THE MONTANA UNMANNED AIRCRAFT SYSTEMS PLAN

Note: this Plan was submitted by the Montana UAS Council to the Governor's Office on February 4, 2022. Minor technical edits were made by the Governor's Office on September 28, 2022 in preparation for the submission of the Plan to the Legislative Audit Committee at its October 4-5, 2022 meeting. After discussing the Plan with the Legislative Audit Committee and receiving its input, the Governor will finalize and implement the Plan.

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Preface – Letter from the Council

Unmanned Aircraft Systems have emerged to be a technological "game changing" tool that is having a significant impact in providing solutions for both new and existing challenges. Due to their advantages of efficiency, accessibility, mobility, durability, and safety, UASs are ideal for many remote sensing needs, providing informed decision making, reduced risk, increased fiscal responsibility, and more productive outcomes. Use of a UAS often will reduce health and safety risks and frequently proves to be a cost-effective, safer alternative to more traditional means of obtaining necessary information. With an array of possible sensors emerging to incorporate into the system, the uses of a UAS are continually expanding, and along with that, the opportunities to leverage their advantages for better operations.

Government organizations are no different in their opportunity to leverage UAS to improve citizen services. From the research this Council has conducted, it would be irresponsible for the State of Montana not to incorporate their use into current organizational programs. However, as is with many technological advancements, with the opportunity to do work better comes the opportunity to abuse the technology and apply it in ways detrimental to an organization and the citizens we serve. Hence why the Council has set forth the incorporated guidelines and recommendations for Montana, so that we have policy, governance, and transparency to assure the public that the benefits are real and such abuses are not permitted to occur.

This document is broken into five parts. Part I outlines the background of the technological opportunities, the benefits, the risks, and why the Governor appointed a Council to examine how the State of Montana can craft an oversight program to ensure the citizens that the State manages their UAS program responsibly. Part II outlines the legal and regulatory framework that guided the Council's work and recommendations, with a particular focus on citizen privacy rights and government transparency. Part III is the operational Montana UAS Plan – how state agencies should operate and manage their respective UAS programs, and how the state should have oversight into those programs – from procurement to data dissemination, with accountability and transparency ingrained in all operations. Part IV is a summary of the Council's conclusions and recommendations in "short form," and is intended to be a quick reference guide to the full document. Part V are the appendices that the Council hopes will be found useful by the Montana state agencies.

The Council recognizes that governance of such an emerging technology will likely change rapidly; it is our hope that this report will help Montana move forward on the path of responsible UAS use for the benefit of all Montanans, and provide a framework for Montana's UAS Program to grow successfully. The members of the first UAS Council are grateful for the opportunity to help Montana in this exciting endeavor.

Kreh Germaine (chair) and the Montana UAS Council Team.

The Montana UAS Plan: Executive Summary

The Montana UAS Council has confirmed that there are great opportunities and benefits to a well-organized and managed UAS program across state government in Montana. These do come with challenges to ensure that such use mitigates risks innate to the technology, and highlights a driving need to ensure citizen privacy and transparency are maintained. Citizen privacy is inherent to the Montana Constitution, and UAS programs need to ensure policies are in place to provide healthy governance around its protection and enforcement.

To accomplish this efficiently, the Montana UAS Council has put forth recommendations regarding procurements, cost-benefit analyses, a centralized organizational structure to ensure good governance is maintained, operational protocols that follow FAA oversight requirements, the development of state policy for UAS programs, proper data handling protections, transparency measures, and coordination opportunities with the Montana University System.

The technology will continue to grow and expand in its opportunities; continual attention to its application will be required to ensure future use of UAS technology continues to align with approved governance measures – ones that accomplish beneficial objectives for citizens, while protecting their rights.

