



Oregon Unmanned Aircraft Systems (UAS) & Situational Awareness Workshop

Wednesday, September 4, 2019 | 8:00AM - 1:45PM

Salem, OR | Department of Public Safety Standards and Training

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Overview

Over 80 public and private sector stakeholders from Oregon and around the region met in Salem, Oregon, on September 4, 2019, to participate in a workshop focused on Unmanned Aircraft Systems (UAS), also referred to as drones in this report. The workshop sought to highlight the current state of UAS usage within the state of Oregon and identify opportunities to collaborate more effectively between the public and private sector on drone usage and utilizing drones for situational awareness. The workshop brought together attendees and speakers from drone companies, industry associations

and organizations, first responders, law enforcement, state and federal agencies, municipalities, emergency managers, and stakeholders from both the public and private sector. The workshop was funded by a grant from the Department of Homeland Security's (DHS) National Infrastructure Protection Plan Challenge Grant program.

Key Takeaways

- Leadership on UAS in the state is currently a shared responsibility.
- The Oregon Department of Aviation director asked for feedback, suggestions, and ideas on how to advance UAS in the state.
- In the Portland Metro area, there are efforts underway to develop a shared set of training standards that can be used as a template for others in developing standards and training programs. It was noted that law enforcement is, to some degree, working separately within their discipline.
- Law enforcement within the state has a working group focused on drones.
- The state has been provided a draft CONOPS that can serve as a potential template for the process of access to critical infrastructure post-disaster.
- There is support for a state-wide Certificate of Authorization (COA) to allow for jurisdictions and agencies to share resources in emergency situations.
- Oregon is home to many drone industry leaders and technology companies.
- Opportunity exists for state agencies to collaborate with both public and private sector on UAS capabilities across the state.
- There are varying degrees of awareness regarding drones within the state legislature.
- Outreach and education would be beneficial in helping legislators better understand UAS capabilities and develop sound policy.
- In other state workshops, FAA claimed total authority on airspace above ground level. One speaker with FAA experience called out that this might be open to some interpretation.
- In another state workshop, it was noted that state legislatures should be careful to ensure that they do not enact UAS policies that conflict with current federal regulations. A clear understanding of current UAS federal policies is necessary in order to develop good state policy on drone usage.
- Webinars are useful in improving knowledge and awareness on UAS issues, on topics such as Beyond Visual Line of Sight, current regulations and policy, etc.

Summary of Events

Welcome, Introductions, and Goals of Workshop

Eric Holdeman, Director of the Pacific NorthWest Economic Region's (PNWER) Center for Regional Disaster Resilience (CRDR), welcomed participants to the workshop. Holdeman gave a brief overview of the role of PNWER and the CRDR and highlighted the approximately 20 events that the CRDR has held during the 2018-19 year, addressing issues such as critical infrastructure protection, cybersecurity, drones, earthquake preparedness, wildfires, long-term power outages, and election security.

Holdeman then outlined the DHS Resilience Challenge grant funding the project and workshop and their goal of protecting and strengthening critical infrastructure. As part of the project, PNWER has hosted workshops in the four northwest states of Montana, Idaho, Oregon, and Washington addressing UAS inspection of critical infrastructure, how to increase situational awareness, and re-entry access to critical infrastructure sites post-disaster.

Overview of the State of the Industry

Jeff Ratcliffe, President of AUVERSI Cascade Chapter and CTO of NW UAV, presented on the current state of the UAS industry. Ratcliffe addressed three trends in the current industry: technical trends, market trends, and regulatory trends.



Ratcliffe spoke to three such technical trends within the industry: air vehicles, payloads, and propulsion. In the development of new air vehicles, companies are seeking to minimize the overall footprint of the vehicle, focus on the end user, and minimize costs. Not only are companies looking at how to minimize the physical footprint of the vehicle, but also the cost of the operation of the system itself in order to make the entire operation quicker, faster, and cheaper. More efficient and cost-effective operations allow easier

training and fewer people operating the systems, which in turn results in smaller spaces for operations, maintenance, logistics, storage space, capital, layout, etc. The easier that systems are to operate, the more quickly one can scale operations. Secondly, there is much work being done around payload, referring to the technology that the drone is able to carry. The technology continues to improve every year; and drones are able to handle heavier and higher quality payloads. Advancements are being made in cameras and optics, sensors, and data collection, in addition to other areas. One major area of payload is that of data collection. Ratcliffe gave the example of drones being used for nuclear and radiation monitoring. Ratcliffe also briefed participants on propulsion and the work that the military is engaged in as it relates to drones.

Next, Ratcliffe highlighted recent market trends. Drone technology continues to develop at a rapid pace. The military continues to be at the cutting edge of the market, but the commercial market is advancing rapidly as well. New applications for drones are being discovered that were not considered a few years ago. Ratcliffe gave the example of drones being used in logging to carry cables across large areas of terrain.

