

**NEVADA FAA UAS TEST SITE QUARTERLY
REPORT**

January 31, 2018

1st Quarter, CY18

**Submitted in accordance with the
FAA's Other Transactional
Agreement (OTA)**

NV-QSR-FY2018Q1



Prepared by:

Nevada Institute for Autonomous Systems (NIAS)

for

The Nevada Governor's Office of Economic Development



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1st Quarter, CY 2018

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EXECUTIVE SUMMARY

Per the Other Transaction Agreement (OTA) between the Federal Aviation Administration (FAA) and the State of Nevada, DTFAC15A-00000, Services to Support Safe Integration of UAS into the NAS MASTER AGREEMENT (MA) Modification #0001, January 17, 2017, the State of Nevada FAA Unmanned Aircraft Systems (UAS) Test Site submits the following 1st Quarter, 2018 report to the FAA. The content in this report is an outline summary of the Nevada UAS Test Site activities over the past 90 days through 31 December 2017.

The Nevada Governor's Office of Economic Development (GOED) is the lead Nevada state entity for interface and coordinating with the FAA UAS Department for developing and integrating the FAA's UAS Systems under the OTA. In turn, GOED has contracted with the non-profit corporation, the Nevada Institute for Autonomous Systems (hereafter referred to as NIAS) to: (a) operate, oversee, and perform profit and loss (P&L) budget responsibilities over all Nevada UAS Test Sites, NASA Unmanned Traffic Management (UTM), and FAA contracts; (b) conduct commercial unmanned aviation consulting operations; (c) provide expert industry leadership; and (d) grow the Nevada UAS Industry. In addition, NIAS manages unmanned aviation operations and logistic resources, develops expanded airspace opportunities, generates UAS business leads that benefit UAS public and commercial entities, and leads future DOT/FAA UAS Integration Pilot Projects (UAS IPP). NIAS is staffed with permanent senior aviation leaders and former senior military officers with the unique responsibility to grow the Nevada UAS Industry on behalf of GOED and the Nevada Governor—no other Nevada entity has this overarching and critical mission. The GOED and NIAS personnel are hereafter referred to collectively as *Nevada personnel* in this report.

During the 1st Quarter, CY 18, the FAA online reporting system recorded seven Certificate of Authorization (COA) flights for the Nevada UAS Test Site. Nevada personnel are supporting NASA's Technical Capability Level (TCL) 3 to advance communication, navigation, and surveillance, UTM data testing, beyond visual line of sight (BVLOS), and operations over people (OOP) within the NASA UTM program. Nevada personnel have focused 1st Quarter efforts on advancing new applications and technologies including: developing and testing urban and rural UAS package delivery, counter-UAS (and drone detection), energy industry aerial inspections utilizing public easements over urban and rural areas, fire inspections and first responder operations using photogrammetry and infrared thermal imaging systems, developing the DOT's Smart City concept into a Smart Silver State Concept (CONOP) for the DOT/FAA UAS IPP, BVLOS operations using multiple Remote-Pilot's-in Command (RPICs), and OOP UAS operations in the City of Reno.

Safe and seamless integration of UAS in the National Airspace System (NAS) is a top NIAS BVLOS and OOP priority. FAA-granted Certificates of Authorization/Waiver (COAs) to Nevada personnel have enabled Nevada to provide significant operational data and lessons learned on a consistent basis to include: safety, advancing UAS-related technologies, privacy regulations, frequency management, and airspace congestion. The Reno-Tahoe Airport Authority (RTAA) recently implemented the Low Altitude Authorization and Notification Capability (LAANC). This capability will better enable the local Reno and Nevada UAS industry to grow economically and expand rapidly for all UAS categories. Nevada personnel will continue to plan, prepare, capitalize on and implement innovative UAS technologies and advance safety and public awareness to remain a top producing and resilient FAA-designated Nevada UAS Test Site to help grow the national UAS Industry and elevate the U.S. as the top global UAS innovator and thought leader for all UAS categories and acceleration of air commerce.



