Montana Unmanned Aircraft Systems (UAS) Situational Awareness Symposium Summary Report

Wednesday, August 28, 2019 | 9:00 am – 1:00 pm
Helena, MT

Table of Contents

Overview

50 public and private stakeholders from Montana with interest in unmanned aircraft systems (UAS) met for a half day workshop on UAS situational awareness in Helena, MT. Participants represented several stakeholder sectors from Montana's public and private sectors. Speakers included drone manufacturers, experts and pilots from private companies, academia and the State of Montana Government. The purpose of the workshop was to educate stakeholders on current UAS policy, understand the use of UAS in Montana and discuss utilizing UAS for improved situational awareness. The workshop was funded by a grant from the Department of Homeland Security's National Infrastructure Protection Plan Challenge Grant program.

Key Takeaways and Recommendations

- There is a knowledge gap between the Montana state legislature and UAS pilots about pre-existing FAA regulations that control UAS activities
- Outreach and education efforts could help legislators better understand the positive benefits of UAS
- Higher education institutions in Montana are working to train new UAS pilots and develop new UAS technologies
- Legislation is needed to enable further use of UAS technology in evidence collection for active cases
- Search and rescue missions would benefit from using UAS on a wider scale
- UAS technology has been successfully used throughout the state to fight wildfires
- Establishing relationships with local media outlets early is essential for UAS pilots and companies if they want to maintain a professional reputation
- Montana Highway Patrol is already using UAS for crash investigations and is well versed in the uses and implications of this technology
- The Workshop provide a good opportunity for networking and information sharing
- There is an opportunity for proactive legislation that would help the UAS industry and bring together legislators and UAS stakeholders

Event Summary

Welcome, Administrative Announcements, and Introductions

Eric Holdeman, Director of the Pacific NorthWest Economic Region's (PNWER) Center for Regional Disaster Resilience (CRDR), opened with a brief overview of the workshop agenda and facilitated introductions. Holdeman provided background information on PNWER's CRDR and the grant it received from the Department of Homeland Security's National Infrastructure Protection Plan Challenge Grant program, which funded the Montana UAS workshop.

Objectives and Goals of the Workshop

Michael Radke, Eastern District Supervisor of Montana State's Disaster and Emergency Services (DES) addresses the workshop.

Michael Radke, Eastern District Supervisor of Montana State's Disaster and Emergency Services (DES), gave insight into the ways his department uses information and data from drones to coordinate resources and prepare communities for disasters. Radke explained that emergencies start and end locally, and that the job of the DES is to coordinate and connect people in local communities to resources. The Montana DES does not own or fly drones, but the department sees both drones and the data taken from drones as an important resource that can be used during emergency situations. Radke highlighted ways that drones were already being used in Montana, including when UASs took footage after a landslide in Stillwater County to help reopen a crucial road, and their multiple uses in wildfire situations. Building off of these positive examples of drone usage, Radke framed the workshop with a series of questions he was hoping the workshop could help answer, including what the rules and regulations for drone usage were, what issues operators were facing, what appropriate uses for this tool exist, and how the DES can responsibly handle the data collected by drones.

Public Sector UAS Operational Concepts and Uses

Several drone pilots in and around Montana work closely with law enforcement and serve the public sector to collect evidence and provide data. This discussion highlighted several of the legal and legislative issues that UAS operators encounter in their work, especially within the state of Montana. The group discussed the lack of information and legal precedent state legislators have regarding the preexisting structure of national rules and regulations surrounding UAS. The state legislature has attempted to pass legislation that regulates UAS within the state, however the regulating authority falls under the purview of the FAA.

Kevin Danz, owner and pilot with IFlyBigSky, spoke of the benefits and challenges of working with private sector entities as a UAS pilot. Danz has worked extensively with his local sheriff's department to provide a variety of services. Following a recent flooding event, Danz took his drone past where cars could safely go to capture footage of a bridge, which will be used to help prevent flooding next year. Earlier in 2019, Danz worked with the sheriff's office in Helena to investigate a homicide, using his UAS to locate a dead body and submitting the drone footage as evidence – one of the first times this has happened in Montana. Danz then used this example to highlight a current issue with the existing system; while searching for the body, Danz captured footage of a car accident involving a drunk driver. However, because Montana

courts currently do not accept video footage as evidence without a warrant, the footage was inadmissible in this case.

