



EXPLORING GOVERNMENT AND PRIVATE SECTOR APPLICATIONS OF UAS/DRONES IN WASHINGTON WORKSHOP

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Workshop Summary

The Pacific Northwest Economic Region (PNWER) and its Center for Regional Disaster Resilience (CRDR) in partnership with Northeastern University's Global Resilience Institute (GRI) have been awarded a 2017 National Infrastructure Protection Plan (NIPP) Security and Resilience Challenge grant. The project seeks to develop technologies for Unmanned Aerial Systems (UAS) (drone) employment to technically inspect critical infrastructure in post disaster scenarios. As part of this effort PNWER partnered with the Washington State Department of Transportation Aviation Division to host over 150 public and private sector participants in a day long workshop focused on exploring the use of Unmanned Aerial Vehicles across Washington and the surrounding Pacific Northwest. The purpose of the workshop was the inform participants on current activities and policy development in order to share best practices and form a regional Task Force User's Group. This newly formed user's group will serve as a forum for the sharing of information between participating personnel and organizations and serve as a coordinating effort to keep public and private sector stakeholder informed and connected across jurisdictions and sectors. The workshop also provided participants with an opportunity to share how they are currently using UAS vehicles through an online survey developed by the PNWER Center for Regional Disaster Resilience. The regional UAS inventory is the first step in better understanding the current landscape and capabilities that could be utilized to assist with post disaster damage inspection of regional infrastructure.

Welcome and Introductions

Eric Holdeman opened the workshop and welcomed the attendees and speakers. Each attendee stood up and stated their name and respective organization. He stressed the networking aspect of

the workshop and encouraged everyone utilize networking breaks between panels and speakers. He then introduced Tom Hagen, the workshop's first speaker, up to the stage.

Overview of UAS/Drone Capabilities

Tom Hagen, President of Enterprise Initiatives, Inc., spoke about the challenges that could come with a world population projected to grow to 10 billion people by the year 2050. He stressed the pressure this would put on farmers, and the power of innovation to address these concerns. Hagen explained both the origins of the word "drone" as well as the history of drone use in the United States. In 1988, the Department of Defense and Boeing worked together to create the Condor, which set the drone industry on a path to the variety of unmanned air systems used today. In 1992, the Insitu ScanEagle served a variety of purposes for both the military and the general public. By 2013, drones had entered an "era of normalization" for consumers. Over 1 million drones were received as presents on Christmas Day last year, and the total number of registered UAS already far outnumbered registered manual aircraft systems.

Drones have many practical uses, especially in regards to agriculture and natural disaster relief. Hagen explained that drones can access crop fields much more easily than satellite technology can. Drones can therefore easily test water, assist in water distribution, and help eliminate the problems and costs that accompany improper water distribution. Drones are also able to assist in fire monitoring and suppression. UAS can fly over fires at nighttime and over areas where it is too dangerous to send first responders, therefore compressing data analysis by up to 36 hours and saving money and man hours. Because such natural disasters often take out communication systems, companies such as AT&T and Verizon are already heavily invested in solving this issue through drone use. Finally, Hagen touched on innovations in package delivery, and explained that the future could potentially include food delivery of raw produce, meats, etc. in minutes.

Hagen concluded with Washington's potential to be a leader in expanding the practical applications of drones. Washington already has many aerospace firms and workforce opportunities for people in this specific industry; therefore, there is a huge potential for innovation and collaboration between academics, legislators, and business leaders.



Federal Regulatory Environment Panel

Robert Hodgman, Senior Aviation Planner for the Washington State Department of Transportation, introduced himself as the moderator for the panel. He asked the panelists to address what local governments ought to know about future regulations on UAS. **Scott Harris**, Special Agent, Federal Aviation Administration, Office of National Security Programs & Incident Response Law Enforcement Assistance Program, explained his role in assisting the federal government with manned aircraft systems and regulations. He stated that a UAS has three parts: the thing that flies, the operator, and the data link, and proceeded to discuss several regulatory codes and responses. For instance, the owner of a building also owns the airspace above it, and even if the flier of a UAS flies just one inch off the ground, they automatically operate under the FAA's jurisdiction. In terms of laws regarding UAS regulation, federal laws often supersede state and local laws.