Part I

Background

Section 1 The Development of UAS Technology

Like many technologies, the first Unmanned Aircraft Systems (UAS) was originally designed for military purposes, being designed around weaponry in the form of remotely-guided aerial missile deployers. More recently, UASs have seen rapid advancements and have become involved in a wide range of applications for commercial and government use, especially in the form of small quadcopters and octocopters. Today, UASs are used for an array of functions, including monitoring climate change, delivering goods, aiding in search and rescue operations, environmental management, law enforcement, structural inspections, filming and photography, and a host of other applications that seemly expend regularly as new fields find use for the technology.

For its most early use, UAS (also known as “drones”) found their most active roll in the military, a role that continues today. The US military alone have a fleet of tens of thousands of drones today, compared to just a few twenty years ago. This is minimal compared to the number of drones in private use. According to the FAA, there were 1.1 million drones registered in the U.S. in 2019. Interestingly, that number has dropped in 2021 to 869,000, reflecting a drop in interest as rules and regulations become more defined.

History of the UAV

One common feature of many modern commercial drones is the quadcopter configuration. Early development of this technology appeared in 1907, when brothers Jacques and Louis Bréguet, with help of French physiologist Professor Charles Richet, developed an early example with their gyroplane, a forerunner of the helicopter.

For its time, the design of the copter was visionary. Although it achieved the first ascent of a vertical-flight aircraft with a pilot, it only reached a height of 0.6 meters. It was also not a free flight, as four men were needed to steady the structure. Though this did demonstrate that the concept of a quadcopter would work for flight, it would take advanced technological development to make it viable.

1915 to 1920

The first pilotless aircraft was developed in 1916, after the outbreak of World War I. Called the Ruston Proctor Aerial Target, these pilotless military drones used a radio guidance system developed by British engineer Archibald Low. The advanced nature of Low's work was not appreciated by the British government as they did not follow up after the war. However, it seemed the Germans certainly understood its importance since they made two attempts to assassinate Low.

The U.S. Army built the Kettering Bug near the same time, which used gyroscopic controls and was intended to be used as an “aerial torpedo”. Each "Bug" was launched from a four-wheeled dolly that rolled down a portable track. After a predetermined length of time, a control closed an

electrical circuit, which shut off the engine. Then, the wings were released, causing the Bug to plunge to earth — where its 180 pounds of explosive detonated on impact.

Unfortunately, the Bug was developed too late to be used in combat, in spite of the U.S. spending $275,000 for its development.

1930 to 1945

During this period the U.S. Navy began experimenting with radio-controlled aircraft, which resulted in the development of the Curtiss N2C-2 Drone in 1937. In 1935, the British developed "Queen Bee", a radio-controlled target drone. This is also widely believed to be the origin of the term "drone" for radio-controlled unmanned aircrafts.

In the 1930s British actor Reginald Denny and engineer Walter Righter developed the Radioplane OQ-2, a remote-controlled model airplane. This became the first mass-produced UAV product in the U.S. Nearly 15,000 drones were manufactured for the military during the war.

However, the actual credit for inventing a radio-controlled aircraft that could fly out of sight goes to Edward M. Sorensen, who developed a technology that used a ground terminal to track the movements of the airplane, which was previously restricted to line of sight.

However, the most widely recognized craft of World War II, with regards to drones, was the emergence of the German V-1 "Doodlebugs". Fitted with pulsejets, these crafts were effectively the world's first-ever cruise-missiles. Their guidance system used a simple autopilot to control altitude and airspeed; a pair of gyroscopes controlled yaw and pitch; the azimuth was maintained using a magnetic compass; a barometric device was used to control altitude. The gyros, rudder, and elevator were controlled using pressurized air. These wreaked havoc on London and the British countryside, with great effort made to intercept and shoot down the autopiloted vehicles. The Doodlebug was later reverse-engineered by the Americans, who then developed drones like the TD2D Katydid and Curtiss KD2C.

Overall, the mid-1940s saw an enormous chapter in the history of drone development. The GB-1 Glide Bomb was designed to bypass German air defenses, carrying a deadly 2000 pound bomb. During that time, the GB-4 or Robin was the world's first television guided weapon. These drones could not fly very accurately, but they were still very effective.