Participants had a brief discussion on ways to establish good working relationships with the media. Eric Holdeman emphasized the importance of creating contacts with the media before a disaster or event occurs so that the media members will know who to call for quotes and information. Danz concurred and discussed his relationship with local media outlets, including how they featured some footage he took of professional ice skaters on a nearby lake.

Steve White, owner of Altilux, then provided background information and history of the FAA and key UAS legislation in Montana. As an airplane pilot, UAS pilot, and former county commissioner focusing on UAS issues, White gave key insights into current legislative issues surrounding drones. His primary frustration as a UAS pilot were issues with the state legislature, who continue to try and pass bills without listening to input from UAS stakeholders.

Steve White, owner of Altilux, provided information on drone legislation and regulations

For example, Senate Bill 170 from 2017 required an easement to fly over private property and did not allow UAS pilots to fly below 400 feet, contradicting FAA regulations which state that UAS cannot fly above 400 feet. A 2019 bill, House Bill 655, aimed to protect critical infrastructure from drone surveillance, but again this duty falls under the purview of the FAA. In this way, White highlighted the ways that this attempted legislation would create redundancies for issues addressed by FAA regulations. For Montana, the perception that UAS will infringe on the property rights of Montana's citizens is part of why this legislation continues to appear.

Question: What is the best way to talk to a legislator about drones?

- Montana has a very open legislative reporting system that is easily accessible on the internet. Drafts of bills are available online, where people can provide commentary on them. White suggested three main steps
- 1. See if there is a UAS related bill by searching this online resource for key works
- 2. Understand the legislation clearly
- 3. Contact your legislator and possibly the sponsor. White advised that if the sponsor is not from a voter's district, they may be more willing to talk with a local constituent or your legislator.

Edward Meier commented that the FAA controls airspace with Congressional approval; a principle that has been upheld by the Supreme Court. This turned into an extensive discussion about the complications of working with state legislators on drone laws because of the perceived intersection this issue has with property rights. Also at play are the tensions between state versus federal power. The group concluded that more needs to be done to educate legislators on the uses of UAS and pre-existing legislation already imposed by the FAA to control the airspace. They mentioned that there is an opportunity for proactive legislation that

would address concerns and help the UAS industry. This process could bring together legislators and UAS stakeholders in a collaborative effort to address bad actors that may use UAS for criminal activities.

Private Sector UAS Operational Concepts and Uses

The Private Sector session discussed what tasks UAS can be used for, and what Montana UAS operating companies are doing now. Speakers focused on the positive impact of UAS usage, especially their effectiveness in helping professional and volunteer firefighting crews combat wildfires. This session had input from four Montana-based companies that manufacture or operate UAS and was moderated by Edward Meier, representing the Association for Unmanned Vehicle Systems International (AUVSI) Big Sky chapter.

Meier kicked off the session with a discussion about the integration of new technologies into our daily lives, and the cross-over between technologies used in UAS with other innovations, including self-driving cars. He introduced the panelists and had them speak about their experience in the drone world.

