The Honorable Brian Sandoval
Office of the Governor
One Hundred One North Carson Street
Carson City, Nevada 89701

Mr. Richard Combs, Director
Legislative Counsel Bureau
401 South Carson Street
Carson City, Nevada 89701

Re: Nevada Knowledge Fund Annual Report 2017

Gentlemen:

NRS 231.1595 requires the Executive Director to report annually to the Governor and to the Director of Legislative Counsel Bureau on the progress of the Knowledge Fund. The attached report is for the period covering November 1, 2016 through October 31, 2017.

Since inception, the Knowledge Fund has supported and established a total of 10 projects within the Nevada System of Higher Education (NSHE) to date. Of this total number, some projects have been completed and no new contracts have been issued. Project selection for the Knowledge Fund combines smaller university–industry collaboration efforts and larger centers that are implementing GOED's vision of *Applied Research Centers* at each of Nevada's universities and at the Desert Research Institute (DRI). These centers will conduct research and create intellectual property that will be used to develop new, relevant technologies to help companies grow their R&D base and enhance their growth through innovation. Applied Research Centers will assist companies to turn advanced technologies into production processes and commercial products by working collaboratively with such firms. The centers can be regarded as 'outsourced R&D departments' providing 'innovation on demand' services. This model is based on the 'Fraunhofer Institutes' in Germany. Of the projects described below, the Nevada Advanced Autonomous Systems Innovation Center (NAASIC) and the Nevada Center for Applied Research (NCAR) at the University of Nevada Reno (UNR) as well as the Applied Innovation Center for Advanced Analytics at the Desert Research Institute (DRI) can be categorized as Applied Research Centers.

Sincerely,

Steven D. Hill
Executive Director

Cc: Laura Freed, Executive Branch Budget Officer
   Jeff Ferguson, Senior Program Analyst

Agenda Item IV A-3 (CAHE)
Meeting Date: 04-17-18

Nevada Knowledge Fund Annual Report 2017

(for the period covering November 1, 2016 through October 31, 2017)

Knowledge Fund supported projects – detailed progress descriptions

I. **Nevada Institute of Personalized Medicine (NIPM) at the University of Nevada Las Vegas (UNLV)**

Project inception: March, 2014
Accumulative funding size, actual: $3.25M
Project end-date: June, 2018

Approximately 1 in 20 people suffer from a genetic disorder by the age of 25 and approximately 1 in 10 overall, yet Nevada has almost no in-state infrastructure to diagnose and treat affected patients. This health disparity in our state negatively impacts the health and well-being of many Nevadans as well as our economy by the continued export of genetic health services and related revenues to other states. The Nevada Institute of Personalized Medicine (NIPM) and an affiliated enterprise will help regional healthcare partners utilize and deliver clinical genetics services and educate a clinical genetics workforce for Nevadans. The major long-term goal is to build a clinical genomics trial entity to provide services for Southern Nevadans and which will engage Nevada healthcare providers in personalized medicine.

The following updates on NIPM can be reported:

- A total of five patent application/ families, based on three innovations developed by NIPM regular faculty receiving Knowledge Fund funding are in active prosecution.
- Since the project's inception, a total of $1.95M of grant awards has been received by Knowledge Fund funded faculty members.
- NIPM intellectual property has been licensed to a drug and diagnostics discovery and development start-up company, Heligenics LLC.
- Launching of a second spin-out company, Food Genes and Me LLC, following amendment to Heligenics license agreement.
- Clinical Genetics Services has reached 300 patients count. A surprisingly high frequency of undiagnosed genetic disorders is confirming the medical need for personalized genetic testing in southern Nevada.

