University of Nevada Cooperative Extension

Fact Sheet 14-01

An Evaluation of the Nevada Nov. 18, 2013 Unmanned Autonomous Systems Development Workshop

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This University of Nevada Cooperative Extension Fact Sheet summarizes the main points of an Unmanned Autonomous Systems Development Workshop hosted by the University of Nevada Cooperative Extension in partnership with the University Center for Economic Development and the Governor's Office of Economic Development. A summary of the evaluation survey is also presented.

Introduction

University of Nevada Cooperative Extension, in partnership with the University Center for Economic Development and the Governor's Office of Economic Development, hosted an Unmanned Autonomous Systems (UAS) Development Workshop on Nov. 18, 2013 at the University of Nevada Cooperative Extension Lifelong Learning Center in Las Vegas, Nev. According to the University of Nevada, Reno's College of Engineering, Department of Mechanical Engineering (2014), "Unmanned autonomous systems are high-tech, intelligent machines capable of traveling by air, land or sea without a human crew on board." Over 100 participants, including faculty and staff from several Nevada System of Higher Education institutions, locally elected and appointed officials, top government executives, and leaders of Nevada's business community, participated both in person and via the University of Nevada Cooperative Extension's statewide interactive video network from several of University of Nevada Cooperative Extension's county offices.

This fact sheet summarizes the various presentations made at the Nov. 18, 2013 UAS Development Workshop beginning with a brief overview of the need for this workshop. A summary of the evaluation survey is also provided.

The University of Nevada Cooperative Extension's Partnership with the Governor's Office of Economic Development

In October 2013, representatives from the Governor's Office of Economic Development (GOED) met with faculty and staff from University of Nevada Cooperative Extension and the University Center for Economic Development to discuss the need for an educational workshop designed to inform locally elected and appointed officials, government executives, business leaders, and the public about the state of Nevada's ongoing efforts to build a UAS industry, the potential regulatory requirements local jurisdictions might be expected to meet in the future, and the potential applications of UAS development in Nevada beyond manufacturing and job creation. According to Tom Wilczek (2013), the GOED defense and aerospace industry representative, the UAS global market is currently estimated to be approximately $6.6 billion in overall economic impact. In the next 10 years, the overall UAS global market is expected to grow to an estimated $140 billion in total economic impact. U.S. airspace integration alone will total approximately $13.6 billion in the next three years and grow significantly to approximately $82.1 billion in overall economic impact between 2015 and 2025.

While the overall economic impact of UAS development in the U.S. and globally will continue to grow, local governments and industry in Nevada interested in pursuing UAS development as a vehicle for economic development will have to consider the potential regulatory requirements currently being developed by federal agencies such as the Federal Aviation Administration, the Department of Homeland Security and the Department of Defense. As a new emerging industry, many of the regulations for UAS have yet to be developed. As part of the Nov. 18, 2013 UAS Development Workshop, faculty from the University's Cooperative Extension and Center for Economic Development, in cooperation with GOED, sought to educate both the public and private sectors about the potential benefits of UAS development in Nevada while being aware of the potential regulatory requirements likely to be developed over the next 10 to 15 years.

The Nov. 18, 2013 UAS Development Workshop

This workshop hosted by University of Nevada Cooperative Extension at the University of Nevada Cooperative Extension Lifelong Learning Center in Las Vegas consisted of presenters from University of Nevada Cooperative Extension; University of Nevada, Reno; University of Nevada, Las Vegas; the Desert Research Institute; GOED; and the Nevada Institute for Autonomous Systems Program Management Office (NIAS-PMO).

The day-long workshop was divided into three interdependent parts. The morning sessions consisted of presentations from GOED and Institute staff. Presentations on GOED's efforts to support the development of a UAS industry in Nevada, public aircraft operations pertaining to unmanned systems, airspace management, spectrum and frequency management, and the Nevada Unmanned Aerial Programmatic Office were provided. The nature of these presentations was to inform the public and private sector about the state of Nevada's ongoing efforts to support the development of a UAS industry in Nevada and the possible regulatory system with which both the public and private sector may have to contend in the near future.

According to Wilczek (2013), the state of Nevada is currently administering several efforts to support UAS development in Nevada. The state has secured approximately $1 million in support of UAS development for pre-Federal Aviation Administration (FAA) UAS designation and the state currently offers several economic development incentives for the UAS industry. GOED has integrated itself with each of the Nevada System of Higher Education's institutions, especially University of Nevada, Reno; University of Nevada, Las Vegas; and the Desert Research Institute, to develop a robust technology commercialization program. The Nevada Department of Employment, Training, and Rehabilitation has also recently established a Governor's Workforce Investment Board advisory council for the defense and aerospace industry. The state has also established the nonprofit Nevada Institute for Autonomous Systems to perform the daily operations associated with being awarded a test site designation for UAS by the federal government.

