



University of Nevada, Reno

The Nevada Advanced Autonomous Systems Innovation Center at UNR

Quarterly Progress Report

Reporting Period: October 1st to December 30th, 2016

December 2016

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Project Purpose

The early 21st century has been characterized by an explosive growth in the number of autonomous systems in use around the world. These systems – unmanned vehicles, disaster response robots, drones, and others – have created the potential to revolutionize the way that we live and work. In a 2013 Las Vegas Review Journal article Governor Sandoval described unmanned aircraft systems as a “tremendous opportunity” for the people of Nevada. However, these systems have also proven extraordinarily difficult to develop and deploy, much less do so profitably. The mission of the Nevada Advanced Autonomous Systems Innovation Center, or NAASIC, is to solve the complex problems surrounding the development, application, and commercialization of autonomous systems through unique industry-university partnerships, innovation, cooperative research, and entrepreneurship. Ultimately, the goal is to spur research and commercialization to advance innovation-based economic development in Nevada.

Faculty at the University of Nevada, Reno have long studied the problems surrounding autonomous systems. Publications by UNR researchers in fields such as robotics and artificial intelligence have been read and cited all over the world for many years. However, recognizing the growing commercial potential of autonomous systems, the vision of NAASIC is that the Center will be able to leverage the strengths of UNR faculty to become a national and global leader in commercially-focused technology innovation in advanced autonomous systems.

Although the field of Autonomous Systems is large and varied, NAASIC’s current focus is on unmanned aircraft systems, or UAS. In contrast with more nascent areas of autonomous systems, such as self-driving vehicles or service robots, the commercial market for UAS is large and expanding. Additionally, the Federal Aviation Administration (FAA) has chosen the State of Nevada as one of its six UAS Test Sites. The mission of the test sites is to assist the FAA in safely integrating unmanned aircraft into the United States’ National Airspace System (NAS). In support of this mission, NAASIC is working to find commercially-relevant uses for UAS, and is assisting the State in its mission to the FAA. The expectation is that this early work to integrate UAS into the NAS will enable ongoing and future commercialization efforts, described below.

Section I: Proposal Progress

Major accomplishments for the current reporting period (Q3 '16) are listed below.

1. NAASIC Projects with NASA.

a. NAASIC Participation in NASA’s UTM Project

NAASIC has been working with researchers at NASA Ames Research Center to develop a prototype system for unmanned aircraft systems (UAS) traffic management (UTM). NAASIC participated in the following flight operations at Reno-Stead Airport: NASA UTM Project Task Order 1 Initial Safe National UAS integration Campaign/Initiative in April; UTM TCL-2 Software Checkout #2 in June; UTM TCL-2 Shakedown #1 in August; and UTM TCL-2 Shakedown #2 and Demonstration in October. For the October flights, NAASIC was responsible for recruiting, training, and scheduling Visual Observers (VOs) and Observer Controllers (OCs). The missions included both *Extended Visual*



Line of Sight (EVLOS) and Non-segregated Operations. Approximately 150 missions were flown over a 14 day period.

- b. NAASIC Support of the Nevada Cooperative Research and Development Agreement with NASA.

NAASIC is negotiating with GOED for reimbursement of the CRADA funds that were spent on Drone Zone at the Reno Air Races in 2015 and 2016.

2. Other Proposal Development

- a. NASA SBIR

Warren Rapp has made more progress on the development of a NASA SBIR Phase III proposal with GS Engineering, a South Lake Tahoe company, for the manufacturing of a light weight, heavy fuel engine.

- b. Regional Transportation Commission (RTC) of Washoe County

A proposal that Dr. Kelley is collaborating on with the Regional Transportation Commission of Washoe Co. to outfit select City of Reno buses with cameras for collision avoidance is still pending.

- c. NASA EPSCoR Track I

S. Commuri, R. Kelley, F. Harris, K. Alexis, S. Sengupta, R. Garcia, and H. Yu submitted a full proposal entitled "*Building Research Infrastructure and Innovation Capacity (BRICs) for supporting NASA UTM and Climate Change*" to the NASA EPSCoR Track I solicitation in October.