II.   UNLV–International Gaming Institute's Global Gaming Capital Initiative (GGCI) at the University of Nevada Las Vegas (UNLV)

Project inception: March, 2014 (CGI); October, 2015 (GGCI)
Accumulative funding size, actual: $1.86M ($500k, CGI; $1.36M, GGCI)
New contract (GGCI): $1.75M

The Global Gaming Capital Initiative evolved from the Knowledge Fund supported Center for Gaming Innovation (CGI). It seeks to reinforce Nevada's position as the world's thought leader in gaming and hospitality, which remain the largest contributors to Nevada's overall economy and the largest contributors of jobs for Nevadans. The acceleration of globalization and the rise of new technologies threaten the continued viability of Nevada's gaming-related economy, and focused investment in research and innovation is necessary to maintain Nevada's competitive advantage. The UNLV International Gaming Institute (IGI) has proposed a strategy that will: (1) provide two reports (one focusing on design and one focusing on industry, government, and academic strategy) that will research, define, and develop recommendations for "The Integrated Resort of 2050." Specifically, this project will develop initiatives that ensure that stakeholders are doing all that they can to ensure the long-term health of the gaming/hospitality sector in Nevada; (2) build upon a successful existing model to create innovative and commercially viable games that attract the next generation of gamblers through the Center for Gaming Innovation (CGI); (3) increase the efficiency, productivity, and profitability of non-gaming operations in integrated resorts through the collaboration of industry, entrepreneurs, and UNLV student inventors through the Hospitality Lab; (4) examine the costs and speed to market challenges for gaming innovations by conducting research that explores these key issues, and then advocating for more consistent regulation across jurisdictions where appropriate; (5) strengthen the economy of Nevada by developing initiatives that expand the leadership role of women in the gaming industry, thereby expanding the pool of talent available to lead this industry.

Major accomplishments for the reporting period include:

*   Since inception of the project, the total number of patent applications filed stands at 49.
*   CGI successfully concluded the fourth gaming innovation class with the most talented and diverse group of students yet. Two of the finalists received generous industry offers to further develop their games including Caesar's Entertainment offering to host a field trial, which started in late June, 2017 and represented the first time that a student-invented game was played for real money on the Las Vegas strip.
*   The Hospitality Lab held what is believed to be the world's first-ever class on e-sports management and business modeling for the modern integrated resort. Two projects will ultimately include patentable intellectual property development to be incorporated into the project's commercialization pipeline.
*   The International Gaming Institute's Executive Development Program continues to be the world's most prestigious gaming leadership academy. Attendees representing 10 countries and virtually every major gaming jurisdiction on the planet.

- The International Center for Gaming Regulation is fully operational and establishing itself as an international center of excellence in gaming regulation, which in turn serves Nevada as the state's companies expand into new markets. The focus of the Center is to ensure that the world's regulators have access to the best research and education. The Center is servicing international jurisdictions through courses and activities in South Africa, Austria, Japan, Brazil and provinces in Canada among others.
- The new scholar development academy program, branded YES (Young Executive Scholars) launched and represents a collaborative project with Caesars Entertainment and the Rogers Foundation to expose the next generation of Las Vegas youth to the executive opportunities available to them on the Las Vegas strip.
- The Hospitality Lab director is continuing to work on moving four student projects from the Spring 2016 class to commercialization. In addition, he is also working with StartupNV and Technium on developing an incubation for student teams from the spring 2017 class.

III. Nevada Advanced Autonomous Systems Innovation Center (NAASIC) at the University of Nevada Reno (UNR)

Project inception: March, 2014
Accumulative funding size, actual: $2.53M
New contract: $928k (part of UNR's overall NCAR contract)

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. The Federal Aviation Administration (FAA) has chosen the State of Nevada as one of its six UAS Test Sites 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. NAASIC is also increasingly playing a leading role in UNR's Intelligent Mobility program for autonomous ground vehicles. Going forward, operationally this project is being merged under the Nevada Center for Applied Research, NCAR (please see below) and the past year marked a transition period for NAASIC.

Major accomplishments for the current reporting period include:

- NAASIC has been restructured and integrated into the Nevada Center for Applied Research, (NCAR) and a more service- and intellectual property (IP) oriented approach has been developed.
- NAASIC has continued to work with researchers at NASA Ames Research Center to develop a prototype system for unmanned aircraft systems (UAS) traffic management (UTM).
- Received a grant award for the development of an autonomous pavement tester.

