally, they examined the potential use of STPA for flight test engineering. FAA representatives David Sizoo and George Romanski were in attendance and engaged in 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, thus enabling an exchange of ideas across both award efforts and fostering a complementary set of research executed across the NRAs to address a wide range of human-machine teaming challenges in emerging technologies and operations.

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NExCT to Develop Security Architecture for xTM

POC: [KENNETH FREEMAN](#)

Members from the Air Traffic Management – eXploration project’s National Airspace System Explorative Concept Technologies (NExCT) subproject team convened for a meeting on Mar. 8. The purpose of the meeting was to develop a security architecture for Extensible Traffic Management (xTM) environments. NExCT has a project goal to develop an initial security architecture that provides protection for cross-domain xTM data exchanges.

AOSP Participates in Public Safety Drone Conference

POC: [ROBERT MCSWAIN](#), [ERSIN ANCEL](#) AND [JOSEPH RIOS](#)

On Mar. 12, several teams representing projects within AOSP gave presentations at the national nonprofit public safety organization DRONERESPONDERS. The organization has a Space Act Agreement with NASA. Presentations were provided from the System-Wide Safety, Advanced Capabilities for Emergency Response Operations, and Air Traffic Management – eXploration projects. NASA public outreach provided an exhibit booth. The NASA support was well received by the public safety community and the exhibit booth was co-located with the FAA’s exhibit. The Air Traffic Management – eXploration project’s



SWS team members at the NASA booth at DRONERESPONDERS conference together with speaker Ersin Ancel – researcher for the SWS project.

Unmanned Aircraft Systems Traffic management (UTM) Beyond Visual Line of Sight (BVLOS) operations team participated in a panel to describe their work in general – and

their work in particular with public operators on small uncrewed aircraft systems (sUAS) BVLOS operations. The UTM BVLOS team also ran a 1-hour workshop designed to socialize UTM and get feedback on how public operators will/should/may interact with UTM in the near future.

SWS Participates at the SAE G-34 Committee Meeting

POC: [MISTY DAVIES](#)

On Mar. 11–14, System-Wide Safety (SWS) project researchers participated in the SAE Committee (G-34) held in Charlotte. SAE Committee G-34 is responsible for writing the first industry consensus-based recommended practice for the inclusion of machine learning in safety-critical aerospace systems. Civil aviation regulators from the United States, European Union, and Brazil were present to review and discuss the current draft. NASA subject matter experts, including Misty Davies, Alwyn Goodloe, and Paul Miner, have been active participants on the committee since the committee’s inception in 2019. The current schedule plans for the document to go to ballot in mid-2025. If the document is accepted, it would provide a means of compliance for the use of machine learning applications that alert pilots, as well as for some subset of human-machine teaming applications that include machine learning components.

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SWS Participates in DARPA ARCOS Final Principal Investigators' Meeting

POC: [PAUL MINER](#), [NATASHA NEOGI](#) AND [MALLORY GRAYDON](#)

On Mar. 12–13, System-Wide Safety (SWS) project researchers Mallory Graydon, Paul Miner, and Natasha Neogi participated in the final principal investigators' meeting of the Defense Advanced Research Project Agency's (DARPA's) Automated Rapid Certification of Software (ARCOS) project. ARCOS participants and Department of Defense (DoD) software assurance project leaders met to discuss the capabilities of the ARCOS tools and DoD's software assurance needs with an eye toward guiding future tooling development. Graydon, Miner, and Neogi used their expertise in safety assessment and safety assurance to provide constructive feedback. The project aimed to produce a low-cost, mostly automated means of certifying safety and security-critical software-intensive military systems. While the project's achievements have been more modest, what was learned over the course of the project might yet aid development of future development and certification techniques for use in aviation and spaceflight applications.

DIP Team Attends Flow Evaluation Team Meeting in Houston

POC: [ERIC CHEVALLEY](#)

On Mar. 12, the Air Traffic Management – eXploration project's Digital Information Platform (DIP) team was invited by United Airlines to attend a Flow Evaluation Team (FET) meeting at the FAA's Houston Air Route Traffic Control Center. The FET is a group co-led by the FAA and the airline industry. The team had an opportunity to observe and learn from a field test conducted by three airlines and FET members at the Houston Air Route Traffic Control Center. The FET team is currently evaluating submissions of trajectory option set data to the FAA's current operational system that relies on the System-Wide Information Management (SWIM) and Pre-Departure Reroute (PDRR) interfaces. FET lessons learned will be beneficial to the DIP team, who plans to investigate the use of trajectory option sets via SWIM and PDRR during the Sustainable Flight National Partnership Operations 1 (SFNP-Ops-1) field demonstration in Houston during fiscal year 2025. The team provided information about DIP's SFNP-Ops-1 activities and discussed potential areas of collaborations in the future. The FET showed an interest in how DIP's predictive engine could

be integrated operationally and reroute benefits could be measured. The DIP team offered to update the FET team about the SFNP-Ops progress in Houston.