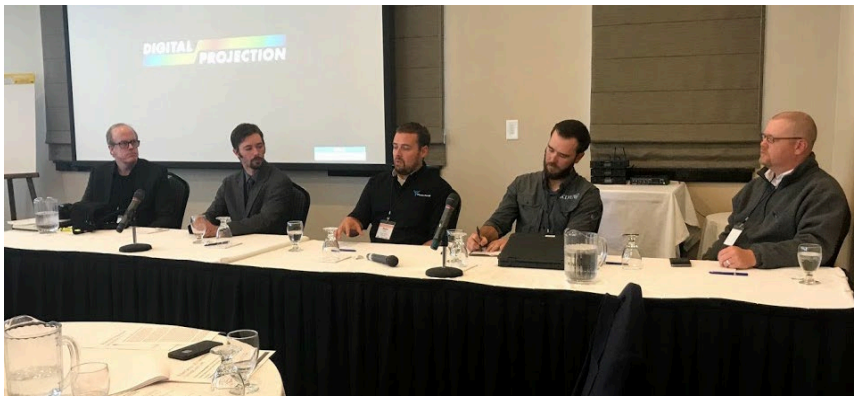
Christian Bryce, UAS design engineer and pilot with Skyfish, highlighted the ways that drones have become more commonplace and mainstream in daily life, helping to remove the stigma against drones. Bryce briefly discussed the different types of drones his company builds and their various capabilities. He followed this up with a personal anecdote about using drones to fight wildfires. Bryce pointed out that many firefighting and first responder crews are hesitant to adopt new technology, but that demonstrating the usefulness of drones in these situations can help convince fire chiefs and others that this technology can be crucial to effectively fighting fires. One instance of this occurred when Bryce was assisting a crew as a volunteer fire fighter, when he used his drone to take thermal imaging of the fire, which helped the team anticipate where it was going next and prevented further destruction.

Shane Beams, CEO and Founder of Vision Aerial, built on this theme by discussing the value proposition of what drones have to offer. Beams reminded the audience that U.S. infrastructure has continually received very poor ratings from the American Society of Civil Engineers, making the case that drones can help address this issue. Drones can be much more cost effective in performing routine infrastructure inspections, which both saves money and allows the trucks and other equipment to focus on fixing pre-existing problems.

Circling back to the role of drones in fighting wildfires, Weston Irr, Director of Unmanned Systems at Bridger Aerospace, discussed how his company has used UAS to fight wildfires across several states. Coming from the U.S. military, Irr has used his background as an unmanned pilot to help Bridger Aerospace put together their UAS program to fight fires, including the 2018 Martin Fire in Nevada. Irr recalled that earlier this year, his team was able to completely map out a large fire in two hours using UAS – a process that would usually take much longer. The team then had a live feed of the fire which they allowed firefighters to watch. This one of the first times that a vendor has provided these kinds of services for a forest fire situation, but Irr stressed that this is the direction that disaster management is heading towards.

J.D. Petersen from Big Sky UAV then provided some insight into his company and his work as a lobbyist and public relations expert for drones in Montana. In Petersen's district, drone operators are often called as a last resort, so his company primarily helps police with mapping areas to locate bodies of missing persons. Petersen talked about how this led into his role as a lobbyist trying to establish proactive legislation for UAS usage. Among other things, Petersen is pushing to allow videos to be submitted as evidence, and for warrants from judges that will allow UAS operators to submit drone footage in case they uncover evidence during their activities.

Meier concluded the panel by highlighting how the usefulness of UAS platforms is increasingly recognized by the general public. California is already using drones to fight fires, and in Tijuana, drones are being used to help police officers monitor areas to see if a situation is truly an emergency that requires an officer response. Meier focused on the positive aspects of drones, including how they can be used to gauge the health of a forest, contribute to pre fire and post fire land management, and ultimately help prevent fires from occurring.



Question: Petersen asked if anyone could speak about a recent mine project the Department of Environmental Quality (DEQ) conducted using UAS technology.

- An audience member responded that the Montana Tells pit lake project used drones to take samples from 1000 feet below the surface. A pilot from Golder and Associates came to Montana from Denver with a proprietary device to collect water. They did one pass with a conductivity and depth probe to get a conductivity profile of the lake to see if it was homogenous or mixed. The team then sampled water from the surface from depths of 100 feet and 200 feet, returning two liters of water for each of those decks.

Question: When you're flying in those fires, are you competing for airspace with manned aircraft? Or are you doing at times they're not up there?