Harris went on to explain the three types of UAS pilots--recreational/hobby pilots, civil/commercial users, and public aircraft users. Recreational/hobby pilots primarily fly model aircrafts and have few regulations against them, while civil/commercial users have many FAA regulations. Public aircrafts



are mostly used by law enforcement, and different codes can be written for specific operations. There are few regulations from the FAA for UAS incident responses, whether for minor incidents such as a drone sighting in a private backyard or for major events. Currently, these incidents are often turned over to local police departments for further investigation. Harris also touched on counter-UAS

programs, a major component of dealing with UAS. Recently, many private companies have been approaching military specialists in hopes of obtaining anti-UAS technology, while the military itself often comes to the FAA asking questions. Finally, Harris introduced the FAA's app that unmanned aircraft operators ought to consult before flying in an unfamiliar region, as well as the FAA's LEAP program that provides aviation-related support to law enforcement agencies.

Hodeman then introduced **Charlton Evans**, a consultant for EndState Solutions, LLC. Evans addressed the current lack of trust among the general public for UAS, and that this was a key issue that needed to be addressed given the industry's projected growth. With the commercialization of UAS also came Arctic Provision, which allowed drones to be tested and flown in the Arctic Circle. The OEM (original equipment manufacturer) of the ScanEagle drone recently worked with the Coast Guard to survey the arctic, while UAS were also used in Hurricane Harvey to survey flood water and damage levels. In the Question and Answer portion of the panel, one attendee asked if there were any other organizations besides the FAA who were working to combine procedures and best practices. Evans answered that while there is currently no place or resources available for best practices, many have expressed interest in creating a separate working group for this purpose and that it is currently in the works.

Research and Education Panel

Ryan Davis, President and CEO of Skilled Workforce, introduced himself as the moderator for the Research and Education panel. The first panelist introduced was **Andrew Kusper** with the UAS Center of Excellence in Sunnyside, Washington. Kusper explained the structure of the UAS Center, a consortium of community colleges intended to get industry inputs and skills students need to match up roughly five years down the road. There are currently 11 Centers of Excellence, which have all banded into smaller groups that focus on an industry to teach students and guide them towards the most efficient path. Kusper stressed that the problems of tomorrow cannot be solved with the technology of today.

Christopher Lum, University of Washington Department of Aeronautics and Astronautics Research Assistant Professor, stood up and proceeded to talk about the emerging opportunities at UW for students interested in UAS or STEM in general. He stated that UAS are "easy sells" for students who are already technologically savvy and view the system first as a toy before anything else. UAS can be a jumping off platform for professors to teach core engineering topics, and many universities want to use that as an integrated package for technology/science majors. One example of this is UW's new industry capstone design projects that companies such as Echodyne have sponsored in the past, thus inspiring students to obtain a career in UAS somewhere down the road. Lum also mentioned that UAS in general are a polarizing topic for the general public (though many within the workshop like them). Lum concluded by saying that the technological challenges of drone use are largely over, but that educating the general public as well as students about the ways in which drones could be used other than for recreational enjoyment still posed a challenge.

Lav Khot, Washington State University Irrigated Agriculture Research and Extension Center Assistant Research Professor, then discussed how drones could be used for agricultural purposes. He noted the recent advances that have been made in optical sensors (RGB, multispectral, hyperspectral). These advances have allowed for advancements in agricultural applications of drones, such as in identifying crop emergence and standing, water stress, leaks in irrigation, and abiotic and biotic stress monitoring. Khot also stated that education was crucial, and that exposing farmers and growers to this technology would take time. In terms of workforce implications, many jobs are emerging that currently don't have a proper title, in areas such as data mining and software development. Engaging the workforce and all different industries would be crucial to utilizing these new technological advancements.

WSDOT Aviation

The next speaker was **David Fleckenstein**, the Aviation Director for the Washington State Department of Transportation's Aviation Division. He explained that historically, the Aviation division of WSDOT has been focused on airports and airport infrastructure, but recently, this has changed because of the wide commercialization of drones. There are now three segments in the Aviation division: Airports, Aeronautics, and Emergency Operations. Fleckenstein explained that the Secretary of Transportation is currently concerned with how to implement a program within WSDOT that would allow its employees to use UAS in a safe and legal way. He noted that several things would remain important in this process: training, maintaining standards for the sake of public/government approval, adhering to regulations, and knowing risks associated with UAS use.