SWS Participates in the US ACCESS Working Group Meeting

POC: [NATASHA NEOGI](#)

On Mar. 13, the System-Wide Safety (SWS) project gave a series of presentations on the topic of assurance for artificial intelligence (AI) and/or machine learning (ML) components in safety-critical systems to the U.S. Aviation Coordination of Cybersecurity and E-enabled Standards Strategy (US ACCESS) working group. SWS researchers included Alwyn Goodloe and Natasha Neogi. Neogi's presentation, titled "Developing AI/ML Components for Civil Aviation (and their Standards): Challenges and Barriers," provided a higher-level view on the difficulties of constructing a safety argument for AI- or ML-enabled components in a safety-critical aircraft system. Neogi examined the reasons why applying traditional verification and validation techniques to these systems would not provide adequate evidence as to their safety and outlined the key barriers preventing the determination of what constitutes sufficient

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evidence an AI/ML component has satisfied a safety claim. Goodloe's presentation, titled "Assuring and Securing Machine Learning," provided a deeper dive into specific aspects related to assuring safety and security over systems with AI/ML components. Goodloe focused on two research avenues:

1. runtime verification frameworks for assuring AI/ML systems and
2. the potential for topological data analysis to yield actionable specifications from high-dimensional data for use in safety-critical applications.

The talks were well attended and well received by the US ACCESS working group, and future opportunities to perform further deep dives on intersectional topics with safety, security, AI/ML, and assurance are being explored.

SWS Holds Mid-Year Strategic Planning Retreat

POC: [KYLE ELLIS](#)

On Mar. 15, the System-Wide Safety (SWS) project leadership held a mid-year strategic planning retreat together with several SWS subprojects to outline scope for two new emerging technical challenges to be stood up as soon as fiscal year 2026. The SWS project management office and subproject managers from



ATM-X project management and PAAV leadership host Collins Aerospace at NASA Ames.

all Advanced Air Mobility-related technical challenges (TC-2: In-Time Aviation Safety Management System (IASMS) Capabilities for Emerging Operations; TC-4: Complex, Autonomous Systems Assurance; and TC-5: Advanced Air Mobility IASMS - Safety Demonstrator Series) discussed strategic plans to execute the Safety Demonstrator Series. The series is the body of work focused on integrating key safety technologies in partnership with industry to implement and evaluate a reference IASMS and generate data to inform industry standards and recommended practices to assure safety emerging operations such as Urban Air Mobility, Regional Air Mobility, and remotely piloted aviation systems. TC-2 and TC-4 are closing this coming year and the foundational research they have matured to enable the current Safety Demonstrator Series effort must evolve to address emerging safety needs. This strategic planning will have impacts to the workforce needs

and strategy to support SWS as it relates to the research portfolio for fundamental research and operational evaluations of research at higher technology readiness levels.

ACERO Hosts Successful Wildland Fire Management Workshop

POC: [BRANDON COOK](#)

On Mar. 26–28, the Advanced Capabilities for Emergency Response Operations (ACERO) project hosted a Concept of Operations (ConOps) workshop for wildland fire management at NASA's Ames Research Center in California. The purpose of the event was to receive input and feedback from attendees on the Interagency Wildland Fire Management ConOps being developed by the ACERO project, which will provide guidance for updating current methods, technologies, and standards to improve wildland fire operations. More than 200 people from

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Participants at the Wildland Fire ConOps workshop at NASA Ames.

federal, state, and local government agencies, nonprofits, academia, venture capital organizations, and commercial industry attended the event. Roughly 90 of those were in person and 110 were virtual. Attendees joined breakout sessions throughout the event, where they discussed the ConOps details, shared input on the needs of their agency or agencies regarding wildland fire operations, and networked. ACERO will assess the ConOps feedback from attendees and use it to inform the ConOps Version 1, which will be released publicly later this year. The workshop was organized and led by Brandon Cook, ACERO's ConOps lead.