- Irr responded that his team participates with manned air traffic. Generally, there is a temporary flight restriction (TFR) in the airspace above a fire, but Irr's company has a government interest waiver that allows their UAS to be added into the TFR. This means that the UAS operators coordinate their activities as if they were another aircraft, with the exception that they have a launch recovery zone so the UAV can climb up to altitude. During launch and recovery, the pilot makes a call to notify active aircraft as the UAV climbs to altitude of approximately 5000 feet, which is above where other aircraft are flying. Irr said his systems can fly as far as electronic line of sight, approximately 50 miles at this time, but the longest they've ever gone is 24 miles.
- A panelist also pointed out that BNSF railways uses small aircraft to do rail line inspections.

Comment: A representative from Montana Senator Steve Daines' office thanked the panelists for their insight and the information they provided about drones. Meier followed this up by bringing attention to Senator Daines and Senator Diane Feinstein's new bipartisan bill on reducing calamity from wildfires.

Highlights from the Montana Highway Patrol of UAS/Drone Usage

Sergeant Jay Nelson and State Trooper Scott Waddell provided context and commentary on the use of drones within the Montana Highway Patrol. Montana state Highway Patrol has experience both using drones as a tool for crash investigations and combatting bad-actor drones in various scenarios. Currently Montana Highway Patrol owns nine drones in Montana, one for each highway patrol district, except for Glendive district, which has two. These capacities allow the highway patrol to supplement other agencies across the state.

Trooper Waddell gave an overview on how the highway patrol uses drones for crash investigations, and the current legal challenges that the agency faces when flying their drones. Certified highway patrol pilots use UAS to take images post-crash which are sent back to the office for analysis, allowing the road to be opened much faster. Currently highway patrol officers needed to get a warrant from a judge every time they want to use their drones to take footage of a crash site. This will change on October 1, 2019 with legislation that allows troopers to take crash footage with UAS without a warrant. However, troopers will still need to obtain a warrant every time they want to fly over a crime scene.

Sergeant Nelson then discussed how the special operations division of the Montana highway patrol has used drones during Emergency Management Assistance Compact (EMAC) requests. In 2016, Montana highway patrol responded to an EMAC request from Ohio's governor to provide extra security at the Republican National Convention in Cleveland. At this event, Customs and Border Patrol were flying drones to get better visibility on the situation, but other actors at the event also had UAS. Nelson used this example to demonstrate that though TFRs and serial number registries are good for tracking down problematic drones, the follow up may be weeks or months after the event simply because it is oftentimes too difficult to track down the operator in a large crowd.

Montana highway patrol also responded to an EMAC request during the 2017 Dakota Access Pipeline protests, where drones played a major role as a tool for the highway patrol and as a danger to troopers. During the event, protesters used UAVS to 'buzz' officers, and one crashed into an officer's vehicle, effectively weaponizing the UAS against officers. In the future, law enforcement will have to worry about the 'threat from above' as the payload of UAVs increase, increasing their destructive potential by enabling bad actors to drop materials and hazardous objects onto people below. However, to highlight the positive uses of UAS, Nelson provided a case example where protesters were seen putting down a florescent type wire in conjunction with online chatter about blowing up a bridge. Law enforcement used a drone to assess the situation, and while the wires were there under the bridge, they weren't hooked up to any explosive device. Under these circumstances, UAS allowed officers to safely access the bridge and ensure everyone's safety.

Nelson concluded by discussing the implications of the Keystone XL Pipeline coming through Montana, close to Fort Peck Dam, and the ways that UAS could make patrolling the area

easier. This route will put large swaths of critical infrastructure at risk and require near constant monitoring. The Montana highway patrol is well versed in UAS technology and utilizing their resources effectively to get the most out of their fleet. Nelson also pointed out that in Lewis and Clark County, search and rescue are quick to call drone operators if someone has gone missing.

Question: How is Montana highway patrol responding to rogue drone operators when the FAA isn't responding to calls about rogue drones?

- Nelson: Currently highway patrol only takes out drones when they fall under the same rules as 'use of force,' so they are only taken out if they are a threat to the public or the officers. There needs to be an 'act' that could result in injury before officers can respond.

Question: How can professional drone operators work with Montana state highway patrol to get good legislation in place that will still allow them to operate while keeping the public safe?