- d. NASA ULI

Dr. Kelly, Dr. Monica Nicolescu, and Flight Research Aerospace submitted a proposal to the NASA University Leadership Initiative entitled "*Detecting and Communicating Intentions of Non-Cooperative Manned and Unmanned Aircraft via a UAS Traffic Management System*". Dr. Kelley's team was selected to submit a full proposal in early 2017.

- e. NASA RFI

Two white papers (Request for Information or RFI) were submitted by Dr. Kelly, Lt. Rapp, and Dr. Welsh to NASA. The portion that would go to NAASIC for each proposal is \$125,000. The titles are "*Airborne Detect and Avoid System Applications for Beyond Visual Line of Sight Unmanned Aircraft Systems*" and "*Ground-based Detect and Avoid System Applications for Beyond Visual Line of Sight Unmanned Aircraft Systems.*" We are awaiting a decision on these submissions.

- f. NSF

Kostas Alexis, Richard Kelley and Paul Oh (UNLV) submitted a proposal in December entitled "*S&AS: INT: COLLAB: Robots in the Wild*" for \$394,723. The project duration is 36 months, starting on 09/01/17.

- g. UNR mICRo Grant

Sesh Commuri and Fang Jiang were awarded \$5000 for a UNR μ ICRo Grant entitled *Cross-modal After-effects in Deaf*.

- h. UNR MW-CTR-IN Pilot Grants

Fang Jiang and Sesh Commuri were awarded \$10,000 from the Mountain West Research Consortium to compete in the MW-CTR-IN Pilot Grant Program for Health Disparities.



3. Additional Accomplishments

a. Business Development

NAASIC has been working on a collaborative business agreement with 2050 Motors (Las Vegas), GSEngineering (South Lake Tahoe) and a Chinese company to manufacture hybrid car engines in northern Nevada.

NASA and NAASIC are in discussions to develop a new Space Act Agreement for a no-cost lease of a NASA high-performance UAV platform to NAASIC. The acquisition of the Viking-400 will provide NAASIC with a platform for future aeronautical research and potential collaboration with GSEngineering.

NAASIC is leading an effort to transition the UNR-owned Naval Reserve Facility in Stead, NV, into an Autonomous Systems Research Center for the development and testing of a wide-range of autonomous systems. NAASIC has actively engaged both federal agencies, such as NASA, and commercial entities to consider leasing space at the facility.

Jensen MetalTech in Sparks, NV, has requested assistance from NAASIC in developing robotic welding for the construction of trap doors.

Ardagh Group in Sparks, NV, is a package manufacturing company has had discussions with Sesh Commuri regarding manufacturing support, as well as manpower support.

NAASIC engineer Richard Kelley continues to work as senior personnel on a \$200,000 grant proposal that Dr. La has submitted to turn his bridge-inspecting robot into a commercial product.

To increase our visibility and strengthen our relationship with members of the Northern Nevada Business Community, NAASIC formed an Advisory Board, which met for the first time on

b. Test flights supported by NAASIC under the State of Nevada Test Site COA

As described in section 1.a above, NAASIC participated in the NASA UTM TCL-2 Shakedown #2 and Demonstration flights at Reno-Stead Airport in November. Warren Rapp, Richard Kelley, and Susan Welsh participated as Observer/Controllers for all of the October flights.

c. Flight Crew Training

NAASIC trained both Observer/Controllers (OC) and Visual Observers (VO) for the October NASA TCL-2 Demonstration flight operations at Reno-Stead Airport. The trainees were mostly students from the University of Nevada, Reno and the Truckee Meadows Community College, although we also had a few retirees. 15 VOs and 3 OCs received training on optimum scanning techniques, effective radio communications, crew resource management, and general aviation traffic patterns. The OCs received additional training on range safety, risk management, communication protocol with the range net, and mission coordination between the members of the ground crew, which included the UTM operator, safety pilot, and ground control operator. NAASIC has also expanded the scope of flight crew training by offering Remote Pilot Certification Work Shops to UNR faculty and students.