Lastly, Ratcliffe discussed current regulatory trends. Both government and industry are eager to advance drones. Governments are beginning to recognize the potential economic benefits of UAS. However, due to the speed at which the market is progressing and the continual discovery of new uses for drones,

issues often arise between the market and current regulations. Governments are seeking to ensure controlled and safe integration of drones into the economy. Beyond visual line of sight is one such area that offers exciting opportunities, but safe integration into the market must be ensured.

The government appears to be adopting more of a standards-based approach. Governments recognize that drones are different from manned aircraft, and thus new standards are required to be written. Ensuring that enforcements are consistent and predictable are key. Ratcliffe noted that this is the benefit of test ranges, which allow for UAS and new technologies to be tested in a controlled environment which in turn helps to inform both the regulatory side and market side of the UAS industry. Oregon has three test ranges.

Public Sector UAS Operational Concepts and Uses

Betty Stansbury, Director of the Oregon Department of Aviation, and Bill Martin, Program Analyst Team Lead from Oregon's Office of Emergency Management, highlighted how agencies within the state are integrating UAS into their operations. Panelists sought to address some of the following questions: What is your agency doing for integrating UAS in operations? What policies, plans, procedures, and mechanisms for the collection and exchange of information have been the best example in your experience? How has your organization been used for operational situational awareness during an incident? How has your organization used or could use your services for critical infrastructure inspection and observation?

Betty Stansbury profiled the Oregon Department of Aviation, which provides assistance to 97 public use airports in Oregon, 28 of which they own and operate. Stansbury explained that she moved into the position of department director within the last 7 months and is open to and is open to suggestions on how to advance UAS operations within the state of Oregon. Stansbury believes that drones are poised to be the next transformative industry for the US. Stansbury encouraged all workshop participants to contact her with their recommendations on steps that the Department of Aviation could take in order to advance UAS within the state and advocate on legislation.

Stansbury spoke on her experiences managing airports on the East Coast through 4 major hurricanes. In disaster situations, when roadway systems are inaccessible, the only manner in which to get resources into a community is via water or air. In much of Oregon, air is the only option, and UAS can play a key role in emergency response and recovery.

Stansbury highlighted recent legislation within the state of Oregon. Senate Bill 581 makes it a violation to knowingly and intentionally cause UAS to interfere with aircraft. It also asks operators of UAS to register their UAS with the Department of Aviation. Thus far, there are about 275 UAS registered with the Oregon Department of Aviation. UAS can be registered at the Department of Aviation website.

The Department also works with the University of Alaska Fairbanks, who was delegated authority by the FAA, on several UAS test ranges within the state of Oregon. The Department is working with the University to assume responsibility of those ranges within the state. In addition, Stansbury stated her desire to work on a statewide certificate of authorization (COA) that would allow local governments and multiple agencies to deploy assets in an emergency. One example of this would be in the case of a major



seismic event affecting multiple communities, a COA would allow for the deployment of UAS to give live updates on infrastructure that is damaged or inaccessible.

Following remarks from Stansbury, Bill Martin discussed the role of Oregon Office of Emergency Management (OEM), how the agency interfaces with drones, and what opportunities exist for greater collaboration. OEM does not collect data themselves but rather receives the information, synthesizes it,

and makes decisions with the information provided. In this vein, drones are a tool that can be utilized in providing accurate intelligence and data, which in turn allows OEM to more easily make decisions about how to deploy limited resources. Martin emphasized that the question should be how to integrate public and private sector UAS usage, especially when it comes to information-sharing in post-disaster events.

OEM looks at drone usage through three spheres of influence: mitigation and preparedness, response, and damage assessment. Drones can be utilized prior to disasters to prepare for and attempt to mitigate emergency events by retrieving data and gaining knowledge about potential hazards or critical infrastructures. UAS should be used in a way that enhances the human intelligence component, said Martin. The response component of drones takes place when a disaster has occurred. Drones can be utilized to provide real-time, accurate information. The focus is on operability – can mission sets be built from the information. Finally, drones can be utilized to provide damage impact assessment and inspect critical infrastructures in a wide variety of settings. Losing critical infrastructure has huge implications and wide-ranging impacts on other connected systems.

One emerging issue for OEM is establishing specific plans and procedures to support partners statewide, receive the information and data from partners, and then analyze it to make it useful and operable. UAS usage is no longer the exception but the standard. The question for state agencies is how to evolve in such a way to add the important tool of UAS to the toolbox.