Public Sector Users

Steve Meyers, Center for Regional Disaster Resilience Senior Program Manager, introduced himself as the moderator for this panel. He asked panelists to answer how exactly public entities were deploying UAS, whether or not the current regulatory environment could host UAS programs, as well as to speak on privacy concerns and challenges within the panelists' specific programs. The first panelist introduced was **Mike Hirte**, Administrative Sergeant to the Undersheriff, Thurston County Sheriff's Office. Hirte explained that the need for UAS ought to be focused more on smaller agencies. He also stressed the importance of knowing "your public" as well as what their viewpoints are in order to gain their trust. There are both "creep" and "fear" factors associated with the introduction of new technology, and organizations are not always good at sharing information and resources about these technologies. This is why Hirte's program has focused on sharing these UAS resources and skills to save time and money, as it is vital for the public to be on board with drone use as soon as possible. He noted that while drones can be helpful especially in emergency management and law enforcement sectors, the applicability of UAS is widespread. In order to start an organization for UAS, everyone has to be on board; otherwise, this will only create distrust and public suspicion.



The next panelist was **Captain Jay Cabezuela** of the Criminal Investigation Division of the Washington State Patrol. Cabezuela detailed the lessons learned from his own UAS program. The first lesson was that there are lots of vendors with different technologies, so it is crucial for organizations to do their homework and know exactly what they need. The next lesson primarily focused

on limiting the scope of policies regarding UAS, but then expanding the scope once UAS use is accepted and approved. The third lesson focused on the most expensive part of the UAS process, which was investing in software and computers for data collection. Cabezuela also encouraged organization leaders to have a plan for the data they will collect through UAS, and that responding to public disclosure requests is also essential. Finally, Cabezuela stressed the importance of training and the value in not rushing through training programs. Making sure people are trained is the most important part of building a UAS program.

Next, **Ginger Armbruster**, the City of Seattle’s Chief Privacy Officer, detailed her experience in managing data and the general privacy of the city. Seattle’s privacy program is primarily focused on maintaining the public’s trust--for example, drones are still not allowed in Seattle parks, and many departments are still in the process of getting UAS to use for emergency management. Armbruster mentioned that containing the data collected from UAS was a major privacy issue, because this data becomes part of the public record and is required to be handed over to authorities if requested, thus interfering with privacy concerns. Acquiring and owning these UAS is not necessarily the best approach, either, and partnerships between departments and organizations are crucial in helping to contain the amount of data collected. Finally, **Sean Davido**, the City of Yakima’s Community Relations Specialist, spoke on his experience with using UAS to survey a recent flood in Yakima. This use was a good starting point for Davido for his nascent UAS program. He agreed with the previous panelists and stated that starting small with UAS/data collection was key, as well as pointing out that education and training were also essential components.

Luncheon Keynote: Drones and Emerging Tech

For the Luncheon Keynote, **Bill Schrier**, the Senior Advisor for FirstNet, spoke on his experience with UAS while at FirstNet. FirstNet was created as a product of the miscommunications between firefighters and police officers during 911. Its initial goal was to create a national wireless network

with first responder priority; now, FirstNet is a 7 billion dollar network at 20 MHz, awarded to AT&T in 2017 and deployed officially in January 2018. FirstNet has dedicated responder care and security operation centers, with roughly 100 professionals constantly monitoring the network. UAS become helpful for inspecting cell towers and creating cell sites that can be put on the drones themselves. Additionally, Schrier brought up several ideas to consider for organizations considering UAS use. He spoke about the problematic nature of data tsunamis, which increase the amounts of data that need to be stored as a result of new technologies. However, Schrier also brought up the advantages of the improvements made in artificial intelligence/object recognition technologies as a result of widespread drone use, especially for law enforcement agencies looking for specific images/words. Drones are also immensely helpful in combating and containing wildfires, as well as assisting in rescue team operations.

Private Sector Usage

David Fleckenstein, the WSDOT Aviation Director for the Washington State Department of Transportation's Aviation Division, introduced himself as the panel moderator. The first panelist was **Paul Applewhite**, President of Applewhite Aero. He introduced Applewhite Aero's Baton model, a precision descent vehicle to be used primarily for search and



rescue missions. He also discussed the Milo UAV, which could take on a larger payload than the Baton. Applewhite then discussed his notes from Hurricane Katrina and the lessons learned from disaster relief missions there. The number one requested commodity was fuel, and by day three of the disaster, pharmacists' distribution of medications and getting cash were also top concerns. Currently, the U.S. government classifies UAVs as manned aircrafts, which is also problematic considering that government regulations in place for manned aircrafts thus limit development of UAVs. China, a major manufacturer of drones, is seizing the opportunities that UAS present, while the U.S. is not.