d. Education/Outreach

The UAS Flight Coordinator Course will be offered in Spring 2017 through a collaboration between the UNR College of Engineering and NAASIC. This 400/600 level course will focus on the basics of flight and flight operations from an unmanned perspective. Warren Rapp and Kostas Alexis are the lead instructors. Richard Kelley and Susan Welsh are supplemental instructors.

Preparations are underway for the **Drone Zone** at the *2017 Reno Air Races*. 10 companies or agencies participated in the 2016 Drone Zone which was visited by approximately 5000 students. This is a large undertaking and a great opportunity to show case UNR's UAV activities, as well as the accomplishments of our partner companies.



Left: Susan Welsh at Reno-Stead Airport for the NASA flights in October. Right: Flight crew, support crew, and human factors representatives at Reno-Stead Airport in October.

There was increased activity during this final quarter of 2016 for the Second Annual SAR Symposium which will be held on April 11-12, 2017. The venue, the schedule, and the keynote speakers have been determined.

NAASIC is continually asked to give presentations to the public about topics such as UAV-related STEM topics and careers, as well as updates on the growth of the UAV industry in Northern Nevada. This past quarter we were consumed with other objectives and had to turn down many requests. Warren Rapp spoke to the Sparks Rotary and Richard Kelley participated in a UNR Recruiting Event for 5th – 8th graders.

e. New Hires

NAASIC's former administrative assistant, Alicia Seefeldt, re-joined NAASIC in December and our current administrative assistant, Alisa Kader, was hired by our colleagues at NVIE.



NAASIC is also working with a number of local and national companies. Details may be found in Appendix 1, but briefly those companies with which NAASIC established or extended its relationship in this quarter are: Koch Industries, Flight Research Associates, GC2IT, the Reno-Tahoe Airport Authority, GSE Inc, Carbon Autonomous, Drone America, Flirtey, Color My Data, Insitu, Alaska UAV, Fireball Information Technologies LLC, and Nevada Dynamics.

4. Programmatic and Project Changes

No significant changes programmatic or project changes took place during the present reporting period.

5. Looking Forward

Looking ahead, NAASIC plans to continue exploring both commercial and academic opportunities. In the commercial space, NAASIC plans to use the authority it has received under the FAA test site to expand test flights under NAASIC supervision. The provision of data analysis and post-flight support could provide revenue streams in the near future. As the NUANCE Lab is established and connected to NASA's systems, that connection also represents a possible monetization opportunity. Lastly, NAASIC plans to more aggressively pursue a commercialization plan for faculty research.

NAASIC will continue to perform visual observer and crew training, and in the coming quarter will explore monetization strategies for these training events.

In a more academic direction, the UAS Cluster Hires in the College of Engineering are working closely with NAASIC. In addition to their efforts, NAASIC is working to direct the efforts of its thrust area leaders to produce more tangible results for NAASIC. Details of the projects and the anticipated results will be discussed in the monthly meetings with GOED and also provided in the next quarterly report that will be submitted in July 2016.



Section II: Performance

1. Progress toward Metrics

Standard Knowledge Fund Metrics	Current Status / Target		
	By 04/28/15	By 04/28/16	By 04/28/17
Companies relocating to Nevada	1 / 1	3 / 3	1 / 5
Startup companies	0 / 0	2 / 1	0 / 3
Jobs created	2 / 10	14 / 32	2 / 36
Intellectual Property Licenses/Options Executed	0 / 0	0 / 1	0 / 3
Intellectual Property Revenue	0 / 0	0 / 0	0 / \$100k
Grants Received	\$200k / \$200k	\$430 / \$500k	0 / \$1M
Sponsored Research	0 / 0	1 / 0	0 / 0
Patents	0 / 0	1 / 1	1 / 3
Students placed with Companies	1 / 1	7 / 5	0 / 8
Impact Faculty Hired	1 / 1	4 / 2	4 / 2
Gifts/Donations to KF Projects	0/2, \$0/\$20k	3/4,\$1.8k/\$10	0/4, \$200k
Student Internships	0 / 2	5 / 5	5 / 5



