



# AOSP Newsletter

Airspace Operations and Safety Program (AOSP)

JAN-MAR 2019 | Quarter 2



UTM Team Visits TCL4 Nevada Test Site 4

Safe2Ditch Steer-to-Clear 6

## AOSP IN THE NEWS

### [Proposed FAA Rules Loosen Restrictions On Drone Flights At Night](#)

Engadget (1/14, Dellinger) “Right on the heels of Canada introducing new, stricter regulations for drone operations, the US Department of Transportation proposed a new set of rules for drones that would allow the unmanned vehicles to fly over populated areas and operate at night. The proposal also includes a pilot program for drone traffic management that would help to integrate the aircrafts into the nation’s airspace. ...The program, first developed as a research project by NASA and operated as a joint effort between that agency and the FAA, will be used primarily to gather information that will help set future rules.”

### [DOT UAS Initiatives](#)

Federal Aviation Administration (1/14) “On January 14, 2019, U.S. Department of Transportation Secretary Elaine L. Chao announced proposed new rules and a pilot project to allow unmanned aircraft systems (UAS), or more commonly called drones, to fly overnight and over people without waivers under certain conditions and to further integrate drones safely into the national airspace system....Developing drone traffic management was initiated as a research project by NASA and subsequently became a major joint effort between the FAA

and NASA. In April 2017, through Congressional direction, the agencies combined their respective technology research and began defining the scope of the pilot project.”

### [Feds Make Major Moves to Relax Restrictions on Use of Drones](#)

Forbes (1/15, Rupprecht) “The Department of Transportation made three major announcements: (1) proposed regulations to allow drone operators to fly over people as well as at night WITHOUT a waiver or an exemption, (2) an advanced notice of proposed rulemaking asking for recommendations on countering problematic drones affecting safety and security, and (3) the awarding of three contracts to commercial service entities to develop technology to provide flight planning, communications, separation, and weather services for drones under 400 feet. ...The UPP, which was originally initiated by NASA but subsequently became a major joint effort between the FAA and NASA, ‘is intended to develop and demonstrate a traffic management system to safely integrate drone flights within the nation’s airspace system.’”

### [‘Get Ready For Flying Cars,’ Says Morgan Stanley’s Widely Followed Auto Analyst](#)

Business Insider (2/5) “A widely followed auto analyst at Morgan

Stanley told clients that ‘electrified, autonomous vertical takeoff and landing vehicles,’ or flying cars, are gaining traction. Adam Jonas wrote that investors ought to consider the future of flying cars—without naming individual companies’ stocks that could benefit from such a development. ...Jonas pointed to a few factors to bolster his view: drone package delivery is already in active testing, and NASA launched an initiative to encourage urban air mobility’s development late last year.”

### [NASA Tests Urban Drone Traffic Management In Nevada, Texas](#)

Business Insider (2/19) “NASA has selected two organizations to host the final phase of its four-year series of increasingly complicated technical demonstrations involving small Unmanned Aircraft Systems (UAS), commonly known as drones. The Nevada Institute for Autonomous Systems in Las Vegas and the Lone Star UAS Center for Excellence & Innovation in Corpus Christi, Texas, will host demonstrations to confirm NASA’s UAS Traffic Management (UTM) system can safely and effectively manage drone traffic in an urban area.”

## AOSP IN THE NEWS

### [NASA Teaming Up With TAMUCC To Study Drone Traffic Safety](#)

MSN (2/19) “Texas A&M University-Corpus Christi was awarded a partnership with NASA to test drones and make them safer. With more companies and people utilizing drones, the partnership will help make sure the skies are safe for unmanned aircraft systems. At the Lone Star UAS Center at TAMUCC, research is already underway into the future of drone technology.”