- A UAS Flight Coordinator Course was offered in Spring2017 through a collaboration between UNR's College of Engineering and NAASIC with a focus on the basics of flight and flight operations from an unmanned perspective.
- NAASIC is continuing to use its current platforms for large scale data collection and make data available to partners on a cost recovery basis. Under NCAR, NAASIC and IT specialists are being connected to leverage UNR's resources on high-performance computing (HPC) to build systems that enable the training of large-scale machine learning systems and the post-hoc analysis of data collected by autonomous systems. This offers a major low-cost alternative to other vendor platforms such as Amazon Web Services.
- A new programming R&D lab was established at the Applied Research Facility (ARF) for faculty, students, post-docs and other personnel to work in the development of potential UAVs and autonomous technology projects.
- Throughout the year, while still working with drone companies NAASIC has also been working on ground autonomous vehicle technology for UNR's Intelligent Mobility program within the R&D labs in the Applied Research Facility, which is now home to NAASIC researchers.

IV. Nevada Center for Applied Research (NCAR) at the University of Nevada Reno (UNR)

Project inception: October, 2015
Accumulative funding size, actual: $2.57M
New contract: $2.19M

The Nevada Center for Applied Research (NCAR) is a stand-alone, fully functional applied research and development technology center that serves to enhance the global competitiveness of Nevada industry by leveraging the physical and intellectual assets of the University of Nevada, Reno (UNR). NCAR's mission is to stimulate regional innovation-based economic development (IBED) by aligning the needs of industry, startup companies, researchers and entrepreneurs with resources at UNR. This is achieved by providing industries with a central and public access point to utilize the broad range of technical services, intellectual capital, testing and research capabilities, advanced tools and methodologies available at NCAR's Shared Research Facilities that otherwise would be cost-prohibitive for startups and not cost-effective for established companies.

NCAR is closely aligned with strategic university programs that are designed to provide value to industry. Some of these programs include: The Autonomous Car program, The Terawatt Facility, Material and Chemical Characterization Equipment, BioSciences Entrepreneurial Laboratory, High Performance Computing Facility, and The Nevada Advanced Autonomous System Innovation Center (NAASIC). NCAR utilizes space both on UNR's campus (Research Centers, Cores and Applied Research Facility) as well as the Reno Innevation Center in MidTown.

Progress toward accomplishing NCAR's goals in the reporting period:

- UNR's NCAR was among the leading initiatives from across the country recognized by the University Economic Development Association during its Annual Summit in Long Beach, CA in October and named as award of excellence finalist for 'place and innovation'.

- The Bioscience Entrepreneurial Laboratory (BEL) is fully operational and reached full capacity only a few months after opening with six companies using the shared space. NCAR is currently working on adding a further 1,100 sqft of new capacity. Wet lab space is currently being repurposed and will house "BEL-2" to accommodate up to seven new companies. Work is expected to be completed by end of 2017. Required equipment has already been purchased and additional assets have been repurposed from other labs on campus.

- NCAR in collaboration with GOED and its Living Lab concept has developed a strategic partnership to implement the *Intelligent Mobility Initiative*, which is a user-centered, open-innovation living lab ecosystem for automated- and connected vehicles in Western Nevada. Founding stakeholders include UNR, Fraunhofer IVI, Dresden Germany, RTC Washoe, Nevada DMV, Cities of Reno, Sparks, and Carson City as well as Proterra, Inc.

- RTC's electric buses manufactured by Proterra, Inc. are being instrumented with all necessary sensors to enable connectivity with infrastructure and eventually, autonomous driving capability. NCAR has also acquired a passenger vehicle to develop self-driving car technology. In collaboration with the City of Reno, the research team has instrumented an intersection on the main route of the living lab gathering high-resolution traffic data for connected vehicles and other traffic participants. Equipment is consisting of LiDAR sensor and dedicated short range communication (DSRC) road side unit. Additional intersections for the RTC's 'Sierra Spirit route' will also be instrumented and so far, road-side and on-board units have been purchased to be installed at eight to ten intersections. Enhanced by such instrumented intersections, connected buses and vehicles will be able to (i.) know the real-time location/ direction/ speed of other road users improving traffic safety, (ii.) receive real-time traffic signal status from signal controllers, and (iii.) know any incident or congestion on the route in advance.