2. Project Scorecard Narrative

1. **Companies Relocating to Nevada** – Flirtey moved to Reno and they have now moved off of the UNR campus to a much larger space in Sparks, NV. SmartPlanes is expanding its business from Sweden to Reno. The company is working with UNR VPRI office to find supporting business properties. A Maryland UAV company, Ausley Assoc., has partnered with Carbon Autonomous, a NAASIC partner. Ausley Assoc. and NAASIC have an NDA for future collaboration.
2. **Start-up Companies** – No new ventures established at this time. Currently developing plans to create a spinoff company based on NAASIC R&D.
3. **Jobs Created** – Flirtey has hired two UNR alumni in its expansion and has recently hired a UNR grad student as an intern. AboveNV has hired two UNR student interns for its technology development.
4. **Intellectual Property Licenses/Options Executed** – Nothing to report at this time.
5. **Intellectual Property Revenue** – Nothing to report at this time.
6. **Grants Received** – Money reported includes the \$130k to support the State’s FAA Test Site in UTM development and \$250k to support the State’s joint UTM development with NASA.
7. **Sponsored Research** – NAASIC is grouping sponsored projects funding under the “grants received” item above. Weston Solutions/Environmental Protection Agency contract for UAV research and aerial mapping. \$70K.
8. **Patents** – One invention disclosure relating to automated manufacturing of orthotic shoe inserts has been filed with UNR.
9. **Students placed with Companies** - Flirtey hired two UNR graduates. Alaska UAV has hired two UNR students. Above Nevada has hired one UNR student.
10. **Impact Faculty Hired** – Three new UAS faculty hired in College of Engineering. Grant writer has been hired and is working in the center. Technical director has been hired, and starts on January 1, 2016.
11. **Gifts/Donations to KF Projects** - Kaempfer Crowell donated \$1,000 dollars to the “UNR Drone Zone” for the September 2015 Reno Air Races. National Search and Rescue Association donated \$600 to NAASIC.
12. **Student Internships** - One intern hired for NAASIC’s NASA-related efforts. One intern hired for Alaska UAV. Two interns hired for Flirtey. Two interns hired for AboveNV.

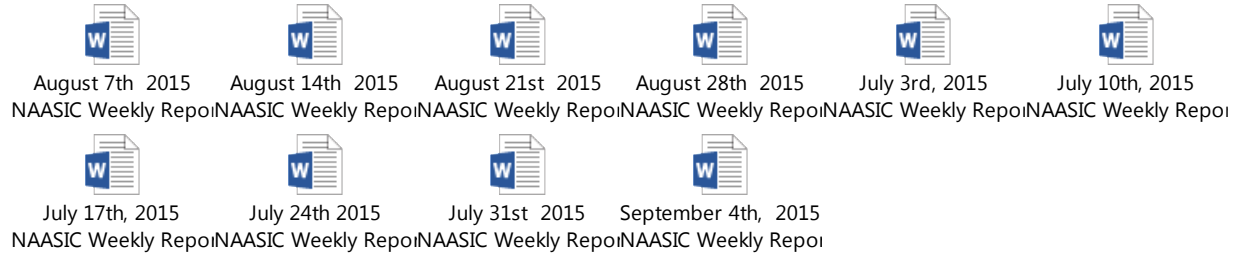


Section III: Budget

Please see budget documents prepared by UNR Office of Sponsored Projects Administration.



Section IV: Weekly/Monthly Logs of NAASIC Activities for Reporting Quarter



Section V: Appendices

Appendix 1 – Sales Pipeline