1945-1980's

Though this period was relatively quiet in regard to UAS development the next substantial development of drone technology came during the Vietnam War. This saw the first widespread use of drones as dedicated reconnaissance UAVs through the use of cameras as part of the payload. Drones began to be used in a range of new roles, such as acting as combat decoys, missile delivery, and dropping leaflets for psychological operations.

The benefit of drones also occurred to many other nations around the world, who also began to explore the use of UAVs for various military applications. New drone models became more sophisticated as designers focused on improving endurance and the height at which the drones could safely operate.

Radio-controlled (RC) operations began to have much greater widespread use during this time, largely in thanks to the advances in transistor technology. Kit planes began to appear, allowing enthusiasts and hobbyists to build and fly RC craft and form aircraft clubs.

1980 to 1989

At this point, the availability of drones for the US military was ample, but the craft themselves were viewed as unreliable and expensive. However, this view changed world-wide when the Israeli forces used their UAS to subdue the Syrian Air Force with minimal losses in 1982. The US also began the Pioneer program in 1980, which in turn led to the development of the RQ2 Pioneer, a joint US-Israeli medium sized reconnaissance drone.

Developers in the industry were also focusing on alternative power sources for drones, primarily focused on solar-power.

1990 to 2010: A New Paradigm Emerges

Early in the 1990's, mini and micro drones were introduced. For the military, this was the birth of the Predator drone, along with numerous other fixed wing drones developed by AeroVironment, Inc. During this time the FAA started to realize it had a complicated issue on its hands as it started to re-claim control over the airspace drones were using. It issued the first commercial drone permit in 2006. Also in 2006, the company DJI was founded by Frank Wang, who built the first DJI prototypes in his dorm room while attending Hong Kong University. In its early years, DJI catered to Chinese Military.

Adoption and applications for commercial permits were slow, fed by the lack of information and clarity on who it applied to, with many drone operators not realizing there were any regulations at all, or thinking that they didn't apply to small radio-controlled craft.

2010 to Today

The last decade has seen a florescence of drone craft, not only for the military, but for the private commercial and hobbyist sector as well. In 2011, DJI produced its first commercial grade drone, the Phantom, which was an entry level drone that was more user friendly than other commercial drones at the time. Improving the stability of multirotor aircraft opened up new possibilities for them to be used in countless ways. This model became their flagship, soon to be followed by the Phantom II, III, and IV models. DJI during this period managed to capture over 70% of the commercial UAS market in the US, and by 2015 had nearly eliminated all other competition world-wide. Though there are now established drone manufactures in the US and other countries,

none are currently able to effectively compete with the availability, price point and capabilities of the DJI offerings.

Equipping drones with cameras is now commonplace in commercial photography and videography. This is the result of a merging of radio-controlled aircraft and smartphone technology. The rapid growth in the usage of smartphones reduced the prices of microcontrollers, accelerometers, and camera sensors, which are ideal for use in fixed-wing hobbyist aircraft. Between 2012 and 2016, other manufacturers, sensor developers and software developers all jockeyed for relevance in the DJI dominated world. By 2018, most had failed or concentrated resources into a few capable companies.

In 2018, over security concerns, numerous US agencies, led by the DOD and DOI, ordered a grounding of all DJI craft across the agencies, followed shortly by a complete UAS platform grounding across all federal agencies except in the case of emergencies. This also applied to state agencies that received federal funding for their operations. Some US based systems under Project Blue sUAS by Defense Innovation Unit (DIU) were eventually approved for federal agency use, but not widely adopted due to the price and underwhelming capabilities of the approved units. The general UAS grounding is still in place as of the publication of this document.

In 2015 the FAA processed over 1000 commercial drone permits, which tripled the following year. Today there are over 869,000 FAA registered drones with over 240 thousand certified remote pilots.