### [NASA's Drone Traffic Control System Moves Into The Final Phase Of Testing](#)

New Atlas (2/20) “Here, NASA expects to carry out trials that show how the UTM can safely coordinate drone traffic in urban areas. This will involve drone flights over downtown Reno, Nevada, and over the campus at Texas A&M University, where technologies like obstacle avoidance, drone-to-drone communication and automated landing will be put through their paces. The results of the trials will then be used to develop rules and procedures for drone traffic in busy areas.”

### [Homeland Security, NASA Team Up To Tackle Ever-growing Airspace Drone Traffic](#)

Oregonian (2/20) “The U.S. government estimates there will be more than 7 million drones in its national airspace within a couple of years, and that there are ‘serious safety, efficiency and security’ problems on the horizon if further regulatory measures are not taken. The Department of Homeland Security reports in a news release that it has partnered with NASA and the Federal Aviation Administration to tackle these concerns.”

# TECHNICAL AND PROGRAMMATIC HIGHLIGHTS

## UTM Team Visits TCL4 Nevada Test Site

POC: [RON JOHNSON](#)

The Unmanned Aircraft System Traffic Management (UTM) project held a kickoff meeting with the Nevada UAS test site and the Nevada Institute of Autonomous Systems (NAIS) in Reno, Nevada, on February 4. The purpose of the visit was to review NAIS' progress on UTM's Technical Capability Level 4 (TCL4) test preparation since being awarded the test site contract on December 21, 2018. Eight UTM team members participated in this face-to-face meeting held in Reno City Hall to discuss the details and test plans of the flights, in and around the city of Reno,



*UTM team surveying takeoff, landing, and staging areas for TCL4 (left to right: Frank Aguilera, Jae-woo Jung, Jeff Homola, Joey Rios, Marcus Johnson, Chris Walach, Juan Ramirez of NAIS, Arwa Aweiss, and Joey Mercer).*

that are planned for May. Mayor Hillary Schieve paid a visit and underscored the city's commitment to successful testing. The team also visited sites in Reno to be used for takeoffs and landings, flight paths, and contingency areas.

## UTM Part of Advanced Proposed Rule Making by FAA

POC: [JOEY RIOS](#) AND [PARIMAL KOPARDEKAR](#)

On February 13, the FAA incorporated Unmanned Aircraft System (UAS) Traffic Management (UTM) as part of an Advance Notice of Proposed Rulemaking (ANPRM). The FAA issues an ANPRM for public commentary prior to implementing proposed rules related to air transportation operations. Specifically, through this ANPRM, the FAA sought to reduce risks to public safety and national security, as the public commentary process may have significant impact to the eventual FAA rules that govern

UTM operations. NASA's UTM concept was referenced in ANPRM Section IV.C. and reflects the increasingly central role that UTM will play in the nation's small UAS operations. The ANPRM referenced the UTM implementation plan, and the FAA requested public input about how UTM should be utilized. The public commentary period ended on April 15, 2019. Typically, NASA aeronautical research products do not have this much direct airspace impact in this short amount of time. Five years ago, there were no UTM companies, and now they are sprouting up all over the world. In fact, other nations (Japan, Australia, Singapore, most of Europe, Colombia, and more) have latched on to the concept and are accelerating their own efforts. UTM is a potential model for other emerging entrants into the national airspace, such as urban air mobility, high-altitude operations, and space traffic management by allowing operators to perhaps collaboratively manage the National Airspace System through data exchange, protocols, and rules.

<https://www.federalregister.gov/d/2019-00758> (overall ANPRM doc)

<https://www.federalregister.gov/d/2019-00758/p-68> (UTM stuff)



*Reno City Hall and adjacent parking garage with roof top takeoff and landing areas.*



## TECHNICAL AND PROGRAMMATIC HIGHLIGHTS

### ATD-2 Demo at Future Flight Central for NASA Deputy Administrator

POC: [LINDSAY STEVENS](#)