Next to stand was **Greg Thies**, KING-5's News Operations Manager and sUAS Chief Safety Officer for TEGNA Corp. and KING-5. Thies works specifically with logistics/operations in special events, as well as with planning teams for disaster recovery. For TEGNA, the number one priority is safety; therefore, consistency/congruence in safety training are critical. Like other panelists, Thies noted the importance of partnerships in making operations for disasters/other events go smoothly. He

also spoke about the challenges of finding a common ground on UAS--difficult to ensure that UAS flight operators are all following the appropriate guidelines going forward. Following Thies was **Samuel Adams**, the owner of Eagle-Eye Aerial Solutions, LLC. Adams manages flight operations for Eagle-Eye, as well as safety management and internal policies for safety. In order to keep a solid safety record, infrastructure needs to be sound and unwavering. Though Eagle-Eye collects a lot of data, much of the data it receives is classified and unable to be shared. Adams also discussed how big of an issue airspace regulations are, as legal issues have made it difficult for UAS-centered companies to sustain themselves because they have to get approval for flying in certain areas, which can take several months.

Finally, **Mo Swanson**, the Public Policy and Partner Engagement Manager for Echodyne, spoke on her company's experience. Echodyne, a Bellevue startup that makes low-cost ways to sustain radar, has focused on maintaining connections and being a part of the innovative pilot program for these types of radar systems. One challenge facing these methods is airspace conflicts, which is why smaller companies with Google Maps underlayers are working to create awareness for intruders/non-intruders. Swanson stated that the current NASA programs were not getting enough recognition, and should have been given more credited. Echodyne's radar systems also focus on both airborne and ground-based detect-and-avoid methods.

Counter Autonomous Unmanned Systems (c-AUS)

Mark Jones, Senior Program Manager for Echodyne, talked of industry drivers and commercial landscapes. As we enter further into the "Era of Autonomous Systems," the growth rate will just keep increasing as well as the amount of money going into these systems (costs in turn going down). However, Jones stated that the U.S. as a whole wouldn't be ready for security threats drones pose. There are an abundant number of national security issues when it comes to drones. Certain community partnerships need to come together, engage, and assist companies in identifying/detecting vehicles in the sky. These partnerships need to thus figure out how to educate people and identify the capabilities of this technology. In regards to the counter-UAS timeline, Jones stated that were seven main steps: detect, locate, identify, track, exploit, defeat, and assess. Locating ought to occur through utilizing radio frequencies radar signals from UAVs. Defeating these UAVs becomes somewhat more difficult, as it is not always known how a specific UAV will come out of the sky and whether it will be controlled or not. Sensor fusion was key in detecting whether a UAS was a "friend or foe." Though these technologies are developing rapidly, the legislative process is still just as slow. Like other panelists, Jones stated that standards development, education, and community engagement were all keys to ensuring that UAS become more integrated and useful in today's society.

CRDR Resilience Challenge Project: Utilizing UAS for Technical Inspections

Phil Anderson, Director for Research and the Chief Innovation Officer at the Global Resilience Institute for Northeastern, took the stage to speak on their current UAS research. The National

Infrastructure Protection Plan Challenge grant is a grant administered by DHS for post-disaster inspections. With this grant, we have begun researching how to best use drones in post-disaster environments, specifically looking at damage to linear infrastructures such as bridges, pipelines and port docks. Besides this capacity, drones are also able to do routine autonomous assessments of infrastructure (a long-term goal for Anderson), assesses/ascertaining types of damages that are impacting infrastructure. 40-60% of autonomous development is already focused on UAVs versus robotics. GRI is partnered with PNWER on this project and we are currently looking at a couple different opportunities to field test the technology, possibly in Puerto Rico later this summer. GRI researchers are working on developing the algorithms for flying the drone and quickly assessing damage. The final product will be completed by the end of the calendar year and will lead continued discussions on how to best utilize this technology.

Next Steps

Participants were in agreement on the need to form a regional Task Force to better coordinate and share information on efforts going on across the region. It was pointed out that while there are many very focused and engaged associations and working groups within specific sectors and jurisdictions, there is no one overarching group to pull these disparate groups together. There was also strong interest in participating in the asset inventory survey to help us get a baseline measurement of the current capabilities across the state and beyond. This is the first step in this effort and PNWER will continue to update this inventory as the Task Force matures. Because of the consensus on the need for developing a cross sector UAS Task Force, we will explore expanding this to other states in the PNWER region. The Task Force will help develop the next workshop which is scheduled for December 2018.