The second component of the workshop consisted of a lunchtime panel moderated by Steven Hill, director of GOED; and Mark Walker, interim dean/director of University of Nevada Cooperative Extension. Panelists included Lynn Fenstermaker, associate research professor at the Desert Research Institute, Rama Venkat, professor of electrical and computer engineering and the interim dean of the College of Engineering at University of Nevada, Las Vegas and Kam Leang, associate professor of mechanical engineering in the College of Engineering at University of Nevada, Reno. The panel focused on the collaborative efforts of Nevada's institutions of higher education in developing a workforce needed to support the development of a UAS industry in Nevada and ongoing research and development efforts of the institutions in the area of UAS. Major assets of the Nevada System of Higher Education highlighted at the workshop, according to Wilczek (2013), included:

- University of Nevada, Reno:
    - Major UAS research capabilities in design efficiency, antennae design, adaptive controls and pathway prediction.
    - Its Robotics Laboratory was the 2011 winner of the national Micromouse competition.
- University of Nevada, Las Vegas:
    - Owns and operates a fleet of six unmanned autonomous vehicles.

- Major UAS research capabilities in communications security and architecture, sense and avoid, hybrid power and in-flight recharge, systems monitoring, formation flying and 3-D imaging.

- Desert Research Institute:

  - Major UAS research capabilities in unmanned aerial vehicles in atmospheric modeling, multi- and hyper-spectral imaging and cloud seeding.

The afternoon sessions, conducted by Loretta Singletary, professor and interdisciplinary outreach liaison for University of Nevada, Reno, and Frederick Steinmann, Extension educator and assistant professor with University of Nevada Cooperative Extension, focused on the potential application of UAS outside manufacturing and on the potential use of various economic development incentives in Nevada to support the development of UAS in Nevada.

According to Singletary (2013), the top 10 potential applications of UAS, outside military applications, according to a March 2013 edition of Air & Space Smithsonian, include, in order of importance:

(1) Agriculture
(2) Infrastructure Inspection
(3) Storm Tracking and Forecasting
(4) Emergency Response
(5) Environmental Monitoring
(6) Search and Rescue
(7) Wildlife Research
(8) Oil and Gas Exploration
(9) Mineral Exploration and Mine Site Reclamation
(10) Monitoring of Construction Sites.

In agricultural applications alone, Singletary (2013) pointed out that UAS could potentially be used to help increase total agricultural production by helping to evaluate hybrid and trait assessments in test-plot environments; generate crop-yield assessments and predictions; provide canopy profiles; identify stresses caused by drought, flooding, pests, diseases, weeds, nutrient deficiencies, irrigation system malfunctions and other factors; and speed up crop scouting by identifying specific problem spots.

Steinmann (2013) concluded the workshop with a brief overview of potential economic development incentives and funding alternatives that local governments in Nevada could use to support UAS development in their jurisdictions. Steinmann provided a brief overview of Nevada Assembly Bill 449 passed by the 2011 Nevada Legislative Assembly and requirements of a Comprehensive Economic Development Strategy (CEDS) needed in order for local, regional and state governments to be eligible for federal nonentitlement economic development grants. He also discussed various funding alternatives present in the Nevada Revised Statutes (NRS), including NRS 279 (Redevelopment), NRS 318 (General Improvement Districts), NRS 271 (Special Assessment Districts) and NRS 278C (Tax Increment Areas).

Each of the presentations made at the workshop can be accessed online through University of Nevada Cooperative Extension's website at http://www.unce.unr.edu/programs/sites/uas/.

A Summary of the Evaluation Survey – Measuring Impacts

A total of 104 people participated in the workshop. As part of a $25 registration fee, each participant was provided a packet of material, including welcome letters from each member of Nevada's Congressional delegation and a copy of each presentation made during the workshop. Morning beverages, breakfast snacks and lunch were served at each of the participating University of Nevada Cooperative Extension and University of Nevada, Reno locations.

According to Table 1, despite the largest number of participants attending at the University of Nevada Cooperative Extension Lifelong Learning Center in Las Vegas, nine University of Nevada Cooperative Extension county extension offices and one location on the University of Nevada, Reno's main campus also hosted attendees using University of Nevada Cooperative Extension's interactive video network. A total of 39 participants, or 37.5 percent of total participants, attended at the University of Nevada Cooperative Extension Lifelong Learning Center in Las Vegas.