On February 25, James Morhard, NASA Deputy Administrator,



*Lindsay Stevens (right) provided an overview of the ATD-2 subproject to NASA Deputy Administrator James Morhard (left) at FutureFlight Central.*

visited Ames Research Center in California. The visit included a demonstration of the Airspace Technology Demonstration–2 (ATD-2) Ramp Traffic Console (RTC) and a traffic scenario at Charlotte Douglas International Airport (CLT) from the Assessment of Ramp Times 2 human-in-the-loop simulation. The demonstration included an overview of the ATD-2

project, discussion of current benefits from ATD-2 technology, future directions for the technology, and the benefits of testing the technologies in facilities such as NASA's Future Flight Central (FFC). Additional NASA attendees

included Ames Director Eugene Tu, the Aviation Systems Division, and Aeronautics Research Mission Directorate management teams.

### ATD-2 Training at Atlanta and Washington Center

POC: [BOB STAUDENMEIER](#)

For three weeks, from mid-February through early March, the Airspace

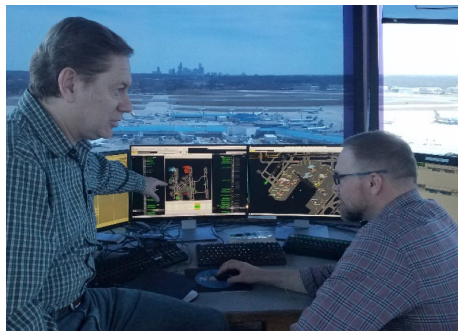
Technology Demonstration–2 (ATD-2) team trained the new Traffic Management Coordinators (TMCs) at both Washington Center (ZDC) and Atlanta Center (ZTL) that had not been in the unit during the previous refresher training sessions. This included nine TMCs from ZDC and three TMCs from ZTL. They were briefed on the capabilities of ATD-2's Ramp Traffic Console (RTC) and Surface Trajectory Based Operations (STBO) Client. During each session, TMCs were guided through interactions with the RTC and STBO Client interfaces and engaged with features and data exchange between the two tools. There was further discussion on how ATD-2 is integrated into their Time-Based Flow Management (TBFM) system through the Integrated Departure/Arrival/Surface capability and the non-verbal interaction that is available through electronic negotiations. TMCs had the opportunity to provide feedback and discussed how these tools could be used in the center environment. Outcomes of the center training, beyond proficiency on the ATD-2 systems, included increased excitement about the potential use of the tool during severe weather conditions. The use of electronic negotiations has been in place at ZDC since November 2017 and at ZTL since October 2018.

## TECHNICAL AND PROGRAMMATIC HIGHLIGHTS

### NATCA ATD-2 Lead Transition and Visit

POC: [ISAAC ROBESON](#) AND [BOB STAUDENMEIER](#)

From March 11–12, NASA Airspace Technology Demonstration–2 (ATD-2) team members provided a demonstration of the ATD-2 system in use at Charlotte Douglas International Airport (CLT), to the new National Air Traffic Controller Association (NATCA) ATD-2 lead, John Short. Short, a traffic management coordinator (TMC) from the Dallas/Fort Worth facility, observed surface metering and overhead stream insertion facilitated with the ATD-2 system from the CLT Tower/Terminal Radar Approach Control Center and American Airlines (AAL) Hub Control Center (ramp tower). NASA briefed Short on the latest ATD-2 status and addressed questions about the project. Pete Slattery, the former NATCA lead, also served as the CLT local representative



*Pete Slattery (left) is transitioning his role as the NATCA ATD-2 lead to John Short (right).*

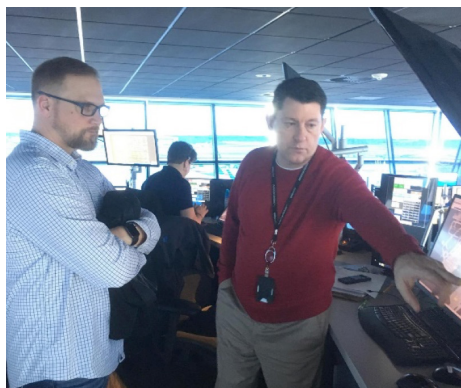
for ATD-2. The CLT role is now assumed by Mike Hoprich, CLT TMC. NASA looks forward to working with the new NATCA ATD-2 leads and is ever grateful for the many significant contributions of Pete Slattery as ATD-2 NATCA lead prior to this transition.