Inside the Beyond Visual Line of Sight Efforts of the IPP Program

One of the most discussed components within the UAS industry is the issue of beyond visual line of sight (BVLOS), seen as a critical component for the UAS industry. Charlton Evans and Kevin Hull of End State Solutions LLC emphasized that beyond visual line of sight is the next step in advancing UAS applications and usage. Evans opened the panel by discussing his experiences being deployed to a number of disasters around the US, and the importance of the relationships and trust that he established while

conducting drone operations there. These relationships and the trust from agencies such as the FAA have been key in allowing Evans and partners to engage with these agencies and others. Evans' organization has been involved in Integration Pilot Programs (IPP) which were started by the Trump administration in 2017. This allowed 10 public-private partnerships to get expedited through the certification process that essentially makes them air carriers. This allows them to put both a design and operational certification into their system designating the ways that they operate as an air carrier. These partnerships allow the FAA and the industry to test these systems and work out some of the tough problems associated with beyond visual line-of-sight.

Kevin Hull opened by giving a background of the various regulations and certifications for pilots and the challenges that arose when unmanned aircraft come onto the scene. The sole purpose of these regulations and requirements are deconfliction of the airspace. When UAS are incorporated into airspace, it is important that risk is not being added into the system. The goal is for UAS to act well with others and not create problems while trying to improve situational awareness.



This is a key element and understanding that BVLOS requires for UAS to operate without visual observers and a high level of automation. Hull noted that the challenge is how to automate the human capability of seeing, deciding, responding, and deconflicting. There are many factors that come into play when dealing with automation of drones and how they react in real-world scenarios when deconfliction of airspace is required. Hull noted that technology is advancing rapidly and great progress has been made but, unfortunately, the technology is quite to the point where the FAA is comfortable allowing BVLOS.

Question: Does the FAA know what kinds of specs it wants to replicate the function of the human eyeball?

- No, said Hull. The existing system with human visual sight is flawed, and current line of sight is incredibly limited in manned aircraft (cannot see out the sides or back of the aircraft). The challenge right now is that the FAA wants no accidents and perfect vision from UAS when the technology is not there, and when the system for manned aircraft is not there. In Hull's opinion, aiming for several orders of magnitude better than existing systems is appropriate. The FAA is shooting higher than that, and it is limiting the industry right now. Because there are not specific specs that can be worked towards, designers seeking approval for their designs have to go out and evaluate the exact performance of the human in the system, and the current capabilities

are not great. This begs the question of how to make the system better with UAS while balancing having too many barriers in place.

- Said Evans, industry has tried to come up with studies that demonstrate what an equivalent level of standards would be. There are committees currently working towards standards, but ultimately, standards will be driven by things like Integrated Pilot Programs where the program sets the standards that others end up following.

Question: What kind of timeline are you working on for certifying beyond visual line of sight? Do you know when it will happen?

- The process is moving very slowly, said Hull. There is some good progress that is going on, and several applicants that are moving pretty quickly. One example of this is Amazon requesting an exemption from part 135. Whether they will receive the exemption remains to be seen, but it is probably the greatest beyond visual line of sight progress that has been made. More generally, within the next year or so we will start to see design approvals. Within a year to two years we will start to see broader operational approvals that are not just specific to certain geographical regions, but will apply more generally anywhere in the country.

Question: Who owns the airspace, and when does it become airspace?

- This is a very challenging question, and it is not fully worked through, said Hull. Prior to Part 107 being issued, the FAA said that they owned all of the airspace from ground to infinity. For a few years, there was some segregation between below 400 feet and above 400 feet because manned aircraft were not supposed to fly below 400 feet, but this has been violated, so now the FAA leans more towards being able to regulate and control from the ground to infinity. From a certification, aerospace, and civilian standpoint, it is zero to infinity - the FAA has jurisdiction. Part 107 pilots must abide by FAA regulations and standards, including only flying during daylight hours, staying within visual line of sight, below 400 feet, etc.
- The FAA has decided that if you put something into the air, it is defined as an aircraft - even if it is a toy - because you have the potential to create havoc once you enter the airspace.

What are Initiatives and Resources Happening in the State?

Oregon is home to several UAS initiatives already happening at the local level. Jeff Pricher, Division Chief of Scappoose Fire Division and Columbia River Fire and Rescue, presented on a project he is helping to lead for the Urban Area Security Initiative (UASI). The project, funded through Regional Disaster Preparedness (RPDO) seeks to develop a UAS program that is coordinated across the multi-county Portland metro area. The project is intended to include all government entities such as..., fire, law enforcement, emergency management, communications, public works, and others. The program is intended to cover such things as training requirements, certification, and regional standardization. Within the program, the goal of collaboration is a key objective, and working together among agencies is critical. Pricher provided several case studies of collaboration among state agencies using drones in operations and noted the importance of regional standardization and collaboration. One outcome of the project is to create an operations guide which helps each agency to create more standardized training requirements and determine a baseline understanding of steps that should be taken regarding their UAS

program. Pricher noted that certification processes need to be clearly laid out for agencies to ensure that no rules are being broken.