- Nelson: When working with the legislature, the best thing to do is to educate them, not just in the halls of the capitol, but at ground zero. Take them out and show them what the equipment can do. The biggest issue is lack of communication, so connecting with the legislators and showing them what's going on is very important.

Question: What has been the most effective means of removing drones, other than your 40 mike-mike?

- Nelson: The 40 mike-mike, or 40 millimeter, is a hard, dense sponge that is extremely accurate, and it is the best way to take out a drone. Getting hit with a drone would be deadly, so there is a change in law enforcement as officers are increasingly aware of threats from above.

Comment: Weston Irr pointed out that in his company's work with the Department of Defense, they have found that some of the best ways to counter UAS is electronic warfare. Specifically, they use a truck that puts a 'bubble' around the event in question which makes it difficult for UAV to fly. The bubble currently can track UAS within 5km and defeat them within 1km, and can be daisy-chained to provide better coverage.

- Nelson responded by reiterating that the highway patrol's primary objective is to protect people's first amendment rights in situations like those surrounding the XL pipeline, but expressed interest in the technology.
- Participants suggested that the highway patrol work with the FAA and use geofencing to establish a no-fly zone above critical infrastructure, like the XL pipeline.

Question: Is the highway patrol able to use the emergency labor process under part 107 to get expedited labor to fly outside line-of-sight in search and rescue missions? Doesn't the line-of-sight restriction limit your capabilities?

- Waddell: We have not been able to do that.
- Nelson: This issue is something that the highway patrol have run into, including a recent event when the highway patrol was assisting the Helena Police Department with a fatality incident. Because of proximity to the airport, they were not able to fly their drones.

Overview and Future Possibilities of Drone/UAS Programs at Montana Higher Education Institutions

Several Montana higher education institutions have programs that focus on both the development of UAS technology and training of UAS pilots to prepare them for the workforce. Higher education institutions are an important place for testing and developing new sensors, pioneering new uses for drones, and educating the public sector on ways to most effectively utilize this technology.

Jennifer Fowler, Director, Autonomous Aerial Systems Office from the University of Montana spoke about its UAS program

Jennifer Fowler began the session by providing an overview of the University of Montana's involvement with drones. Fowler serves as the director for the Autonomous Aerial System's Office at the University of Montana. The program began with funding from NASA to conduct research on weather balloons in the early 2000s, and in 2007 their team began coordinating with the Forest Service to work on forest fires using tethered balloons and UAVs. Around 2013, the program wanted to train pilots to fly drones, but ran into issues with permitting and certificates of authorization. Prior to the establishment of Part 107, there were lots of complications around the permitting process to fly drones, which made it difficult for the University to train students and future drone pilots. This led to the University of Montana's establishment of the Autonomous Aerial Systems Office, which expanded from training into drone-based research and data processing of the information taken from drones, and became a regional source of licensed UAS pilots.

The Office has since coordinated efforts to investigate different types of UAS sensors and their applications in both the public and private markets. Among these efforts are programs with the University of Montana's Fire Center to evaluate pre- and post-burn landscapes, smoke effects, and the impact of wildfires on communities. The Office is also using grant funding to look into the potential benefits of using UAS instead of weather balloons to give better weather profiles with real-time data feedback. Fowler noted that UAS contractors often run into issues when working with the public sector because the deliverables are unclear and the public sector actors don't always fully understand the capabilities of drones. To address this gap, the AASO has done lots of demos in conjunction with the forest service to help the public sector better understand what information each of the various sensors can provide so they can make better choices on the types and styles of UAS / UAS sensors they use in a given situation.

Fowler noted that as part of the space grant consortium, the AASO now has a formalized program and is putting together funding propositions for the next four years with NASA. This will allow students to intern with various UAS companies, and Fowler encouraged the vendors and operators in the room to contact her if they wanted or needed an intern for a summer. The program is very interested in working with and connecting to the private sector.

Question: What kinds of data will the UAS weather sensors provide?

- Fowler: UAS weather sensors provide temperature, relative humidity, pressure, and wind from GPS.