Section 2 Opportunities and Benefits for Government use of UAS

In the UAS industry, there are three broad categories that are often referred to when justifying the use or development of a UAS program: *Saving Time, Saving Money, and Saving lives*. Increasing work efficiency and productivity, decreasing production costs, improving accuracy of information, refining service and customer relations, boosting agricultural production, increasing emergency situational awareness, and resolving security issues on a vast scale are a few of the top applications drones offer. Adoption of drone technology across industries and within government agencies has quickly leapt from the "toy to tool" stage as more and more organizations realize its potential, scope, and scale. Moreover, UAS have the dexterity to carry out such work in hazardous conditions with significantly less risk than manned aircraft.

Saving Time

Two fields the state is already seeing efficiencies in work operations is in the Natural Resource realm and that of Infrastructure and Asset Management. Below are some examples of how the state is currently utilizing UAS toward operational efficiencies.

Environmental Protection and Scientific Data Collection

Environmental organizations and governments can use unmanned aircraft systems to monitor operators for illegal collection or disposal, protect green space, observe wildlife and monitor erosion and infrastructure degradation. UAS also examine facilities and other structures for evidence of degradation that could pose environmental risks. UAS will provide new vantage points for researchers, giving them perspectives and accuracy of data collection never attained before. UAS also remove the risk researchers previously faced while flying in manned aircraft through hazardous conditions or over difficult terrain. Here are some of the ways state and local agencies are using UAS to address the environment and scientific endeavors:

- Investigation of dams, highway and bridge conditions is an efficient use of UAS.
- Mapping of future and current land development projects
- Investigation of river and stream channel history and changes
- DEQ uses UAS to monitor gravel and small miner operations to ensure that they stay within the bounds and limits of their permit operations. Violations of their permits are recorded and used in follow up enforcement actions. Previously, such documentation required a significantly greater amount of time and personnel cost to record and was subject to human error.
- DOL uses UAS to monitor bison migrations out of Yellowstone National Park and to assess their proximity to domestic cattle.

Infrastructure and Asset Management

UAS technology offers a host of benefits for obtaining near real-time imagery for infrastructure and asset inspection and management, including incident response, engineering, documentation, routine and degradation inspections, and solution development. UAS technology provides a safe, expeditious, and cost-effective tool that has flexibility in mission, can cover remote areas, and can capture imagery from angles other applications cannot.[1]

At the Montana Department of Transportation (MDT), UAS uses include:

- Mapping – Creating surfaces, photogrammetry of projects, mapped preconstruction areas, post construction, specific areas like slopes, rockfall areas, etc.
- Incident Response – Slides, Flooding, Rockfall, etc.
- Inspection – Construction and Preconstruction, Infrastructure
- Photo Video Documentation (Image Capture) – Preconstruction and Construction, Maintenance, Environmental, Claim Mitigation, etc.
- Measurement – Determine stockpile volumes and riprap gradation
- Engineering Analysis – FLIR analysis of concrete on bridge decks, and other bridge elements
- 3D Model Creation – For Construction and Engineering
- Public Involvement – Providing imagery and video for public relations media

Saving Money

Leveraging operational efficiencies yields financial benefits. While some benefits do indeed reduce cash expenditures to accomplish the similar task, much of the efficiencies state agencies are seeing is in the "soft costs" of staff time. Performing routine tasks in 1/4th the time allows for staff to repurpose hours toward other services to citizens. Obtaining better data faster empowers staff to make timely and smarter decisions, saving money by avoiding costly mistakes. Thus UAS technology is proving to allow staff to accomplish more and better services within their limited resources.

Efficiencies & Cost Savings

- DEQ use of UAS has decreased "time on site" for environmental scientists in the range of 30-70 percent, depending on the project, for many of its open cut, mining, reclamation, and abandoned mine lands (AML) projects. Data collected is more accurate, and thus

[1] Special thanks to Dustin Rouse, MDT engineer, for the information contained herein as to how MDT leverages UAS for the public benefit.

more defendable in cases of enforcement actions. Streamlined data flows are proving to greatly contribute to the efficiency of the data collection.