ATM-X Offsite Meets for Strategic Planning Meetings

POC: [WANESSA PRIESMEYER](#)

On Mar. 26–28, the Air Traffic Management – eXploration

(ATM-X) project leadership team gathered for a strategic planning technical interchange meeting at NASA's Johnson Space Center in Houston. The meeting included approximately 15 personnel supporting in person and additional attendees supporting virtually. The

team discussed a variety of topics such as upcoming milestones, risk posture, task planning, and cross-project collaboration opportunities. New ideas were explored, subprojects empowered, and actions assigned to help strengthen the team and focus the group on upcoming objectives.



ATM-X leadership team at NASA Johnson for the strategic planning meeting.

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SWS Presents Aerial Aid project to NASA/FAA RTT Group

POC: [TANNER SLAGEL](#)

On Mar. 28, System-Wide Safety (SWS) project researcher J. Tanner Slagel presented the “Aerial Aid” Convergent Aeronautics Solutions activity to a group of approximately 40 stakeholders from NASA and the FAA at the quarterly Verification and Validation Research Transition Team (RTT) meeting. The goal of the Aerial Aid activity is to enable the use of Uncrewed Aerial Vehicles in the medical industry by creating a representative dataset that can be used to train classification engines for medical situational awareness, as well as to create prototype classifiers and an assurance framework for them. The Verification and Validation Research Transition Team, organized by Aaron Dutle and sponsored by the SWS project, is a forum for NASA and the FAA to share their research on topics related to verification, validation, safety assurance, and related topics.

SWS Participates at Drone Safety Team Meeting

POC: [STEVE YOUNG](#)

On Mar. 28–29 the System-Wide Safety (SWS) project participated in the Drone Safety Team (DST) meeting at MITRE Headquarters in Virginia. Representing the SWS project were Steve Young, Becky

Hooey, and Jeff Homola. The DST is a government/industry group that develops consensus-based recommendations for safety enhancements for uncrewed aircraft operations. At this meeting, leadership introduced activities to be undertaken by the team. One is a safety data collection and analysis capability that will host data provided by DST member organizations and provide tools to help the DST understand the types and prevalence of contributing/causal factors to accidents, incidents, and mishaps. Ultimately, this capability will be used in concert with the existing Aviation Safety Reporting System, which collects voluntary reports from the community at large. Participants in this meeting represented a broad sector of the community including manufacturers, operators, the FAA, and other government agencies involved in either uncrewed aircraft systems operations or safety-related research and development.

RECOGNITION

SWS Leadership Member Speaks at MLK Event

POC: [WENDY OKOLO](#)

In honor of Martin Luther King, Jr.'s legacy, the Ames African American Advisory Group hosted a virtual event, "Learn to Fly: Determination Plus Resilience Equals Progress" on Jan. 17. The event featured keynote speaker Wendy Okolo of the System-Wide Safety (SWS) project. Okolo's academic memoir, entitled "Learn To Fly," aimed to change the narrative of under-representation in Science, Technology, Engineering, and Mathematics (STEM) by inspiring and equipping young girls, career women, and people of color to persist in STEM fields.

SWS Researcher Selected as ACM Fellow

POC: [CORINA PASAREANU](#)

System-Wide Safety (SWS) project researcher Corina Pasareanu was named as an Association for Computing Machinery (ACM) fellow "for contributions to the development and application of symbolic execution and compositional verification." The award was announced in a press release issued by ACM on Jan. 17. In the press release, ACM named 68 fellows for "transformative contributions to computing science and technology." ACM fellows represent 1-percent of the ACM

entire global membership, which includes nearly 110,000 computing professionals. This year's inductees include the inventor of the World Wide Web, the "godfathers of AI," and other colleagues whose contributions have been "important building blocks in forming the digital society that shapes our modern world." Pasareanu's research on symbolic execution and compositional verification has found multiple applications at NASA, industry, and academia, resulting in multiple publications as well as practical tools aimed to improve the safety and reliability of software systems. Additional information about the 2023 ACM fellows is available through the [ACM Fellows website](#).