Pricher expressed support for a statewide COA. He noted that a regional COA will make it easier to share resources such as pilots and aircraft beyond county lines.

Pricher also discussed a number of different UAS standards that participants should look more closely at, including the NWCG's A-450 Basic Remote Pilot, S-373 UAS Incident Operations; NFPA 2400 Standard for sUAS Used for Public Safety Operations; and NIST/ASTM's trainings and

evaluations for fuel truck and rail car inspection, night operations.

Question: Do you have any standards for how you are housing and maintaining your assets?

- Pricher stated that the goal of the project is to give a framework to other government entities that want to have a UAS program. It takes a lot of time to put these components together. With this in mind, it is up to the organization to figure out a deployment model. For the RDPO, the end goal is to have two or three specialized aircraft with the appropriate sensors to be issued to individuals. However, more generally, the organization wants to have smaller, foldable aircraft specifically for situational awareness that are in the chief vehicle, which usually goes on every scene. This means that pilots can take the UAS off of the chief vehicle and fly it.

Question: How do you put so many resources into this program? How do you make sure that you get the amount of interest necessary from the community and superiors? How do you make sure that this program is seen as valuable?

- According to Pricher, the first component is going to be the creation of stakeholder groups. This includes public works, communications, emergency management, law enforcement, and fire. A representative from each of these groups will be stakeholders and give input as we are setting up the framework moving forward, deciding what standards we will or will not apply. The hope is the program can be made available to other entities within the state when the project is completed, which can potentially lead to collaboration with the Oregon Department of Aviation, the State Bar Marshal's Office, and the Department of Public Safety Standards and Training to ensure consistent credentialing. This will help ensure there's a state-wide standard for UAS operations. We are very fortunate to have the funding to hire someone to pull all these elements together, because normally we would not be able to do this. So with base funding, we can make sure these credentials and guidelines are available to everybody. Standardized criteria and credentials will allow for easier mutual aid requests.

Following Pricher's presentation, Kevin Tucker, President of Near Space Corporation, presented on the UAS Test Range located in Tillamook, Oregon. Such test ranges were born out of the FAA Modernization and Reform Act of 2012, which mandated the establishment of UAS test sites to promote the integration of UAS into national airspace. Oregon has four of these test sites, which facilitate such actions as testing, standardization, and operability. The Tillamook range, in particular, has well-established infrastructure that allows for launch recovery operations, access to vertical space for indoor operations, terminal operations, ground stations, secure servers, and more. The range is directly connected to the FAA Seattle Center and maintains a good working relationship with the FAA.

The Tillamook range has COAs for beyond visual line of sight and high-altitude operations. Tucker highlighted the range's available infrastructure and equipment, as well as the experience of the range in conducting such test operations. Ultimately, the range provides the personnel, processes, and infrastructure needed for organizations for drone test operations. When asked the cost of using the facilities, Tucker answered that users of the facilities must cover the cost of the services needed, but there is no cost to using the infrastructure that is available.

Private Sector and Infrastructure Concepts and Uses



The utilization of UAS within the private sector continues to drive the industry forward and innovate new ways in which drones are being used. Sam Adams, Owner of Eagle Eye Aerial Solutions commented on how drones are being utilized within the private sector and highlighted some of the key issues and concerns that organizations and drone operators should be aware of. Adams noted that a significant issue not often addressed relates to the increasingly large amounts of data that drones collect and how to responsibly process, store, and

protect this data. Adams noted that data storage can be done in-house or with a third-party vendor, but there are varying levels of security depending on the choice that is made. Adams emphasized that organizations using drones to collect data need to think seriously about what is done with the data that is collected, where it is stored, and how it is protected. Adam recommended that organizations should have a well-thought out plan on how to manage their data when considering the implementation of a drone program.

Question: Have you compared in-house processing to outsourcing your processing?

- I personally prefer in-house processing, said Adams. The issue with cloud applications is that the companies will be sold or go under, and their services disappear. If an organization's data is not on a server that they own, it is not accessible if that company disappears.

Comment: We should also recognize that if you do hire a cloud-based company, the risks associated with their server is now your risk. Put clauses in your contract with them so you can have no-notice visits at their site, allowing you to see the fire suppression systems, access control, security, the racks and cages that separate your servers, etc.

- I completely agree with this, said Adams. My company's policy is that, if we go fly something, we are flying for that company and the data belongs to them. If the company wants us to store their data on-site, it is still theirs to disseminate.

Question: Are you confident that the privacy concerns of your clients will be met by most of the existing cloud services?