- The living lab projects also includes an exchange of post-docs with Fraunhofer IVI, Dresden, which is targeted for Q1 2018. Fraunhofer IVI belongs to the network of Fraunhofer Institutes, which are the world's foremost applied research institutions.

- Since Inception January 1, 2016, NCAR has raised nearly $190k in fee for service and additional $37k in facility use agreements, which include the BEL.

- The High Performance Computing Facility (HPC) has substantially added to the $500k Knowledge Fund investment by raising $1.5M. A HPC cluster to advance research and industry engagement has thereby been completed. Switch will also provide critical technology infrastructure support services through space, power, and security for five years at Switch Tahoe Reno, The Citadel Campus. NCAR will manage access to the HPC cluster. The effort also includes an extension to the UNR 'Science DMZ', deployed at the Switch datacenter, enabling scalable HPC networking traffic to be separated from the standard university network.

- The Nevada Proteomic Center (NPC) staff has implemented a new cutting-edge approach for target protein quantitation. The NPC has provided services to 16 NSHE researchers and

three external academic institutions and one commercial enterprise ad has raised a revenue of $216k since January, 2016.

- Nevada Terawatt Facility (NTF) state-of-the-art core laser diagnostic package was developed for installation on NSTec's Las Vegas Dense Plasma Focus. Apart from an R&D result that helps NSTec technical staff finding operating conditions optimizing neutron yield and to stabilize machinery behavior, the effort helps to train the next generation of scientists and engineers with highly technical skill sets needed to accomplish the mission of the Nevada National Security Site (NNSS).
- NTF development of spectroscopic plasma diagnostics for measurement of electronic fields was completed. The project helped NSTec to maintain its leadership in the area of neutron diagnosed subcritical experiment area as required by the National Nuclear Security Administration (NNSA). It also strengthened the ties between NSTec and UNR creating employment opportunities for physics graduates in Nevada.

V. Applied Innovation Center for Advanced Analytics at the Desert Research Institute (DRI)

Project inception: March, 2014 (AIC phase I); March 2016 (AIC phase II)
Accumulative funding size, actual: $4.26M ($2.69M, phase I; $1.57M, phase II)
New contract: $1.8M

The Applied Innovation Center at DRI (AIC) is an Applied Research Center following the Fraunhofer model and start-up in the data and analytics space. The AIC leverages the intellectual capital of more than 100 DRI faculty and 60 years of environmental science research to focus on four main areas of applied research: (i.) Climate, weather and energy nexus; (ii.) Internet of things and remote sensing; (iii.) Engineering and design, and; (iv.) Life Sciences and informatics. From these four core areas the AIC is able to: 1) Build platforms (hardware and software) for industry; 2) leverage these platforms for sponsored projects; 3) Create jobs; 4) write new and more competitive grants; and 5) build or help build high tech companies in NV.

Within the last twelve months, the AIC has made the following progress:

- In Q4 2016, the AIC expanded on the community health project in partnership with Renown Health and supported by the personal genetics company 23andMe. The success of the launch was a direct result of more than 12-months work between the AIC and Renown Health, mainly through building the data security infrastructure, addressing HIPAA and other compliance needs and designing a study that has wide-ranging potential for Nevada in areas of data science, population health and biotechnology.
- The AIC – Renown Health partnership has intensified with the formation of *The Institute of Health Innovation* (IHI) to implement and accelerate the population health mission of Renown Health's strategic plan. Leveraging data and analytical techniques the Institute has four main

objectives: (i.) Improve the health outcomes of *all* Nevadans through data driven operational changes in health education and healthcare delivery, (ii.) increase research and development, (iii.) increase clinical trial numbers and efficiency, (iv.) harness the value of Renown's data. The IHI is a 50:50 partnership between Renown Health and DRI. It is a not-for-profit start-up, tasked with solving challenging health problems using big data, clinical trials and public/private partnerships. It will exploit its increasing expertise in environmental science, genetics and Electronic Medical Records (EMR) data mining, offering billable services to other health systems, private industry and public/private partnerships. The strategy is to fund the Institute via grants, revenue from clinical trials and public-private partnerships, and consulting that leverage the unique research and commercialization abilities of DRI and the AIC. The IHI is building the largest health determinants platform in the US and is preparing to raise $50m for the effort.