Question: Is your office experimenting with workable payloads, arms, or anything like that?
Fowler: We have been working with Montana Tech, the engineering school, and the results have been good so far.

Question: When you were doing the smoke study, how did you measure the density of smoke in the air?
Fowler: We are investigating various sensors with an emphasis on flight configurations and then giving the data to the right people to process it.

Jeremy Crowley, who works with both the Montana Bureau of Mines and Geology and as a professor at Montana Tech, provided further insight into the role of UAS in higher education. Through his work at the Bureau of Mines and Geology, Crowley currently uses drones to study ground water-surface water interaction using photogrammetry and to investigate geothermal discharge using photogrammetry and thermal mapping north of Yellowstone. They are also experimenting with different ways drones can be used to investigate changes in vegetation and groundwater elevation after the installation of beaver mimicry structures for stream restoration

Montana Tech's interest in UAS is heavily based on the development of new sensors and new ways of using drones to take measurements, and this has prompted lots of cross-discipline cooperation between departments. Crowley noted that while Montana Tech is a small school, its emphasis on applied electrical engineering and UAS has allowed the geophysics, electrical, environmental, mining, and geological engineering departments to coordinate and specialize in the development of new sensors for drones. Currently Crowley and his team are working on a custom LIDAR sensor with an onboard computer, developing algorithms for obstacle avoidance and terrain-guided flight. This sensor relies on Simultaneous Localization and Mapping (SLAM) technology which allows real-time feedback over the flight controller to avoid obstacles.

Several grants have focused on mine safety, funding work at the Golden Sunlight mine outside of Whitehall, MT. Drones were brought in to map different areas of the mine and to establish likely areas of rockfalls in inaccessible parts of the mine. The team discovered that LIDAR was good for rockfall detection, but photogrammetry is better for understanding the mineral structure of the area, so a combination of the two have large implications for mineral mapping. Another application being investigated in the geophysics department involves detection of unexploded ordnance. This department is developing magnetometers and electromagnetic induction sensors to do this work. They are getting pretty good results with small, lightweight magnetometers and electromagnetic induction sensors.

Another area of UAS innovation in Montana's higher education institutions is a drone research test area. Crowley and his team currently have a memorandum of understanding with the local county, and have secured a 500-acre area for drone testing. The testing area was intended to promote public-private partnerships and cooperation between different sectors and agencies.

Crowley concluded by emphasizing that UAS technology development is a good economic opportunity for Montana.

Kreh Germaine, Chief Information Officer of the Montana Department of Natural Resources and Conservation (DNRC), was in the audience and provided some commentary from the state government's perspective about the role and regulation of UAS. While the DNRC recognizes that UAS technology has lots of positive implications for the natural resources community, Germaine highlighted the ways that current policies and legislation in Montana are not adequate to address the various challenges UAS present.

Germaine argued that government agencies need to establish good and clear policies for UAS usage which will address some of the complications that arise from working with drones and flying them over private property. He believes that the state should establish both operational policies which outline how, when, and where the state will use this technology, and data privacy policy so that there are safeguards in place to handle the data collected by government UAS. Montana is a sunshine state, so lots of information is easily accessible, which means that government agencies must balance that against the interest of protecting citizens' privacy. This means that the data collected needs to be handled responsibly with a reviewing process to scrub personal information if necessary.

To address this issue, Germain advised the Information Technology Managers Council to put together a working group of state agencies with UAS programs to develop a framework of standards to preempt potentially troublesome legislation. Germaine currently chairs this working group, and they have begun designing a framework for state agencies and local governments to help them understand how to create a UAS program and how they can operate within the state. The group is very concerned about the citizens' perspective and how they can convince them that utilizing these technologies helps the state serve citizens better.

Simultaneously, the legislator auditor's office opened up an audit on UAS use in state government agencies. As part of the audit they held a council meeting and released a report, all of which is available online and "Appendix A" lists the link. The audit found that the state needs to be more organized and proactive about policies regarding UAS programs. Governor Steve Bullock agreed, and issued executive order no. 11-19 which called for the establishment of a UAS council with three slots available for private sector or local government representatives. This will likely be only a year-long council that will start the process of establishing and regulating some type of organization. Currently it's attached to the Department of Transportation for funding purposes, which is what other states have been doing. If any of the workshop participants were interested in serving on this council, Germaine urged them to contact him for follow up.