Fifteen participants, or 14.4 percent, attended at the Cooperative Extension is Washoe County office in Reno. Twelve participants, or 11.5 percent, attended at the Cooperative Extension is Churchill County office, in Fallon, and the same number attending at the National Judicial College on the University of Nevada, Reno campus. Other University of Nevada Cooperative Extension county offices with notable participation included the Elko County office in Elko, with seven participants, and the Carson City and Storey County office in Carson City, with five participants.

University of Nevada Cooperative Extension's interactive video network permitted participants at county extension offices and the University of Nevada, Reno main campus to listen to each presentation made at the University of Nevada Cooperative Extension Lifelong Learning Center and ask questions in real time. One presentation, Wilczek's presentation on the current efforts of GOED to support UAS development in Nevada, was made from the National Judicial College.

Table 1 – Total Attendance by Location
Nov. 18, 2013 UAS Development Workshop

Location	Total Number of Participants	Percent of Total
Clark County Lifelong Learning Center	39	37.5%
Washoe County	15	14.4%
Churchill County	12	11.5%
National Judicial College, Reno	12	11.5%
Elko County	7	6.7%
Carson City/Storey County	5	4.8%
Douglas County	5	4.8%
Humboldt County	3	2.9%
Lincoln County	3	2.9%
Mineral County	2	1.9%
Lander County	1	1.0%
Eureka County	0	0.0%
Northeast Clark County	0	0.0%
Lyon County	0	0.0%
Northern Nye/Esmeralda Counties	0	0.0%
Southern Nye County	0	0.0%
White Pine County	0	0.0%
TOTAL	**104**	**100.0%**

A two-page 10-question evaluation survey was provided to each participant and attendee at the beginning of the Nov. 18, 2013 UAS Development Workshop. Participants and attendees at all locations were asked to thoroughly complete the evaluation survey and return it at the end of the workshop. A total of 42 surveys were returned resulting in a 40.4 percent return rate.

Workshop participants were asked to evaluate the performance of each speaker and presentation using a five-point Likert scale. With "one being not helpful" and "five being very helpful" the workshop participant was asked to determine whether or not the material covered in each individual presentation clarified important and complex questions and improved the participant's knowledge about the topic. The total number of respondents for each question (*N*), the mean, the median and the mode are presented for each question, question number one through question number eight, in Table 2.

Forty-two participants answered question number one. On a scale of one (not helpful) to five (very helpful), workshop participants generally indicated that the first presentation, an overview of GOED efforts, was helpful to very helpful in clarifying important and complex questions (mean of 4.12, median of 4.00 and a mode of 4.00) and improving the participant's knowledge about this topic (mean of 4.24, median of 4.00 and a mode of 4.00).

Forty-two participants answered question number two. Workshop participants and survey respondents generally indicated that the second presentation, regarding public aircraft operations pertaining to unmanned systems, was helpful in clarifying important and complex questions (mean of 3.86, median of 4.00 and a mode of 4.00) and improving the participant's knowledge about this topic (mean of 3.95, median of 4.00 and a mode of 4.00).

Thirty-nine participants answered question number three. In general, workshop participants found the third presentation, regarding airspace management, was helpful in clarifying important and complex questions (mean of 3.82, median of 4.00 and a mode of 4.00) and improving the participant's knowledge about this topic (mean of 3.79, median of 4.00 and a mode of 5.00).

Forty-one participants answered question number four. In general, workshop participants found the fourth presentation, regarding spectrum and frequency management, neither helpful nor non-helpful in clarifying important and complex questions (mean of 3.56, median of 3.00 and a mode of 3.00) or in improving the participant's knowledge about this topic (mean of 3.46, median of 3.00 and a mode of 3.00).

Forty participants answered question number five. In general, workshop participants found the fifth presentation, an overview of the Nevada unmanned aerial programmatic office and a wrap-up of GOED efforts, somewhat helpful in clarifying important and complex questions (mean of 3.90, median of 4.00 and a mode of 4.00) and in improving the participant's knowledge about this topic (mean of 3.88, median of 4.00 and a mode of 4.00).

Forty-one participants answered question number six regarding the overall helpfulness of the lunchtime panel moderated by Hill and Walker. In general, workshop participants found the lunchtime panel, discussing the efforts of the Nevada System of Higher Education to help develop a UAS industry in Nevada, somewhat helpful in clarifying important and complex questions (mean of 3.80, median of 4.00 and a mode of 3.00) and in improving the participant's knowledge about this topic (mean of 3.98, median of 4.00 and a mode of 4.00).