ACCOMPLISHMENTS AND RESEARCH



Photo: AviSight C3 Vehicle

NV Energy/AviSight C3 Vehicle Demonstration with NIAS Austin, NV December 2017

Discussion. NV Energy adopted a team approach and incorporated the FAA-designated Nevada UAS Test Site/NIAS and commercial industry specialists in the discovery process of integrating unmanned aircraft systems (UAS) into utility operations to help improve customer service and reliability. To advance the use of UAS technology, NV Energy has been working with NIAS, AviSight, and other stakeholders on the discovery process for part 107 waiver development. The main objective of this collaboration has been to work with the FAA to discover the requirements for developing a beyond visual line of sight (BVLOS) approval path forward to inspect utility infrastructure. The ability to use this technology will allow for safe, cost-effective and innovative data collection. This December 2017 flight demonstration took place in Austin, Nevada using the Vapor 55 industrial inspection UAS and the AviSight Command, Control, and Communications vehicle.

Lessons Learned. The lessons learned during this mission included: (a) mast mounted C2 link is stable and maintains connectivity to the maximum extent of Line-of-Sight; (b) mast mounted PTZ Camera greatly enhances Situational Awareness of the local flight environment; and (c) the controlled environment of the C2 Van allowed the flight crew to maintain their proficiency and awareness levels at a greater level and longer duration than if they had been in the elements for the Mission Duration.



Nevada UAS Test Site Original Equipment Manufacturer (OEM) Air Robot AR200 VTOL Flight Training Port Mansfield, TX October 2017

Discussion. NIAS completed Original Equipment Manufacturer training on the Air Robot (AR) Model 200 in Port Mansfield, TX. Air Robot GmbH and Company KG is a German-based global manufacturer of Unmanned Aerial Systems (UAS). The company provides the German military with several models of reconnaissance platforms. A total of six NIAS personnel successfully completed the rigorous Air Robot qualification training. The training was conducted over five days and encompassed all flight modes including: manual flight, autonomous flight after takeoff, degraded operations, and emergency procedure training. The AR 200 is a nearly autonomous UAS that was used for a flight demonstration for package delivery in the greater Reno, Nevada Tahoe-Reno Industrial Center during 3rd Quarter, FY 2017. Flight crew and aircraft maturity training took place through November 2017.

Lessons Learned. Throughout operational testing and package deliveries, NIAS recommended several Air Robot lessons learned: (a) although the AR200 UAS is considered autonomous, for safe and efficient package delivery, there were several required pilot inputs for a successful package delivery; (b) the relatively short battery life of less than 25 minutes, including reserve battery time for safety, seriously limits the AR200's range and number of deliveries possible per battery charge; (c) the time required to charge a AR200 battery was found to be very lengthy and required specific cooling requirements prior to charging—this process was extremely time and battery management intensive; and (d) packages for delivery also required extensive attention to detail to ensure center of gravity as the package was lowered to the delivery location via a single point—if the packages were slightly off center of gravity, the release mechanism would fail to release. NIAS recommended that the Air Robot and all UAS package delivery further develop the delivery mechanism to be resilient under all flight modes and environments.



Large UAS Package Delivery Retailer – Training, Development, and Testing with NIAS Greater Reno, NV Area 3d Quarter, FY 2017 to 1st Quarter, 2018

Discussion. NIAS continued package delivery operations with a large commercial retail entity. NIAS set the conditions for package delivery operations in the greater Reno area with the Reno Mayor and City Manager, other local and county officials, economic development regional entities, and commercial businesses to receive Part 107 paid package deliveries from this large retailer. NIAS acted as the Nevada and National UAS entity for this retailer



and as such, NIAS efforts included: recruiting seven FAA commercial and Part 107 certificated pilots, training six pilots on the commercial UAS (Air Robot); conducted extensive flight team training and pilot maturity; developed the global retailer’s Part 107 operational concept (CONOP) for Reno Operations Over People (OOP) and use of publicly available easements; further developed this concept to deliveries into business expansion areas for controlled business-to-business deliveries; developed a plan to train, field, test, and evaluate live package delivery flights at the Tahoe Reno Industrial Center (TRIC) with five businesses and a county annex. NIAS expended significant efforts in developing relationships and Non-Disclosure Agreements with 12 businesses in the greater Reno, NV area for package deliveries; establishing flight profiles (air corridors) from a controlled departure to a controlled delivery location for each business. NIAS continues to advance UAS package delivery in the State of Nevada with an intense focus on the greater Reno, Nevada area.