Comment: In the past, legislators have not wanted to get involved in drone legislation, especially close to an election

- Germaine replied that legislation needs to happen, and trying to be proactive about it was a better move. He said they should utilize the council to direct concerned citizens and private industry businesses etc. to stay away from the negative aspects of drones and focus on the benefits that they can provide. Germaine has worked with Fowler and Crowley on some of these frameworks, which will be presented to the council as a draft to

build off of, and will continue to work with it as is seen fit. Part of the goal is to set up public website with all recommendations from the state of Montana about what to do once you have your part 107 license, what kinds of things need to be in place to have a good program that will keep the user out of trouble.

Crowley concluded by informing participants that he has an email list serve of UAS users in Montana, and that he would be interested in participating in a UAS users' group.

Potential Users Group and Concept of Operations (CONOPS) in the State: Facilitated Discussion

Eric Holdeman then began a discussion of a potential UAS users' group for the state of Montana, presenting the CONOPS seen in "Appendix B" Participants then began discussing different uses for UAS in the state, and places where the technology could be beneficial. One participant commented that the Montana Department of Transportation has been using Phantom 4 and Inspire 2 Quadcopters to do mapping and surveying. Other state-wide uses for drones include structural inspections and avalanche mitigation and assessment.

Holdeman interjected that the participants should highlight and bring up these positive stories of UAS successes publicly. He recommended a strategy used by a county south of Seattle which had UAS media day where they demonstrated the benefits and real dollar efficiencies of UAS usage.

Pepper Petersen drew attention to the fact that most of the discussion had been focused on using drones post-disaster, when in fact they can be equally useful for pre-disaster preparedness. This could include surveying bridges and buildings to understand pre-existing weaknesses in the structures before a disaster strikes. Jeremy Crowley informed the group that the DNRC is currently working with $10 million of FEMA grants to get high resolution LIDAR scans of the state. These scans contain some of the information that Petersen wanted to track.

Steve Myers then presented a positive case example from a private critical infrastructure company where UAS operators informed the community ahead of time when and where they would be flying their drones. After doing this, there were no calls from the community complaining about the drones, which highlighted the positive impact of keeping the community well-informed on UAS activities preemptively.

Next Steps and Timeline

Montana would be interested in a users group, which could be headed by Jeremy Crowley, Pepper Petersen, or another participant from the workshop. State will identify members of a council that will look at UAS regulations and policies for the State. The PNWER Annual Summit will be held on July 2020 and might be a venue to discuss the progress being made on UAS policies in the State.

Appendix A: Resources

Weblinks:

- https://www.dhs.gov/cisa/uas-critical-infrastructure
- https://www.regionalresilience.org/drone-news--resources
- https://leg.mt.gov/content/Committees/Administration/audit/2019-20/Meetings/June-2019/17DP-05.pdf
- http://www.umt.edu/aaso/

Videos:

- https://vimeo.com/296920234 - CRDR Webinar on establishing a drone program
- https://vimeo.com/328330356 - Edward Meier
- https://vimeo.com/341291247 - Kevin Danz
- https://www.youtube.com/watch?v=Y42jfniK-n8&feature=youtu.be – Steve White

Appendix B: Draft CONOPS

DRAFT Template
Critical Infrastructure Disaster Access and Damage Reporting
State of [insert state]
Concept of Operations (CONOPS)

I 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 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.