### Safe2Ditch Steer-to-Clear

POC: [LOU GLAAB](#)

Flight testing of the Safe2Ditch (S2D) Steer-to-Clear mode was completed on March 13. Testing was

performed at the City Environment for Range Testing of Autonomous Integrated Navigation (CERTAIN) range at Langley Research Center in Virginia. S2D is an autonomous crash management system for small Unmanned Aerial Systems (UAS). Its function is to enable small UAS to execute emergency landings to avoid injuring people on the ground and damaging property while preserving the vehicle and payload, if possible. S2D includes an internal database of predefined ditch sites that the system can select when needed. This database provides location information for sites that have a high probability of being unoccupied and suitable for emergency use. The system triages these sites based on distance, size, and terrain characteristics. To ensure a ditch site is clear at the time of use, a camera-vision system developed for S2D by Brigham Young University scans the selected ditch site for unexpected occupants



*John Short, NATCA (left), visits the AAL Hub Control Center with Mike Smith, AAL (right).*



*Test of Safe2Ditch ability to find a safe landing spot and effectively land the small UAS.*



## TECHNICAL AND PROGRAMMATIC HIGHLIGHTS

during the vehicle's approach and descent. This allows S2D to either select a different site, if possible, or to steer to avoid the occupants using the S2D Steer-to-Clear mode. Once the camera's field of view can no longer scan the entire ditch site, a touchdown spot is selected that is away from the detected motion and the vehicle transitions to autoland mode. A second objective of the flight tests was to verify the new C++ software version of S2D. Prior flight testing in 2018 verified the S2D ability to trigger a reroute due to occupancy when an alternate site is in range. The recent round of flight testing forced the vehicle to engage Steer-to-Clear by restricting S2D to a single ditch site option. With no reroute available, Steer-to-Clear was in operation for the entire descent of the vehicle.

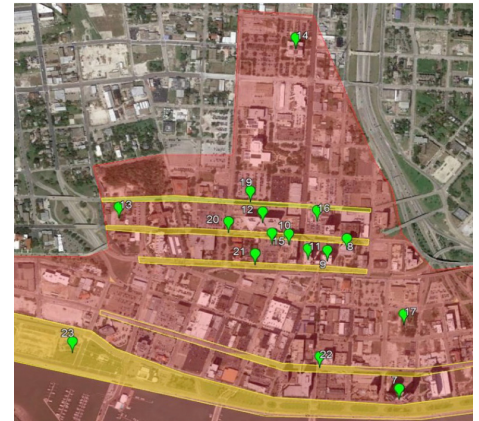
### UTM Team Visits TCL4 Texas Test Site following Award in February

POC: [RON JOHNSON](#)

On February 13, the Unmanned Aircraft System (UAS) Traffic Management (UTM) project awarded a contract task to the Lone Star UAS Center of Excellence (LSUASC) test site in Corpus Christi, Texas, for conducting a demonstration of the UTM system with live and simulated UAS flights. This demonstration will be part



*Views of urban canyon used for test flights (left) and map view of downtown Corpus Christi with flightpaths highlighted in yellow (right).*



of Technical Capability Level 4 (TCL4) and is the final field test of the UTM system which will be the most extensive and complicated testing to date by the project. Flights will take place in and around the urban areas of Corpus Christi and will investigate the challenges of communication, navigation, obstacle avoidance, safe landing, and beyond visual line of sight UAS operations. LSUASC is responsible for outfitting several vehicles with advanced technologies, leading UAS service supplier partners in performing UTM, installing ground tracking and weather instrumentation, and coordinating with the FAA for flight approvals and the city and public safety organizations for range safety. Flight tests planned for the July–August timeframe will complement the May tests being performed in Reno.