Lessons Learned. NIAS lessons learned include: (a) there is a great deal of time, effort, and coordination required in the preparation, planning, and execution for successful package delivery operations, integration of privacy laws into such operations, and local community engagement; (b) risk mitigation throughout the operational phases remains critical to successful package delivery operations and should follow a crawl, walk, and run method of pilot and aircraft maturity; and (c) NIAS embraced the FAA Partnership for Safety Program (PSP)—NIAS was the only test site to recommend major changes to the retailer’s PSP.

Nevada personnel performed a great deal more preparatory work for this global retailer—listed below in the discussion are the highlights. NIAS gleaned key insights into what it takes for a global retailer (any UAS company large or small) to standup and rollout a commercial UAS package delivery operation. Nevada is very nationally and globally focused and oriented and these critical insights position Nevada to help other retailers in achieving their major UAS testing and training goals.



Source: Las Vegas Review Journal

Training and Workforce Development, NIAS partnered with SkyOp Part 107 Course Developer
Las Vegas, NV
October/November 2017

Discussion. NIAS completed their first “Drone Academy” in October 2017. NIAS has teamed with New York-based training and education provider SkyOp earlier in the year to offer SkyOp drone training curriculum and programs in Nevada, Arizona, California, Utah, Washington, Idaho and Colorado. The training program was held in the Switch Innovation Center in Las Vegas, Nevada. The students attending the training included energy sector employees to workforce members undergoing retraining. NIAS is in discussions with several universities and community colleges across the State of Nevada to assist them in developing their UAS offerings and degree programs. The demand for this course and training has exploded since inception and Nevada Personnel expect this to continue for the foreseeable future.



Lessons Learned. NIAS lessons learned include: (a) an experienced staff adds significant value to the curriculum—NIAS has a very experienced staff of five former military and current FAA commercial and Part 107 certified aviators to present the course curriculum; (b) student pilots attending the course with no formal aviation knowledge requires a patient and multi-faceted experienced-based learning environment; (c) instructors must adapt the curriculum to facilitate the greatest learning end state; and (d) the hands-on course flight segment enables students to reflect and then implement the concepts presented in the course curriculum. The NIAS course, in-depth curriculum, and individual study requirements logically allow the student to successfully attain the FAA’s Part 107 Airmen certification.

COMMUNITY OUTREACH



FAA Technical Interchange Meeting Virginia October 2-5, 2017

NIAS and Dr. Chris Walach presented at the FAA Technical Interchange meeting on the integration of the FAA Safety Management System (SMS). This meeting/conference was both productive and informative on topics ranging from safety, beyond visual line of sight operations, and spectrum management.



NASA Industry Day for Unmanned Aircraft in National Airspace Collaboration San Diego, CA. November 30, 2017

NIAS attended the NASA *UAS in the NAS* industry day in support of the ongoing NASA Nevada initiatives. The purpose for the San Diego NASA's Industry Day was to meet and gather input from various commercial and academic partners that may have interest in or have technologies available that can support the *UAS in the NAS* project's Systems Integration and Operationalization (SIO) demonstration in the summer of 2020. The goals for the day included leveraging agency research in integrated detect and avoid, command and control, and other state-of-the-art UAS vehicle technologies with a pathway toward FAA certification for vehicle operations above 500 feet or more above ground level. Specific objectives for the NASA Industry Day included:

- Gaining technical information on relevant industry efforts such as technology development cycles and overall plans for UAS commercialization
- Obtaining schedule-related information to determine whether a 2020 SIO demonstration date is feasible
- Acquiring reasonable fiscal rough orders of magnitude (ROMs) from Industry to guide



partnership/acquisition decisions, and ensure the SIO demonstration can be successfully executed within resources

- Communicating NASA expectations for the NASA partnership development process
- Fostering coordination across industry participants and potential partnership teams



NIAS Sponsorship of Local Youth Drone Amateur Racing League

Las Vegas, NV.
November 2017

NIAS sponsored one of the first teams in the International Drone Racing Circuit (IDRC) which is a Las Vegas based amateur drone league for 10 to 18-year-olds. The IDRC's fundamental purpose is to enable all Las Vegas youth to participate in competitive sports to keep them in school and thus better motivate and challenge possibly at-risk youth on positive decision-making and career choices. The sponsorship helped support 1,000 local youth from across Nevada between the ages of 10 and 18 to learn everything about drones and drone racing to prepare them for competition and eventually for future employment within the multifaceted drone industry. This event also increases public awareness for drone use and the necessary safety mitigations that should be put in place