- Adams replied, not at this time, which is why we did not go with a cloud-based service. We are doing work with federal entities like the BPA, and even some of the smaller utilities like Washington PUD, Monterey County PD. They do not want everyone to know what is going on with their data. If you are putting things on the cloud, it is really easy to lose information. There are a lot of good opportunities for cloud-based storage, but if you depend solely on that you will run into some issues.

Question: From the public sector side of things, are there standards being set up for doing inspections? Is there a good way or standard that can make sure that things are done in a standardized fashion?

- Adams: I cannot speak for other groups, but in my company, we hire guys with backgrounds in such as construction and engineering so they have previous experience with these inspections. You get what you pay for in terms of your staff and contractors. We tried to set our internal flight standards based on the national flight standards of organizations like the BPA, but this really varies widely from company to company.

Following Adam's presentation, Rick Brown provided an overview of Union Pacific's use of drones. Brown utilizes drones for inspection of rail tracks, security, and law enforcement in his role as a special agent for Union Pacific. Brown highlighted and provided case studies for the ways in which UAS are being utilized by Union Pacific. Brown stated that railroads have been using drones for critical infrastructure inspections since about 2014. One of the main concerns for railroads is safety, and this is a primary reason that railroads have become a leader in private sector UAS usage. Drones allow for safer method of examining infrastructure while keeping employees safe. Brown noted that Union Pacific works to, not just meet, but exceed FAA standards and procedures on UAS. Union Pacific currently has 250 UAS-certified pilots and 336 drones. Another key use of drones at Union Pacific is for evidence location and collection.

Brown provided several video examples of how Union Pacific has used drones to collect intelligence along tracks, rapidly inspect infrastructure, and enhance situational awareness.

Recommendations and Next Steps

Following the conclusion of speakers, Eric Holdeman discussed next steps. Holdeman reviewed the draft CONOPS for critical infrastructure disaster access and damage reporting (see Appendix A) that was provided to the state. Workshop participants expressed an interest in a statewide users group.

The topic of drone policy gaps and implications will be addressed at the upcoming PNWER Economic Leadership Forum in Seattle, WA, in November 2019, and at the PNWER Annual Summit in Big Sky, Montana, in July 2020.

Appendices

Appendix A: Draft CONOPS

DRAFT Template

Critical Infrastructure Disaster Access and Damage Reporting

State of Oregon

Concept of Operations (CONOPS)

1. Introduction

1.1 Purpose

The purpose of this CONOPS is to enable critical infrastructure owners and operators to have access to their infrastructures in post disaster scenarios. This will allow them to make a rapid damage assessment of their facilities. The second purpose of this CONOPS is to establish a criteria for reporting the status of infrastructures to the state emergency management Emergency Operations Center (EOC). Finally, if there is raw data, such as photos, video or other data that assists in better communicating the status of the damaged facilities, this CONOPS will designate the format and possible transmission methods for sharing that information back to the State EOC.

1.2 Background

86% of the nation's critical infrastructure is owned and operated by the private sector. There is a need for rapid damage assessment of these critical infrastructures immediately following a disaster. Emerging drone technology is allowing for an expedited and detailed damage assessment of infrastructures by

owners and operators. To accomplish this work requires that the private sector have access to disaster zones to conduct damage assessments and then be able to share information rapidly with state emergency management agencies so that a common operating picture can be established and shared appropriately.

1.3 Scope

This project scope includes the development of plans, procedures, processes, and mechanisms for the collection and exchange of damage information. This information will assist both infrastructure owners and the public sector to obtain faster situational awareness on the status of their infrastructures, and other interdependent infrastructures that may impact their ability to provide services, and products to their customers. This information will be transmitted to state EOCs and used to create a common operational map that can be shared with the federal government, lower level jurisdictional organizations and the private sector.

A public-private workshop was conducted. At this workshop sessions were held that invited public and private CI owners and operators to be briefed on and consider their needs and concerns about partnering with the government sector and their state. The outcome of the workshop provided for the initial formation of operational concepts are now incorporated into this CONOPS.

1.4 Objectives

- Document the process whereby critical infrastructure owners and operators can gain access to their facilities located in disaster zones that may be located in areas that are sealed off from the general public by law enforcement.
- Designate a simplified reporting format whereby infrastructure owners and operators can report the operational status of their infrastructure facilities.
- Establish communication pathways and file formats for the transmission of raw data, as appropriate, that amplifies and perhaps clarifies the extent of damages to said infrastructure.

2 Options for Gaining Access to Critical Infrastructure in Disaster Areas

2.1 Law Enforcement Control of Access into Disaster Zones

Disaster zones are often sealed off post disaster at the direction of government officials at all levels of government. This is done to protect property and facilities that have been evacuated due to a disaster. When this occurs, traditionally this task is performed by law enforcement agencies at the city, county and state levels. During large scale disasters they may be assisted in this security task by the National Guard.