NASA Selects SWS Proposal for Non-Provisional Patent

POC: [CHAD STEPHENS](#)

On Jan. 25, NASA began the process to seek a non-provisional patent for the System-Wide Safety (SWS) project's SWS Technical Challenge 6 (In-Time Aviation Safety Management System for Commercial Air Operations) technology (Case No. LAR-20356-1). The patent is titled "Method and System for Risk Precursor Identification in Commercial Aviation Terminal Area Operations." SWS Technical Challenge 6 researchers and NASA

patent attorneys are planning to file the non-provisional patent to the United States Patent and Trademark Office. The information in the application represents technologies developed by the SWS Technical Challenge 6 researchers as presented at the SWS Technical Challenge 1 closeout event in July 2023.

SWS Researcher Presents Technical Talk at the EMA Expo 2024

POC: [TRUONG NGUYEN](#)

System-Wide Safety (SWS) project researcher Truong Nguyen presented a technical talk titled "A HIRF-Map Certification Approach for AAM, UAM, and UAS Vehicles" at the Electro Magnetic Applications (EMA) Expo 2024 in Colorado, held Jan. 29–Feb. 2. The presentation proposed a novel certification approach for protecting flight systems from High-Intensity Radiated Fields (HIRF) specifically tailored for Advanced Air Mobility (AAM) vehicles – particularly for Vertical Take-Off and Landing. Current standards often require AAM vehicles to meet the same stringent HIRF requirements as rotorcraft – leading to overly demanding testing conditions and adding significant cost, size, and especially weight penalties to AAM vehicles. The approach proposes generating HIRF avoidance zone maps specific

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to each vehicle's HIRF tolerance level. By actively avoiding these high-risk zones, the interference risk is significantly reduced. Data for zone creation primarily comes from the Federal Communication Commission's transmitter databases. Additionally, a minimum HIRF tolerance threshold was suggested based on data for New York as a representative urban environment. This lower threshold allows AAM vehicles to be lighter and reduces the overall cost of design, manufacturing, testing, and certification. Following the presentation, several industry and government representatives from the FAA, Canada, and Brazil expressed interest in the concept. The SWS and Electrified Powertrain Flight Demonstration projects funded this work.

NExCT Participates in TVF 2024 Meeting

POC: [KENNETH FREEMAN](#)

On Feb. 8, Ken Freeman, deputy project manager for the Air Traffic Management – eXploration project and subproject manager for National Airspace System Exploratory Concepts and Technologies (NExCT), participated in a panel at the Transformative Vertical Flight (TVF) 2024 meeting in California. Freeman participated on the “Autonomous Infrastructure and

Operations Panel,” and spoke on information, cybersecurity, and cooperative operating practices needed to support a drone package delivery for a multitier vertiport use case.

AOSP Safety Liaison is 2024 AIAA Fellow

POC: [MISTY DAVIES](#)

On Feb. 8, Misty Davies, AOSP's safety liaison, joined the American Institute of Aeronautics and Astronautics (AIAA) newly elected class of 2024 fellows. The class will be inducted during a ceremony on May 14 in Washington, DC, and celebrated during the AIAA Awards Gala on May 15 at the John F. Kennedy Center for the Performing Arts. “The Class of 2024 AIAA Honorary Fellows and Fellows are among the most respected names in the aerospace profession. Congratulations to each member of this year's class for their many accomplishments,” said Laura McGill, AIAA president. “These distinguished individuals have earned the respect and admiration of our broad science and engineering community. We are in awe of their creativity and exceptional contributions to advance the performance and capability of aerospace systems.” AIAA confers fellow on individuals in recognition of their notable and valuable contributions to

the arts, sciences, or technology of aeronautics and astronautics. Nominees are AIAA associate fellows. Since the inception of this honor, 2,064 people have been elected as an AIAA fellow. “AIAA takes great pride in honoring the Class of 2024 Honorary Fellows and Fellows. These professionals have made significant and lasting contributions to the aerospace community. Their passion and dedication are inspiring the generations that follow to reach even greater heights,” added Dan Dumbacher, AIAA chief executive officer.

SWS Participates at imaginAviation 2024

POC: [ABIGAIL GLENN-CHASE](#)

The System-Wide Safety (SWS) project was among the AOSP projects that had a substantial presence at the imaginAviation 2024 event held Feb. 27-29. The free virtual event provided the aeronautics community an opportunity to experience the latest innovations in NASA Aeronautics through the eyes of the Transformative Aeronautics Concepts Program's University Innovation, Convergent Aeronautics Solutions, and Transformational Tools and Technologies projects. SWS project researchers presented at the poster session event in the event's virtual

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GatherTown with three posters covering subject matter on the Safety Demonstrator Series that SWS is developing, along with the In-Time Aviation Safety Management System (IASMS) for emerging operations and IASMS for commercial operations. SWS project manager Kyle Ellis participated as a panelist on the “On the Rise: Early Career Perspectives” panel, and SWS associate project manager Wendy Okolo participated on the “Advanced Air Mobility: Moving Through the Tech and Innovation Life Cycle” panel.