On March 18, the project held its kickoff meeting with LSUASC in Corpus Christi, Texas. The purpose of the visit was to review LSUASC progress on UTM's TCL4 test preparation since being awarded the test site contract in February. Nine UTM team members participated in this face-to-face meeting held at the LSUASC facilities to discuss the details and test plans of the flights, in and around the Corpus Christi area, that are planned for this August. The team also visited the Mission Command Center and sites in Corpus Christi to be used for takeoffs and landings, flight paths, and contingency landing locations. Particular areas of interest were the "urban canyons" in the downtown area near the Corpus Christi airport where UAS will be flying in and out, avoiding manned aircraft.

## TECHNICAL AND PROGRAMMATIC HIGHLIGHTS

### IDM Team Conducts Demonstration and Discussion with FAA National TBFM Ops Leads

POC: [NANCY SMITH](#) AND [PAUL LEE](#)

On March 21, the Integrated Demand Management (IDM) team held discussions and a demonstration session with the FAA management and National Air Traffic Controller Association (NATCA) leads for national Time-Based Flow Management (TBFM) operations at Ames Research Center in California. The purpose of the meeting was to demonstrate the IDM concept and get feedback on its feasibility, benefits and potential barriers for implementation. The visit was arranged by Perry Casselle and Matt Gammon, management and NATCA co-leads for the national TBFM operations team, respectively. Other FAA visitors included Wendy O'Connor, Phil Hargarten, and Warren Byrd. They were briefed on the potential benefits of coordinating strategic TBFM systems to precondition the traffic into TBFM arrival streams. Live demonstrations followed by a 4-hour end-to-end simulation run allowed the visitors to ask lots of questions, interact directly with the tools, and see the outcome results of the concept. The meeting was quite successful. There was discussion on how the IDM concept

could be used complementarily with their new TBFM adaptations. Overall, they were very positive about the work and the quality of the research and encouraged the IDM team to expand and explore the IDM concept further, especially in dealing with the convective weather problem.

### Dallas Love Field Business Aviation Pilots Briefed on ATD-2 Mobile App

POC: [ERIC CHEVALLEY](#)

On March 25, NASA supported a kickoff meeting organized by the National Business Aviation

Association (NBAA), FAA NextGen and the MITRE Corporation in Corpus Christi, Texas. NBAA and MITRE described opportunities to general and business aviation pilots to participate in the research and evaluation of the mobile application during the Airspace Technology Demonstration-2 (ATD-2) field evaluation in North Texas. The mobile application allows pilots to provide their Ready-to-Taxi times on to the airport movement area and for pilots to receive information back from the ATD-2 system about their estimated taxi time on the surface. The NASA team introduced the ATD-2 system use and benefits



*Pilots are briefed on ATD-2 and the ATD-2 mobile app.*



## TECHNICAL AND PROGRAMMATIC HIGHLIGHTS

of Earliest Off Block Times as key input from flight operators into the future surface system. Flight operators invited the group to brief a local pilot association. The team plans to collect data from summer 2019 until the end of summer 2020.

### NASA/FAA Coordination Kickoff for FAA Phase 3 Field Demo Partners

POC: [ERIC CHEVALLEY](#)

On March 26, the NASA ATD-2 team and its FAA NextGen representatives briefed FAA field demo partners about the engagement plans of the ATD-2

Phase 3 effort at the NASA/FAA North Texas Research Station (NTX). The team provided a programmatic and concept overview, development milestones, and a status update to local National Air Traffic Controller Association (NATCA) representatives, traffic managers of Fort Worth Air Traffic Control Center, Dallas Terminal Approach Control, Dallas/Fort Worth Air Traffic Control Tower and Dallas Love Field Air Traffic Control Tower. The NASA team showed the Phase 3 system running with live data and opportunities for rerouting traffic leveraging Trajectory Options Sets (TOSs).