COLLABORATION



Drone Demonstrations for First Responders in Partnership with the Commercial UAV Expo

Henderson, NV.
October 25, 2017

NIAS partnered with the Commercial UAV Expo and hosted and demonstrated law enforcement drone deployment at the Henderson Unmanned Vehicle Range (H.U.V.R.) to approximately 300 visitors and attendees from the conference. Local and national public safety experts demonstrated drone use in a variety of fire and law enforcement scenarios. The event was sponsored by Yuneec and Aeryon Labs and featured UAS teams from Las



Vegas Fire & Rescue, Las Vegas Metro Police Department, Nevada Highway Patrol, Colorado Division of Fire Prevention, and Sundance Media Group. Demonstrations included live-streaming monitoring of an accident scene, a search and rescue scenario, a high-risk traffic stop, and a suspect pursuit. This was a very publicly engaging event with the attendees having the opportunity to ask multiple questions from a variety of topics including public safety during law enforcement real drone scenarios.



Source: <https://www.lockheedmartin.com/us/products/desert-hawk.html>

Lockheed Martin Desert Hawk UAS Integration with NIAS
Las Vegas, Nevada
December 2017

Lockheed Martin and NIAS have entered into an agreement to field the Desert Hawk III UAS to the Nevada UAS Test Site. This UAS has been employed in support of combat operations since 2005 and has accomplished thousands of sorties under austere conditions. NIAS will use these UAS for research and development, NASA operations, and live operational demonstration missions in support of Nevada UAS Test Site operations to help advance BVLOS, operations over people, and night operations. This integration of the Lockheed Martin UAS will significantly enhance the Nevada UAS Test Site public safety awareness of advanced UAS flight and data collection processes.



FAA/DOT UAS Integration Pilot Program
Las Vegas, Nevada
November and December 2017

Nevada personnel and several dozen highly integrated local, state, and tribal entities, Nevada-based UAS companies, and dominant retailer, technology, and tele-communications industry giants recently submitted an aggressively comprehensive and unique DOT/FAA use case and proposal for the landmark joint DOT/FAA UAS Integration Pilot Program (IPP). Nevada's proposal significantly advances beyond visual line of sight operations, operations over people, and night operations in an uncontested one-stop state technology proving ground unlike any other known use case. Nevada personnel have set the DOT/FAA conditions to solidify Nevada (i.e., the Smart Silver State) as a key hub for significantly advancing the drone industry; fuel economic development on a national scale through the engagement and deployment of the very top research and development partners; streamlining government policy and procedure development deployed state-wide; and integrating incredible community feedback on a level not seen to date using social media as a powerful communications platform.



IMPROVEMENT IN SAFETY RISK MITIGATION PROCEDURES

Based upon the previous experience of senior NIAS personnel, package delivery operations with a global retailer flight team revealed the need to standardize a methodology for flight planning and execution. To ensure safe, efficient and successful package delivery, a detailed and extensive test card was developed. The cards were developed using Google Earth Pro for a graphic representation with markers and text that included:

- Takeoff location
- Enroute information
- Hazards along the flight path from takeoff to delivery location
- Delivery location

Although created in Google Earth Pro application, a site safety survey was imperative to ensure that current ground truth met with the Google Earth stored data. The flight test cards were updated to include known hazards to flight and any other flight information that aided the UAS pilot's safety mitigation. This method proved to be of immense value to the entire flight team. Training the flight team, including visual observers, to assist and then eventually prepare and present and deploy their flight card greatly improved safety risk management. The cards were used post-flight to review and discuss Nevada UAS Test Site safety mitigation processes and procedures with the purpose to improve public safety and public safety education.