Table 2 – Evaluation Survey Results, Question 1 through Question 8

Question 1: The presentation regarding "Overview of the Governor's Office of Economic Development Efforts"	**N**	**Mean**	**Median**	**Mode**
Clarified Important and Complex Questions	42	4.12	4.00	4.00
Improved Knowledge About This Topic	42	4.24	4.00	4.00
Question 2: The presentation regarding "Public Aircraft Operations Pertaining to Unmanned Systems"				
Clarified Important and Complex Questions	42	3.86	4.00	4.00
Improved Knowledge About This Topic	42	3.95	4.00	4.00
Question 3: The presentation regarding "Airspace Management"				
Clarified Important and Complex Questions	39	3.82	4.00	4.00
Improved Knowledge About This Topic	39	3.79	4.00	5.00
Question 4: The presentation regarding "Spectrum and Frequency Management"				
Clarified Important and Complex Questions	41	3.56	3.00	3.00
Improved Knowledge About This Topic	41	3.46	3.00	3.00
Question 5: The presentation regarding "Nevada Unmanned Aerial Programmatic Office and GOED Wrap-Up"				
Clarified Important and Complex Questions	40	3.90	4.00	4.00
Improved Knowledge About This Topic	40	3.88	4.00	4.00
Question 6: The Lunchtime Panel Discussion, featuring Steven Hill and Mark Walker				
Clarified Important and Complex Questions	41	3.80	4.00	3.00
Improved Knowledge About This Topic	41	3.98	4.00	4.00
Question 7: The presentation regarding "Potential Applications of Unmanned Aerial Systems in Nevada"				
Clarified Important and Complex Questions	38	3.92	4.00	4.00
Improved Knowledge About This Topic	38	4.08	4.00	4.00
Question 8: The presentation regarding "Overview of Economic Development Incentives in Nevada"				
Clarified Important and Complex Questions	34	3.94	4.00	5.00
Improved Knowledge About This Topic	34	4.15	4.00	5.00

Thirty-eight participants answered question number seven. In general, workshop participants found the sixth presentation, an overview of potential applications of unmanned aerial systems in Nevada, helpful in clarifying important and complex questions (mean of 3.92, median of 4.00 and a mode of 4.00) and in improving the participant's knowledge about this topic (4.08, median of 4.00 and a mode of 4.00).

Thirty-four participants answered question number eight. In general, workshop participants found the seventh presentation, an overview of various economic development incentives in Nevada, helpful in clarifying important and complex questions (mean of 3.94, median of 4.00 and a mode of 5.00) and in improving the participant's knowledge about this topic (mean of 4.15, median of 4.00 and a mode of 5.00).

In question number 10, workshop participants were asked if they would be willing to attend future, more intensive workshops regarding unmanned aerial systems in Nevada. Table 3 summarizes the results for question number 10. Thirty-seven participants answered the question and 36 participants answered "yes" indicating that they would be willing to attend future, more intensive workshops regarding unmanned aerial systems in Nevada. Just one participant answered "no".

Table 3 – Question 10: Would you be willing to attend future, more intensive workshops regarding unmanned aerial systems in Nevada? (Yes or No)

N	No	Yes
37	1 (2.7%)	36 (97.3%)

Overall, participants of the workshop found the material presented to be helpful in clarifying important and complex questions and in improving the participant's knowledge about the various topics covered during the day-long workshop. Workshop participants overwhelmingly indicated that they would attend future, more intensive workshops that would provide additional time for more attendee participation through expanded question-and-answer sessions.

Conclusion

On Nov. 18, 2013, University of Nevada Cooperative Extension, in partnership with the University Center for Economic Development and the Governor's Office of Economic Development, hosted a day-long workshop on the development of unmanned autonomous systems in Nevada. The workshop included presentations from the Governor's Office of Economic Development; the Nevada Institute for Autonomous Systems Program Management Office; and faculty and administration from: University of Nevada, Reno; University of Nevada, Las Vegas; and the Desert Research Institute. Topics covered during the day-long workshop included the state of Nevada's efforts to support the development of an autonomous systems industry, the efforts of various Nevada System of Higher Education institutions to support research and development efforts and workforce development efforts related to the development of an autonomous systems industry in Nevada, and the potential application of autonomous systems in key economic industry sectors.

The results of the evaluation survey indicated immediate knowledge gains among the 104 workshop participants who attended from various locations throughout Nevada utilizing University of Nevada Cooperative Extension's interactive video network. A majority of workshop participants who completed a participant survey indicated that they would be willing to attend future, more intensive workshops regarding unmanned aerial systems.

The mission of University of Nevada Cooperative Extension is to discover, develop, disseminate, preserve and use knowledge to strengthen the social, economic and environmental well-being of people in the state of Nevada by extending the expertise of the University of Nevada, Reno and other Nevada System of Higher Education institutions to the public. The Nov. 18, 2013 UAS Development Workshop is an example of how the University of Nevada Cooperative Extension can, in partnership with various state agencies and other educational institutions, develop high-quality educational programming and deliver that programming in helpful and impactful ways.

References

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