MITRE briefed the group about opportunities for the General Aviation pilots from Dallas Love Field to participate in the field demonstration using mobile application technology. Field demo partners expressed strong interests and confirmed their commitment to the NASA Phase 3 field demonstration. Regular follow-up shadow sessions will take place at the NTX facility to further mature the Phase 3 capability and procedures and obtain feedback.

### ATD-2 Assessment of Ramp Times 3 Human-in-the-Loop Simulation Shakedown

POC: [LINDSAY STEVENS](#) AND [YOON JUNG](#)

The Airspace Technology Demonstration-2 (ATD-2) experiment team completed the Assessment of Ramp Times (ART) 3 human-in-the-loop simulation shakedown testing at NASA's Future Flight Central (FFC) air traffic control tower simulator facility, from March 26-28. The ART studies focus on testing various research questions for ramp controllers during surface metering events and results are used to collect user feedback and refine the ATD-2 tools for field operations. Eight retired Dallas/Fort Worth International Airport (DFW) FAA Air Traffic Control Tower (ATCT) and American Airlines ramp



*Field demo partners kickoff at NTX.*

## TECHNICAL AND PROGRAMMATIC HIGHLIGHTS



*Human-in-the-loop simulation shakedown testing assessed ramp times.*

controllers, as well as 12 pseudo-pilots participated in the ART 3 shakedown. Participants managed traffic per normal DFW operations while the ramp control participants worked to meet surface metering advisories for pushing aircraft off of the gate and/or for delivering aircraft to the spot between the ramp and the airport movement area. The simulation environment at FFC includes a 360-degree tower cab to simulate airline ramp operations, and a 270-degree out-the-window view to simulate the ATCT). Traffic scenarios were built based on live DFW operations during the summer of 2018. Additional flights were also added to the simulation's traffic scenarios in order to reflect planned increases in DFW traffic demand beginning the summer of 2019. The ramp and ATCT controllers managed surface traffic in the shakedown using the Ramp Traffic Console, Ramp Manager Tower Console, and the Surface Trajectory Based Operations Client ATD-2 user interfaces.



ART 3 is a precursor to the ART 4 human-in-the-loop scheduled for two weeks beginning April 22.

### **ATD-2 Presents Phase 3 Concept of Use to the CDM-Flow Evaluation Team**

POC: [ERIC CHEVALLEY](#)

On March 27, NASA briefed technical details of the ATD-2 Phase 3 concept of use, to the Collaborative Decision Making

(CDM) Flow Evaluation Team (FET), in Dallas, Texas. Attendees at this meeting included FAA leads, National Business Aviation Association (NBAA), National Air Traffic Controller Association (NATCA), JetBlue, Southwest, and American Airlines representatives. The NASA team described the key technology supporting the Phase 3 concept and discussed development needs to leverage System Wide Information Management (SWIM). The NASA ATD-2 system will use trajectory options sets (TOSs) to help to offload demand/capacity imbalances at the terminal boundary. The system includes a user interface to coordinate TOS usage that is shared among field demo partners. The group identified potential development to support exchange of TOS information in



*Representatives from FAA, NBAA, NATCA, JetBlue, Southwest, and American Airlines review Phase 3 concept of use.*

## TECHNICAL AND PROGRAMMATIC HIGHLIGHTS

SWIM. In May, NASA will meet in Washington, DC, with both the FET and the Surface CDM team groups who have a CDM task to support ATD-2 Phase 3 activities.