- Business development efforts for the Weather Intelligence Numerical Decision Support (WINDS) platform continued moving past proof of concept work in weather related agricultural pest and disease forecasting for industrial scale farming. As a result, the first commercial software product developed by the AIC called *ForecastView* was created. This integrated data tool will allow farmers to consider strategic and tactical options in advance potentially damaging crop infestations. The first beta version of *ForecastView* and its companion mobile app, *FieldScout,* has been developed.

- In Q3 2017, Predira Inc. was formed as the first spin out from Desert Research Corp. (DRC). DRC is DRI's for-profit C-corporation intended to incubate DRI generated IP. Predira Inc. leverages the WINDS platform to provide localized pest and disease forecasts for industrial scale farming through AIC developed web based software product *ForecastView*. With its companion app, *Field Scout*, users gain timely detailed pest and disease forecasts, providing response options to mitigate significant crop loss. Software development and beta testing is expected to be complete in late 2017 after which application to THRIVE, an agtech incubator, is anticipated. AIC business development efforts have identified key clients with significant interest in the *ForecastView* and an industry acknowledged need is already in place. Revenue will be driven by user subscription fees based on field/acreage size and service tier.

- Tu Biomics Inc., also formed recently as a WINDS based spin out from DRC, is an agricultural pharmaceutical company and *ForecastView* byproduct that targets industrial scale farming and its significant soil health challenges. In conjunction with DRI scientists, Tu Biomics is driving the development of organic antifungal chemicals as a cost-effective alternative to currently available options. DRI scientists have demonstrated the ability of Biological Control Agents (BCAs) to eliminate white rot (a fungal pathogen impacting onion and garlic crops) under laboratory conditions. Venture Capital fund raising successfully generated commitments and initial funding in late Q3 2017 with additional funding expected to be achieved in Q4 2017. Additional raise rounds are anticipated after successful field trials are complete. Operating Revenue will be formula driven by crop pathogen, fungicide potency, covered acreage and market demand. Given the market size for organic fungicides in the hundreds of millions of dollars, anticipated revenue will sustain Tu Biomics as an ongoing business in year 3 of operation.

VI.   WaterStart

Project inception: April, 2014 (NvCOE); October, 2015

Accumulative funding size, actual: $2.13M ($425k, NvCOE; $1.7M, WaterStart)
New contract: $1.58M

WaterStart (formerly The Nevada Center of Excellence in Water) aims to make Las Vegas and Nevada a global water innovation hub and portal for investment by leveraging the state's leadership and expertise in water. The WaterStart business model involves a joint venture between academic, public, and private sectors. Each partner brings critical resources to create a mechanism to accelerate the economic cycle through applied research. These resources will lead to technology commercialization that will bring high-value, shared services to a broad range of public and private sector clients as well as an advanced workforce with core technology skills and domain expertise to meet employers' needs and attract technology-focused companies to Nevada. At the same time, the WaterStart's efforts will enhance NSHE's goal of strengthening public private partnerships to generate additional sources of nonfederal grants and contracts. By combining the domain expertise of the NSHE institutions, Southern Nevada Water Authority (SNWA), and the Las Vegas Global Economic Alliance (LVGEA), WaterStart (1) acts as a portal for attracting, partnering with, and servicing national and international business in the water domain; (2) delivers high-value, shared services to public and private sector clients while building job skills and assisting DETR to grow Nevada's future workforce; (3) assists with commercializing and distributing the collective domain expertise in water sciences, technology, and management areas with NSHE and Water Utility Partners Southern Nevada Water Authority (SNWA), Truckee Meadows Water Authority (TMWA) etc.; (4) provides additional sources of grants and contracts to NSHE faculty members.