EMERGENCY OPERATIONS

In October, the Henderson Unmanned Vehicle Range (H.U.V.R.) was selected to host a law enforcement drone demonstration of real capabilities. NIAS with the Commercial UAV Expo, hosted the demonstration attended by approximately 300 visitors and conference attendees. Demonstration attendees were able to engage with the local and national public safety experts demonstrating drone use in support of fire and law enforcement operations. UAS teams included: Las Vegas Fire & Rescue, Las Vegas Metro Police Department, Nevada Highway Patrol, Colorado Division of Fire Prevention, and Sundance Media Group. The event demonstrations were extremely well received and covered four important scenarios for drone use cases in law enforcement operations:

1. Monitoring an accident scene via live video-streaming
2. Search and rescue operations
3. High-risk traffic stops
4. Suspect pursuits

FUTURE ACTIVITIES

Nevada personnel continue to grow the UAS workforce by working with Nevada higher education entities to increase the number of Part 107 operators within Nevada and the West Coast states and tie academic excellence to actual workforce jobs in the community. Nevada personnel also continue to advance UAS in multiple UAS categories including aerial package delivery, drone detection, cloud seeding, infrastructure inspections of critical facilities and energy powerlines, and growing the artificial intelligence (AI) and machine learning technologies that can effectively integrate into the Unmanned Traffic Management (UTM) System. Nevada personnel also continue to prepare to execute a successful NASA Technical Capability Level 3 Operation in the 2nd Quarter, 2018. Facilitating safe integration of UAS and technology into the National Airspace System (NAS) remains a top Nevada UAS Test Site focus while ensuring the highest level of citizen privacy. Nevada lessons learned will continue to enhance the UAS Industry's situational awareness with UAS operators and with the public's safety and privacy in mind to significantly advance air commerce and FAA regulations. Nevada will continue to set the conditions



through the 2nd Quarter, 2018 to ensure a successful role out of the DOT/FAA's UAS IPP to help the U.S. lead all major global UAS innovations.

NEVADA BULLET POINTS

1. The Nevada UAS Test Site/NIAS continues to push FAA policy and procedures for the Nevada and National UAS Industry in technology advancements for beyond visual line of sight technologies, urban and rural aerial package delivery operations, UAS cloud seeding advancements, and drone detection and identification capabilities with the development of artificial intelligence (AI) capabilities that focus on integrating into the Unmanned Traffic Management (UTM) system.
2. The Nevada UAS Test Site workforce development training academy promotes training standardization and public safety awareness enhancing the FAA's ability to safely integrate UAS into the manned NAS.
3. As a NASA preferred partner, the Nevada UAS Test Site continues to innovate and push the technology integration into NASA's Unmanned Traffic Management system by developing a unique drone detection capability that can significantly advance the research and development for detecting and identifying drones during law enforcement operations, public outdoor events, and use for surveillance at high security sites.
4. The Nevada UAS Test Site and the State of Nevada are proud to support the application to the DOT/FAA's UAS Integration Pilot Program (IPP) with a comprehensive and leading-edge proposal that will advance the shared goal of safely integrating UAS into the NAS.
5. Nevada has the distinct benefit of being the only designated statewide UAS test site offering a very favorable geography and climate for testing, strong partnerships with Nevada and global universities, and the innovative infrastructure in place due to the efforts of NIAS and the Nevada UAS Test Site—all of which are critical to the IPP's success and growing the U.S. UAS Industry.

CHALLENGES

NIAS challenges from this quarter relate to setting the conditions for the Nevada NASA March 2018 operation, integrating Nevada partners into Nevada UAS operations to grow air commerce, or the recent Nevada application submission for the DOT/FAA's UAS Integration Pilot Program (IPP) and setting the conditions for this program's deployment after award to lead entities selected. These challenges include:

1. The demand for Nevada business-to-business and residential package delivery services, drone detection, and infrastructure inspections are currently on the rise. With the rollout of the DOT/FAA's UAS IPP, this will answer this demand in Nevada and elsewhere in a big way. Airspace access and flexibility to meet technology evolution and innovation is going to be key as well as streamlining FAA policy and procedures to facilitate such evolution and innovation.
2. Obtaining greater public engagement to grow the UAS Industry is going to be key to creating the perspective that UAS can be safe and reliable in a variety of industries and environments to include passenger drone travel.
3. Integrating drones into e-commerce is going to revolutionize the American way of life but facilitating such air commerce needs a one-stop uncontested environment like Nevada to solve the problem sets of conducting beyond visual line of sight in rural and urban environments and creating the technology to allow safe operations over people for day and night operations.

Nevada looks forward to our continued strong partnership with the FAA to help resolve these UAS Industry challenges and the unanticipated DOT/FAA UAS IPP challenges that arise after the FAA selects lead entities.