The senior law enforcement officer for the department with this security task normally acts in concert with state and local emergency management authorities, or in some cases as part of a specific Incident Management Team (IMT), discussed below.

When infrastructure owners and operators need access to their facilities that are located in secured areas, they must work with the senior law enforcement officers, County Sheriffs and Police Chiefs to gain access. This can be accomplished by working through an established local EOC that has local law enforcement liaisons present to coordinate the specific access point for entry by infrastructure owners, the route to the infrastructure and likely the exact destination and location of the infrastructure.

Crews who are allowed access into disaster zones must abide by all the stipulations placed upon them by law enforcement, e.g. single points of entry and exit from the disaster zone and means and methods for communicating their location and status to the appropriate EOC or command center designated by the law enforcement agency.

There may be additional requirements for all staff entering a disaster zone to have a written pass/authorization from established by local law enforcement and special identification for vehicles operating within the disaster zone.

The emphasis on gaining access is to provide for the safety of individuals entering the disaster zone, accountability of personnel and vehicles/equipment operating within the disaster zone and compliance with all reporting requirements established by the law enforcement agency.

2.2 Areas under the control of an Incident Management Team (IMT)

For many disaster situations it will be possible that an IMT is established to manage the field response to a disaster. In the past, wildland fires have been the typical use for IMT organizations. The usage of IMTs has expanded for other disaster response operations that could include search and rescue, recovery operations, flooding, or in one well documented case a large mudslide.

2.3 Direction and Control under an IMT

In a situation that has an IMT in charge of the disaster response it is the Incident Commander who has the ultimate authority for all operations that occur within the designated disaster area and for granting access into disaster zones. Infrastructure owners and operators must contact the individual IMT command center to coordinate their entrance into a disaster area. All protocols established by the Incident Commander must be followed. Normally this will require anyone entering a disaster zone to also report their exit from that zone when their work is completed.

State Emergency Operations Centers (EOC) can assist infrastructure owners and operators in identifying the specific IMT and its location where coordination will be required. Note that the use of drones to conduct inspections within areas controlled by an IMT needs to be clearly communicated and approved by the IMT, integrating their use into their air operations plans.

3 Infrastructure Damage Reporting

3.1 General

The impact of disaster damages to our modern business and supply systems can be catastrophic to our ability to function as a society. Public health and our overall economy can be decimated by the lack of a

functional infrastructure system that provides electrical power, communications, transportation, liquid fuels, water and waste-water services to name only a few of the major infrastructures.

It is critical to have good situational awareness on what infrastructure systems are functional, those that are functioning at a less than optimal level and then those that are either off-line or perhaps even destroyed. Having this information will assist in establishing a common operational picture.

Reporting on the status of infrastructure will initially be scarce, but with teams forming and organizations getting organized to respond, the amount of information available on the status of infrastructure will escalate rapidly.

It will be important to have a system which enables the operational status of critical infrastructure to be reported easily and provide a “snapshot” of the status of the infrastructure.

3.2 Rapid Damage Reporting—Color Coded System

In order to rapidly communicate the status of infrastructures a color coded system will be utilized. This system of reporting focuses only on the operational status of the infrastructure and not what the specific issue is that is causing the rating to be applied to the damage. The judgement on what the status of the color code is made by the inspector on the ground using their individual expertise to make such a judgement call. This rating system does not provide detailed information on the cause of the rating or why a system receives a specific rating.