For the reporting period, the WaterStart has made the following progress:

- WaterStart initiated an additional seven projects among partners and NSHE faculty. These are:
  - RedEye. The company is based in Australia and offers cloud based solutions for managing engineering drawings and blue prints. RedEye opened a US presence in Nevada in Q1 2017 and has hired three permanent staff.
  - STAR Water Solutions. The company is also based in Australia. It designs and supplies custom biofiltration media for stormwater, industrial/ agriculture runoff and groundwater reuse applications. The company has projected the creation of 32 jobs in the state over the next five years.
  - AdEdge and Carollo. The Georgia-based company manufactures technology solutions for nitrate treatments, whereas Carollo is a large engineering firm with offices across the US. The project is expected to create five to eight jobs from AdEdge and four to ten from Carollo within five years and will also be supporting UNR faculty.
  - IMGeospacial, formerly Intelligent Modelling. The UK-based firm is piloting flood prediction technology with SNWA and forecasts the creation of 10 jobs over three years.
  - Riventa. The company, developing pump station efficiencies services, is based in the UK and had connected with WaterStart during Singapore Water Week in the summer of 2016. It has received a grant from WaterStart's commercialization fund and has the goal to create three full-time jobs in Nevada over the first 24 months.
  - WINT. The Israeli company develops and manufactures sub-metering sensors and software for monitoring and optimizing water consumption. It has agreed to establish

a re-seller partnership in the state as well as opening a customer services support center upon selling additional unites in the Mountain West region. The project was partially funded with a donation of Jojn Ferahi to support the partnership between WaterStart and the Israeli Innovation Authority. WINT is piloting the FlowLess technology at Renos' Atlantis with the latter also becoming a design partner for testing and improving the real-time beta.

- o MetaWater. The Japanese company is partnering with UNLV for a project to optimize an online bromate sensor.

- WaterStart with the support of its local Israeli partners, signed an MOU with the Israeli Innovation Authority. The Israeli Innovation Authority was formed to drive a new era of innovation by the Israeli government as an acknowledgement of the need for a central agency to manage knowledge and the advanced capabilities of technology innovation. This MOU establishes the framework for joint funding of projects promoting technological innovation, research and development.

- Closed round six and seven of the Request for Proposals (RFP) process. Round six was initiated as the result of the MOU with the Israeli Innovation Authority and Round seven resulted from WaterStart's and GOED's visit to Finland. Both rounds resulted in a total of 23 proposals taking the total number of companies and/ or requests to work with WaterStart to 279 with over 20 categorized as qualified leads.

- Water Start signed an MOU with the Nanjing Riverside Quay Co. (NJRQ) responsible for developing the Nanjing International Water Hub in China. WaterStart and NJRQ agreed to jointly promote each cluster with the goal of attracting companies for investments into the US and Chinese water technology market.

VII. NSHE-Industry Unmanned Autonomous Systems Collaboration Program

Project inception: September, 2014
Accumulative funding size: $824k ($500k, original projects; $324k, DRI project increase)
$166k (UNR); $491k (DRI); $167k (UNLV)
No new contract

Of the Collaboration program, the following projects are still ongoing:
Project Prometheus (DRI)
Project end-date: June, 2018

This project's objectives are to develop technology, capabilities, and partnerships with industry partners in the area of UAS for wildland fire research and monitoring; and to develop and pursue external funding opportunities to which these developments are calibrated.

The project has made the following progress:

- Drone America hired 12 positions and received a $2 million contract from Australia as a result of this collaboration.
- Participation in the Leadership Team for the Fire and Smoke Model Evaluation Experiment (FASMEE) Phase 1 (planning) project. This is planned to be the largest suite of fire-science projects ever undertaken. Prometheus' lead PI authored a UAS concept paper that was excerpted in the FASMEE Study Plan, which will guide funding notices for which Nevada teams are expected to apply.
- Contribution to a UBC-Okanagan business school capstone program; this collaboration led to the creation of an opportunity for DRI-industry team to field-test a UAS communications system for Parks Canada and a major Canadian defense contractor.
- Advised two NV UAS startups.
- Prometheus' team leveraged UAS and sensor capabilities to support disaster-relief activities in Houston following Hurricane Harvey.