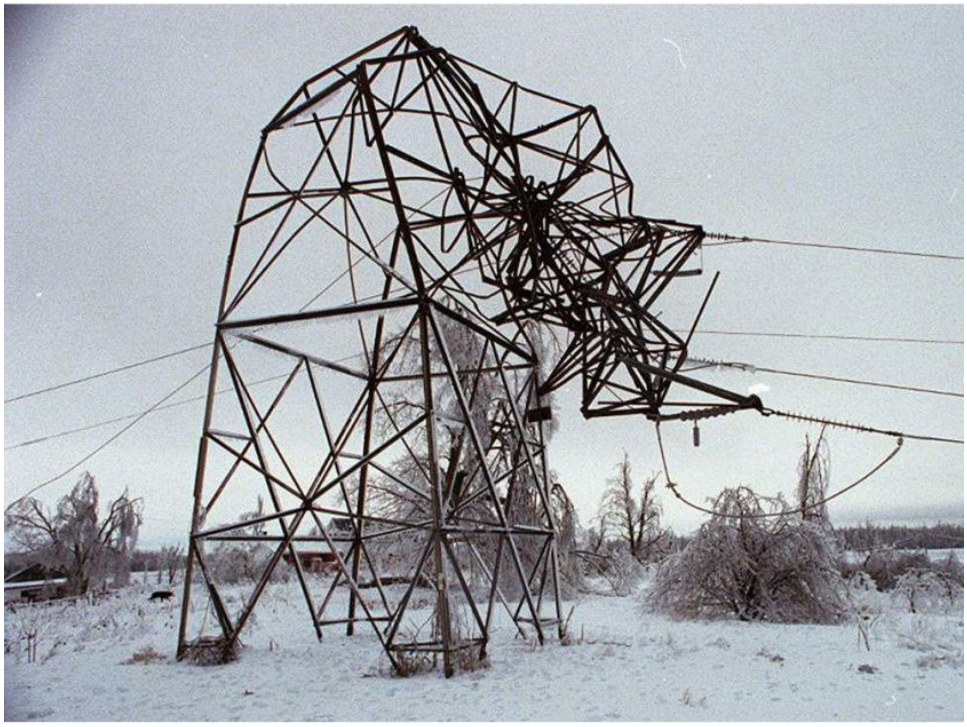
Rapid Damage Reporting – Color Coded System

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 C: Agenda

Montana Unmanned Aircraft Systems (UAS)
Situational Awareness workshop
Helena, Montana
August 28, 2019

8:00 am Registration, and Networking

9:00 am Welcome, Administrative Announcements, and Introductions
- **Eric Holdeman**, Director, PNWER's Center for Regional Disaster Resilience
- **Steve Myers**, Senior Program Manager, PNWER's Center for Regional Disaster Resilience

9:15 am The Objectives and Goals of Today's Workshop
- **Michael Radke**, Eastern District Supervisor, Montana State Disaster and Emergency Services

9:25 am Public Sector UAS Operational Concepts and Uses
Moderator **Steve Myers**
Panelists:
- **Kevin Danz**, Owner/Pilot, IFlyBigSky
- **Steve White**, Owner, Altilux

10:15 am Private Sector UAS Operational Concepts and Uses
Moderator **Edward Meier**, Association for Unmanned Vehicle Systems International (AUVSI)
Panelists:
- **Shane Beams**, Founder and CEO, Vision Aerial
- **Weston Irr**, Director of Unmanned Systems, Bridger Aerospace
- **JD "Pepper" Petersen, Jr**, Partner, Big Sky UAV
- **Christian Bryce**, UAS design engineer and pilot, Skyfish

11:10 am Highlights from the Montana Highway Patrol of UAS/Drone Usage
- **Sergeant Jay Nelson**, Special Operation Commander, Montana Highway Patrol

11:25 am Overview and Future Possibilities of Drone/UAS Programs at Montana higher education institutions.
- **Jeremy Crowley**, Associate Professor, Montana Tech and Hydrogeologist, UAS Pilot, Montana Bureau of Mines and Geology
- **Jennifer Fowler**, Director, Autonomous Aerial Systems Office, University of Montana

12:00 pm Break and pick up boxed lunches

12:15 pm Potential users group and Concept of Operations (CONOPs) in the State: Facilitated Discussion: **Eric Holdeman,** Director, PNWER's Center for Regional Disaster Resilience

12:55 pm Next Steps

1:00 pm Adjourn