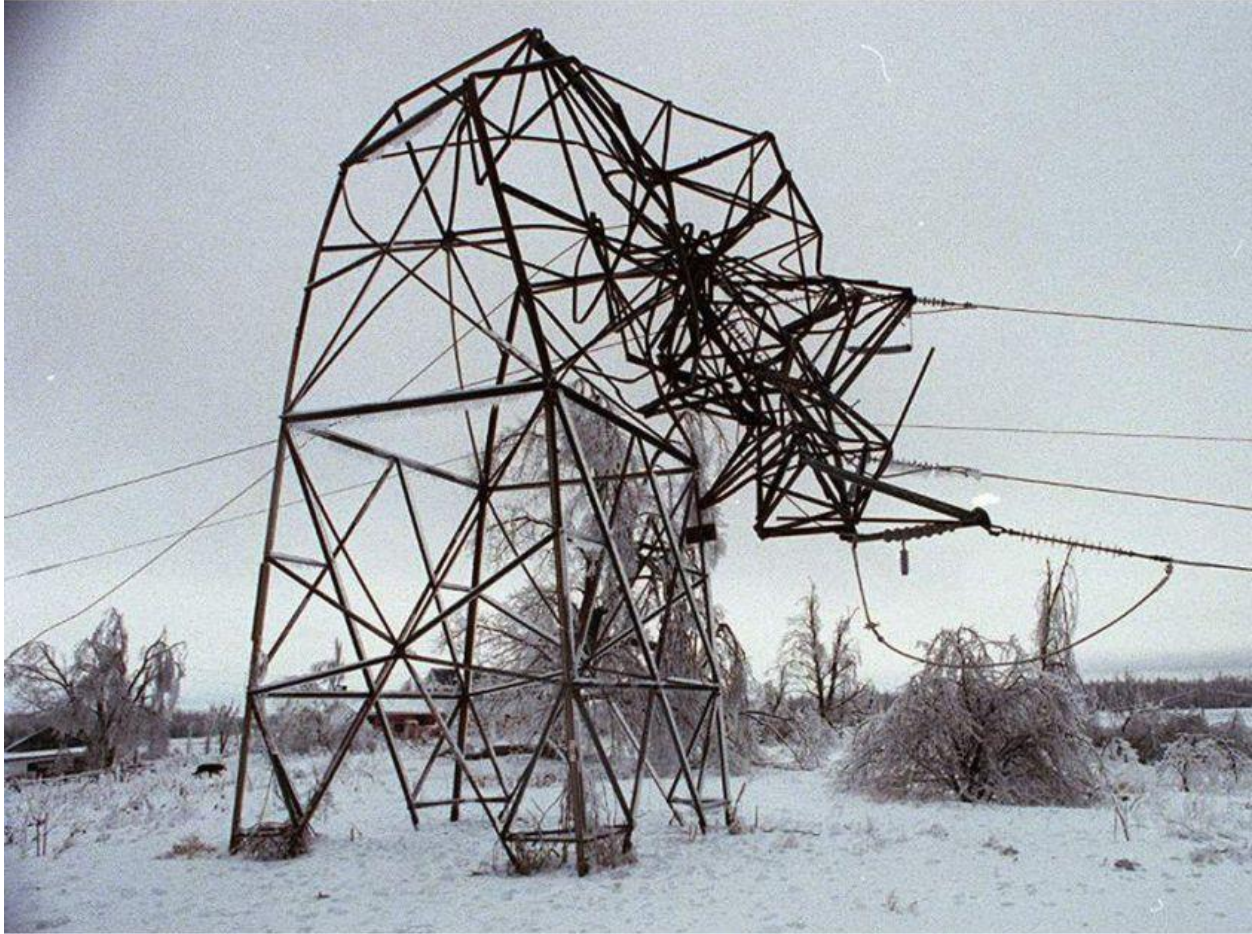
Rapid Damage Reporting – Color Coded System

Green	Yellow	Red	Black
Fully Operational	50%-80% Operational	Not Operational Repair Needed	Destroyed Major Damage

Information is likely shared back to a parent organization which will consolidate information for a series of individual inspections for disasters that are regional in nature, such as an earthquake, wildfire or major flooding. It is possible that there is a single event at one specific location that is impacting critical infrastructure. The same process of reporting will be followed.

3.3 Sharing of Raw Data of Damages

It is not unusual for persons receiving reports about damages to have trouble comprehending the extent of the disaster and the damages that have occurred. Besides the use of the color coded system described above it may be advisable to provide additional information when possible on infrastructure damages by transmitting photographs or video, that clearly depict and clarify the extent of the damages. For instance, this photo immediately explains the extent of damages to a tower carrying electrical power lines. Note, every instance of infrastructure damage does not need to have photographic or other information shared.



3.4 Communicating Damage Information to the State EOC

The transmission of infrastructure damage information should be made by any available means of communications that remains operational following a disaster. Typically, in a field environment this may include cellular phones followed by radio transmissions. In some cases it will require gathering data on the damages at an incident site and then inspectors relocating to a position where telecommunications systems remain operational. It is possible that early in a disaster information will have to be transmitted by messenger if all telecommunications systems are inoperable.

Damage information is collected shared in the EOC by the _____ Section. [Typically this would be the Plans Section, but a state could have a different operational procedure—need to confirm which section in the EOC gets the damage information]

See Appendix 1 for a list of the state EOC means of communications, to include the main EOC phone number, Duty Officer number, radio frequencies, call signs, and amateur radio means. [Need to get this from each state Operations Section]

3.5 Sharing Infrastructure Damage Information—Establishing the Common Operating Picture

Within the State EOC infrastructure damage information is gathered and displayed appropriately. This may include the use of status boards and maps, both physical and digital.

Infrastructure damages that are shared will improve situational awareness that will be incorporated into the establishing the common operating picture. This information is shared with appropriate individuals and organizations with a right to know. In most cases this will include senior appointed and elected officials responsible for the disaster response.

Information on infrastructure damages will be incorporated into regular EOC Situation Reports that are shared with other state agencies, local EOCs, IMTs and other critical infrastructure owners and operators who have dependencies or interdependencies caused by the infrastructure damages.