VIII. Cloud Seeding UAS Project at the Desert Research Institute (DRI)

Project inception: November, 2015
Accumulative funding size, actual: $750k
Project end-date: June, 2018

DRI, in partnership with AviSight and Drone America, will develop and test UAS technologies for cloud seeding operations. This includes creating forecasts and conducting flight planning for manned and unmanned aircraft, cloud seeding using manned and unmanned systems and ground generators as well as estimating effectiveness of UAS cloud seeding operations.
The goals of the project are four-fold: (1) development of new UAS technologies for cloud seeding operations while demonstrating Nevada's Public COA and commercial COA and 333 authority; (2) operation of UAS for cloud-seeding operations, both alone and in conjunction with ground-based generators and manned aircraft; (3) assessment of the effectiveness of unmanned cloud seeding platforms using newly-developed technology and tools; (4) assessment of the broader market potential and development of a commercialization process for UAS cloud seeding in other areas.

Major accomplishments include:

- First-ever flight test of burn-in-place cloud-seeding flares aboard the Drone America X-8 multi-rotor UAS.
- First-ever flight test of burn-in-place flares aboard the Drone America Savant fixed-wing UAS.
- First-ever flight test of ejectable flares aboard the DA Savant.
- DRI was permitted operations to 1200 feet altitude above ground level (AGL) through the FAA UAS Test Site Node status, which is a substantial advantage compared to other groups who are generally limited to 400'AGL.

- Longest commercial UAS flight in US airspace, and DRI's first beyond-line-of-sight (BLOS) flight.

IX.   Development of Unmanned Aircraft System (UAS) for Agricultural Applications

Project inception: April, 2016
Accumulative funding size: $152k
Project end-date: November, 2017

The Desert Research Institute (DRI), in collaboration with Above Geo (formerly AboveNV), is deploying AboveGeo's Unmanned Aircraft Systems (UAS) in support of agricultural and water management of critical crop fields owned and managed by Winnemucca Farms, Inc. The project is testing the applicability of UAS data to address large-scale, multi-crop agricultural needs, particularly water-related crop stress and irrigation efficiencies. Winnemucca Farms, Inc. is one of the largest Nevada farms and they have expressed interest in assessing UAS data products to improve farm management. UAS activities are being conducted using AboveGeo's Section 333 COA and the team is working with the Nevada Institute for Autonomous Systems (NIAS) to become a NIAS Node that would allow us to use the NIAS blanket COA from the FAA. DRI and AboveGeo propose a near-term and long-term approach to utilizing UAS collected imagery to monitor irrigation management and crop health. The project is focusing on UAS data acquisition to identify and map agricultural crop stress that will lead to improved water use while maintaining and/or improving crop yields (project location is a portion of Winnemucca Farms' properties). The primary outcomes of the potential outcomes will be (1) Formation of a partnership between the private sector (a business and a customer) and DRI to help grow a UAS business already located in Nevada, (2) Enhancement of DRI's and AboveGeo's UAS expertise leading to national recognition, (3) Testing and refinement of a platform and sensor for commercial and governmental environmental applications, specifically agricultural applications.

Progress toward accomplishing these outcomes in the reporting period:

- Image processing methods were further defined and UAS imagery of fields in bare soiled condition acquired. This enabled the assessment quality of elevation mapping from standard image processing techniques.
- In response to the client's needs (Winnemucca Farms), the original intent of developing a Geographic Information System (GIS) database was changed to pursue a secure web-based interface that the farm manager and his staff will be able to use from a computer or handheld devices such as notebook and smart phone assisting in his crop management decisions. This exemplifies customer driven applied R&D solutions.
- Collaboration with a DRI faculty member, which resulted in the preparation of a secured website to display data acquired for Winnemucca Farms at multiple spatial scales. It includes both USGS digital elevation model data and a Landsat 8 satellite multispectral

image that encompasses the entire main farm fields and immediate adjacent areas with the UAS-acquired images being embedded.