### **Technical Interchange Meeting with FAA Systems Analysis and Modeling Division Manager**

POC: [YOON JUNG](#)

The Airspace Technology Demonstration-2 (ATD-2) team hosted a technical interchange meeting with David Knorr, Manager of the FAA Systems Analysis and

Modeling Division, on March 29 at Ames Research Center in California. The FAA Systems Analysis and Modeling Division is responsible for developing a post-operational assessment of key NextGen capabilities. Knorr also serves as co-chair of the Joint Analysis Team to conduct analysis regarding performance impacts and benefits that can be attributed to implementation of NextGen capabilities. The ATD-2 team provided status updates of the project, including current benefits results of ATD-2 capabilities using surface metering and electronic

negotiation of release times for approval request flights. A high-level overview of the Phase 3 metroplex planner capability that allows weather impacted flights to reroute utilizing airlines' trajectory options sets during the stormy season was also presented. Alternative benefit mechanisms for delay reduction and throughput increase of both airport and terminal airspace traffic were also discussed. Knorr showed great interest in the results of the ATD-2 analysis, and is looking forward to future technology transfers.



## RECOGNITION

### Deseret UAS Webinar: Commercial UAS/UAM Flight Testing hosted by AUVSI

POC: [PARIMAL KOPARDEKAR](#)

On February 20, the Deseret Unmanned Aircraft System (UAS) moderated a webinar discussion on the current state of commercial Urban Air Mobility (UAM) testing. Panelists discussed the overall flight-testing environment, current test site activities, and opportunities for new UAM flight test programs. Panelists included Parimal Kopardekar, NASA; Jay Merkle, FAA; Adam Robertson, Fortem Technologies; Rafal Kicingier, Metron Aviation; Chris Walach, Nevada Institute of Autonomous Systems; John Manning, Electrafly; Robert Labelle, XTI Aircraft; and Tulinda Larsen, Deseret UAS.

### All About Autonomy 2019

POC: [PARIMAL KOPARDEKAR](#)

On March 1, the Silicon Valley Chapter of AUVSI (Association for Unmanned Vehicle Systems International) gathered experts from industry and government to discuss issues related to autonomy, including drones for public good and remote identification. A NASA panel, featuring William Van Dalsem, Starr Gin, Mark Ballin, Christopher Teubert, Joseph Rios, and moderated by Parimal Kopardekar, presented on the

Unmanned Aircraft System Traffic Management Technical Capability Level updates and an overview of autonomy projects at NASA. The event was held at the Hiller Aviation Museum, in San Carlos, California.

### Supreet “Sue” Kaur selected for Brooke Owens Fellowship

POC: [ANDREW GING](#)

Congratulations go out to Supreet “Sue” Kaur, who was selected as one of the 2019 Brooke Owens Fellows in early March. Kaur has been an intern on the Airspace Technology Demonstration-2 (ATD-2) Systems Engineering team since June 2018, and will be graduating with a Bachelor of Science degree in Industrial and Systems Engineering, and a minor in Green Engineering, from San Jose State University in the spring of 2019. Kaur’s responsibilities on the ATD-2 team have included software release testing, participating in human-in-the-loop simulations at NASA’s Future Flight Central, and documentation. Her senior project is focused on conducting workflow assessments on the ATD-2 systems engineering processes and implementing efficiency improvements. As one of 38 honorees (or “Brookies”) of the Brooke Owens Fellowship, Kaur was selected for accomplishments related to her professional aptitude, creativity, leadership ability, and commitment to serving her

community. Kaur demonstrated not only her dedication to her professional discipline, but her passion for mentoring and fostering diversity in science, technology, engineering, and math (STEM). Kaur was born in India and is the first woman in her family to obtain a college education. She has been an active mentor through the NASA Community College Aerospace Scholars program (of which she is an alumna) and participates in multiple external organizations serving diversity and STEM interests. Under the fellowship, Brooke will work at the Center for Strategic & International Studies with the International Security Program. The award was named for space industry pioneer and accomplished pilot D. Brooke Owens.

National Aeronautics and Space Administration

**Headquarters**

300 E. Street, SW

Washington, DC 20024

[www.nasa.gov/aeroresearch](http://www.nasa.gov/aeroresearch)

[www.nasa.gov](http://www.nasa.gov)