4. Use of Specialized Equipment for Infrastructure Inspections

4.1 General

We are now in an era that is beginning to use specialized tools to perform damage assessments. Traditional methods included using binoculars, human inspection (climbing a tower), and things like specialize bridge inspection equipment, e.g. bucket trucks.

Today many other tools are coming to the fore that provide for remote sensing, specialized sensors, e.g. drones, LIDAR, and even Artificial Intelligence (AI).

4.2 Use of drones for inspections

A rapid expansion of the use of drones is happening across a wide range of governments, businesses and industry. They have become useful tools for the infrastructure inspections of towers, bridges, and railroad tracks, to name only a few uses.

One of the key benefits for using drones is the speed with which infrastructure can be inspected rapidly following a disaster. They can carry a variety of sensors that go beyond the traditional camera and geo-location. These sensors can assist in providing more specific information on the status of an infrastructure. We can expect a rapid expansion of systems and sensors as the technology evolves.

It is important that any organization planning to use drones for the inspection of infrastructure obtain the necessary permissions and comply with all federal regulations concerning the use of drones.

Appendix 1 Communications

Appendix B: Agenda

Oregon Unmanned Aircraft Systems (UAS) & Situational Awareness Workshop

September 4, 2019 | 8:00AM – 2:00PM

Dept. of Public Safety Standards & Training | Salem, Oregon

8:00am **Registration and Networking**

9:00 **Welcome, Introductions, and Objectives and Goals of Today's Workshop**

- **Eric Holdeman**, Director, Center for Regional Disaster Resilience

9:30am **Overview of State of the Industry**

- **Jeff Ratcliffe**, President, AVUSI Cascade Chapter, & CTO, NW UAV

9:50 **Public Sector UAS Operational Concepts & Uses**

- **Betty Stansbury**, Director, Oregon Department of Aviation
- **Bill Martin**, Program Analyst Team Lead, Oregon Office of Emergency Management

10:30 **BREAK**

10:45 **Inside the Beyond Visual Line of Sight Efforts of the IPP program**

How design, production and operations certification play a role in establishing public trust in unmanned aviation systems – the real progress we are seeing and how it relates to local state and government efforts to incorporate Drones into disaster response.

- **Charlton Evans**, CEO, End State Solutions LLC
- **Kevin Hull**, Principal, End State Solutions LLC

11:30 **What are Initiatives and Resources Happening in the State?**

Hear about efforts within the state that are happening locally, and resources that are available

- **Jeff Pricher**, Division Chief, Scappoose Rural Fire Protection District
- **Kevin Tucker**, President, Near Space Corporation

12:00pm **LUNCH**

12:30 **Private Sector and Infrastructure Concepts and Uses**

- **Sam Adams**, CEO, Eagle-Eye Aerial Solutions
- **Rick Brown**, Special Agent, Union Pacific

1:15 **Facilitated Discussion on Users Group, Access to Disaster Zone Concept of Operations (CONOPs) in the State, and Information Sharing and Situational Awareness**

- **Eric Holdeman**, Director, PNWER's Center for Regional Disaster Resilience

Next Steps

1:45 Adjourn

Appendix C: Feedback Form

UAS & Situational Awareness Workshop

ATTENDEE FEEDBACK FORM

September 4, 2019

Overall impression and general comments on the workshop- **Please rate each component on a scale of 1-5 (5 being excellent /valuable; 1 being not valuable)**

Workshop	Excellent	Very Good	Satisfactory	Fair	Poor	N/A
Overall Impression of Workshop	5	4	3	2	1	N/A
Quality of Workshop Speakers	5	4	3	2	1	N/A
Workshop Format	5	4	3	2	1	N/A
Quality of Discussion	5	4	3	2	1	N/A

1. What industry or type of organization do you represent? (e.g., Emergency Services; Law Enforcement; Energy; Local, County, State, Federal Government; Utility; Private Sector and type of business, etc.)

2. What was the most useful aspect of the workshop? (Presentations, Table Discussions, Networking, or Other)

3. What was the most valuable “take away” or insight you gained from today’s activities?

4. Based on the presentations and discussion today, list any areas that were identified that you think could be improved at your organization, the state, or the region:

5. What priority issues should the state and local government or the private sector focus on to improve our ability to utilize UAS?

6. What organizations and sectors, not here today, should be part of future meetings and workshops? (Please include contact names and information if available.)

7. What topics or speakers should we consider for another potential workshop in the future?

8. Are you interested in being part of a UAS Users' Group that focuses on information sharing?
YES / NO

CRDR is collecting information for a UAS Users' Group Survey.

Take the survey at <http://bit.ly/ORDroneSurvey>

Optional/Required if interested in the Users Group:

Name: _____

Title: _____

Organization: _____

Email: _____

Thank you for your feedback. Please return this form to organizers as you leave.