- DRI personal provided training to local start-up AboveGeo on the calibration and operation of FLIR thermal cameras and how to establish ground-based calibration targets for acquisition of thermal images using UAS. This is a good example of how an applied research institution can support a local early stage company by providing vital technology and equipment know-how.

X.   Nevada Center for Advanced Mobility (NCAM)

UNLV in collaboration with the Nevada Institute for Autonomous Systems, other NSHE institutions and the Governor's and UNLV's Offices of Economic Development established the Center for Advanced Mobility (CAM) in early 2016 to serve as a catalyst for bringing together the government sector, industry, and research organizations to address modern transportation issues: "Nevada Center for Advanced Mobility creates advanced mobility opportunities for visitors, residents and industry."

Nevada CAM is a hub leveraging challenges at the nexus of mobility and data experienced by state, regional and local partners. This enables an environment for the development of innovative mobility solutions resulting in new products, services and businesses. Nevada CAM drives activity in the industry, creates economic diversity, an improved travel experience and increased range of transportation options for visitors and residents. For industry Nevada CAM aims to create an optimized environment enabling collaborative and streamlined engagement with government, research institutes and other transportation organizations.

Project inception: April, 2016
Accumulative funding size: $209k
New contract: currently in progress

In the reporting period, NCAM has made the following progress:

- In April 2017, representatives of UNLV and UNR under GOED leadership traveled to Germany to meet with Fraunhofer IVI, Dresden to complete planning and begin the implementation of a researcher exchange program between the Fraunhofer institute and NSHE, specifically to progress transportation research and commercialization initiatives.
- NCAM has been receiving support and expertise from the Las Vegas Global Economic Alliance (LVGEA) to manage PR, Events and Marketing efforts. A new NCAM logo and website is currently under development and the project looks forward to maximizing this synergistic relationship.
- Nevada CAM and Nexar announced a strategic partnership that will create the first statewide vehicle-to-vehicle (V2V) network in the country. This unprecedented collaboration is designed to enhance safety on Nevada's roads and highways, spur economic development and job creation in the state, and introduce a series of innovative smart transportation systems that will optimize infrastructure management, regional planning and inform policy throughout Nevada.

In addition to improving road safety Nexar intends to hire at least a dozen staff in Nevada as deployment of the app progresses. Nexar hired their first employee in July 2017 and the the collaboration is also yielding spinoff projects with UNLV.

- In late 2016, Nevada CAM conducted a global search for technology solutions to help address pedestrian safety on behalf of the Regional Transportation Commission of Southern Nevada (RTC). A byproduct of that search was the encounter of technology company WayCare.
  Under NCAM's guidance, the RTC and Waycare with its predictive analytics platform for smart cities, announced a first of its kind pilot program to help prevent traffic crashes and congestion.

- The RTC and Waycare are collaborating with Nevada Highway Patrol (NHP) and Nevada Department of Transportation (NDOT) to utilize Waycare's predictive insights to strategically deploy highway patrol and roadside service units. The technology enables local first responders and traffic management centers to more efficiently deploy resources and to patrol problem areas ultimately hoping in the prevention of traffic incidents.

- GOED, the Nevada Department of Transportation, the City of Las Vegas, the Regional Transportation Commission (Team Nevada), and NCAM are working with GENIVI (Jaguar Land Rover, Volvo, Harman, and Hortonworks) in a multi-phased twelve-month pilot project that addresses pedestrian safety, increased traffic throughput and reduced traffic congestion across 3-4 key corridors in Southern Nevada.

- After one year in operation, NCAM is becoming a well-recognized brand in the 'new mobility' industry. Partnering engagements with different types of companies range from tier one automotive suppliers and tech startups through to insurance and fleet telematics. The types of opportunities range from collaborative R&D with UNLV to businesses locating their north American offices in Nevada. NCAM's activities have raised awareness of the opportunity and challenges associated with smart infrastructure and intelligent mobility within the relevant local, regional and state government agencies