SWS-Sponsored Research Results in New License

POC: [CHAD STEPHENS](#)

The System-Wide Safety (SWS) project-sponsored research (LAR-18996-1) titled “System and Method for Training of State-Classifiers” has resulted in a new license (DN-2206) with The Mozart Effect, LLC for six patented NASA technologies (LAR-18144-1, LAR-17895-1, LAR-18267-1, LAR-17951-1, and LAR-19302-1). The newly patented NASA technologies are expected to contribute to The Mozart Effect’s portfolio of technologies and services focused on virtual learning in education contexts and training services for professional development. The work

supporting this new license was conducted under the Technologies for Airplane State Awareness subproject completed a few years ago. The coinventors on the licensed patents include Chad Stephens, Lance Prinzel, Angela Harrivel, and Alan Pope.

AOSP Director Participates in ALPA Podcast

POC: [KYLE ELLIS](#) AND [KELLEY HASHEMI](#)

Akbar Sultan, program director for AOSP, was invited to participate in an Air Line Pilots Association (ALPA) podcast with ALPA president Jason Ambrosi. The podcast was recorded on Mar. 5 and the question-and-answer portion was focused on NASA research and development efforts to improve commercial aviation safety. The invitation was extended to Sultan as part of stakeholder engagement between the System-Wide Safety project and ALPA national. The podcast will be available on all major streaming services as part of the “Air Line Pilot Podcast.” When available, it can be located online at <https://airlinepilot.podbean.com/page/2/>. In addition, Sultan has published an article in the ALPA magazine, “Air Line Pilot.” This piece in the March 2024 issue highlights the importance of collaboration for achieving an air transportation system that

enhances its safety standards while maintaining affordability and efficiency. Sultan emphasizes the benefit of collaboration, stating that “our success as a national aeronautics research agency depends on partnerships with airlines committed to groundbreaking achievements in technology and operational concepts that prioritize safety.” The magazine audience reach is an impressive 100,000+ digital readers with 90,000 print issues being circulated. More than 70,000 pilots are part of the readership. SWS will author four more articles in 2024. The topic for April’s issue is pilot contributions to aviation safety.

SWS Subproject Manager Invited to Speak at Boeing

POC: [CHAD STEPHENS](#)

System-Wide Safety (SWS) subproject manager Chad Stephens was invited to give a virtual talk at the Boeing Human Engineering Community of Excellence held Mar. 18. His talk was titled “Psychophysiological Methods to Assess Pilot Productive Safety Behaviors.” More than 110 Boeing personnel attended the presentation focused on human factors methods deployed by the SWS project’s Human Contributions to Safety researchers to study human error and human contributions to safety

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in aviation operations. This work was conducted within the project's Technical Challenge 6: In-Time Aviation Safety Management System for Commercial Aviation Operations. Requests for additional information and follow-on discussions with Boeing's Flight Deck Engineering and Research and Technology Development groups resulted from this presentation.

ATM-X Participates at NSBE's 50th Annual Convention

POC: [FAISAL OMAR](#)

The Air Traffic Management – eXploration (ATM-X) project

participated in the NASA recruitment effort at the National Society of Black Engineers (NSBE) 50th Annual Convention held in Atlanta on Mar. 20-24. NSBE is one of the largest student governed organizations in the United States. It is estimated that more than 18,000 students, faculties, professionals, and government/industry recruiters attended the convention. More than 400 career fair exhibits were showcased at the convention. Student attendees had the opportunity to network and interview with industry and government entities. The convention also included panels

and professional development opportunities geared toward students and young professionals. Representatives across all the NASA centers and Headquarters welcomed hundreds of students and faculties to the NASA booth. ATM-X personnel engaged with students to educate them on project concepts and technology. Additionally, hundreds of on-the-spot interviews were conducted as part of the NASA Post-Secondary Students pilot program, which provides students with the opportunity to gain developmental work experience and may lead to full-time opportunities after graduation.



NASA booth at NSBE's 50th Annual Convention.

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