- An analysis at the Department of Natural Resources (DNRC) found that after 65 missions, the department saved close to $50,000 (primarily "soft cost" in staff time efficiency). UAS missions included volumetric calculations of gravel pits to determine the amount of material extracted and the payment due, archaeological site documentation on state lands, and general site analysis and documentation for department mission purposes (high-hazard dam conditions, real estate commercial lease advertising, etc.). What typically would take hours with personnel on the ground now takes minutes from the air.
- The MDT utilizes UAS for many types of inspections, analysis, and engineering design work that saves both time (personnel soft cost) and money (hiring contractors), as well as reducing the risk to the safety of personnel. For example, when conducting rock slope evaluation, the MDT used to hire a helicopter to take photos/video at a minimum cost of $1500 per hour. The UAS can fly this at a fraction of the cost. The MDT also used to have people on these steep rock slopes using "rope access" to conduct inspection. This required special certifications and came with a safety concern. Hiring consultants or private firms for this work cost a minimum of $5,000 to have someone get on a rope for a few hours, and these personnel are primarily out of state. The UAS mitigates these risks and expenses, allowing a close inspection in much less time.

Saving Lives

When readily available to be deployed in emergency situations, the ability to have a set of "eyes in the sky" can aid in situational awareness and strong decision making when lives and property hang in the balance on a large scale. From local jurisdictions to state agencies, UAS has a myriad of ways it is benefitting this sector of society.

Public Safety

For law enforcement, firefighters and other first responders, UAS provide superior situational awareness while minimizing the danger to which they are exposed. Further, with tight budgets, UAS provide a cost-effective solution for public safety agencies. Today, fewer law enforcement units have manned aviation assets to support their daily operations because of the high operating costs of manned aircraft. UAS changes this, allowing such agencies to better protect themselves as they work to protect the citizens of Montana, and at a fraction of the cost. Here are some of the ways state and local agencies are using UAS to enhance public safety:

- Use of UAS during accident recording reduces processing time by a significant factor, allowing traffic flow to resume much quicker while improving the accuracy of scene reconstruction. Drones collect data faster, lower human exposure to hazards and typically costs less than other traditional data collection methods. Data collected with drones can

be used as trial exhibits to help the court and jury better understand how and why an accident occurred due to enhanced image clarity and real-life detail.

- State and local agencies, by using their UAS, are able to monitor critical situations from the air. These could include a barricaded subject surveillance, active shooter incidents (situational awareness), hostage events, etc.
- Often forensic photography and crime scene mapping is best performed from the air.
- Firefighters using UAS including infra-red analysis provides additional information to those working on a structure fire.
- Alarm responses (roof checks, inaccessible fenced areas)
- Security patrolling of critical infrastructure.
- MDT uses UAS for bridge inspections, bank scour near roadways, rock slope conditions above roadways, and after flood events for road stability.

Emergency Response

When disaster strikes, UAS can play invaluable roles in analyzing and mitigating their impacts when time is of the essence. Giving situational awareness to Incident Command can provide a "big picture" in the midst of chaos. In the event of disasters such as wildfires, earthquakes or environmental accidents, whether natural or anthropogenic, they may present conditions too dangerous to observe directly with manned vehicles. Under human control and operated remotely, UAS can enter hazardous spaces for long periods of time in a way that humans simply never could. Here are some of the ways state and local agencies are using UAS to address emergency response situations:

- The Department of Environmental Quality (DEQ) recently used a UAS to monitor an active coal seam fire near Culbertson Montana. The Agency was able to use a Forward Looking InfraRed (FLIR) sensor to identify sub-terranean spreading hot-spot areas which allowed containment efforts to expand and prevent future fire eruption, while long term treatment methods were evaluated.
- DNRC, in conjunction with our Federal partners, regularly use infrared imagery from UAS on wildfires that aid wildland firefighters to target specific hot spots and increase their effectiveness with less time to resolution and ultimately reducing fire expense.
- State and local agencies involved in Search and Rescue operations, and under the right conditions are able to use UAS in their mission(s).
- Assessments of flooding areas help agencies in planning their strategies for response and possible evacuations. A recent example was used by the Saint Mary's police department when the town flooded in May, 2019. In 2020, when the Saint Mary's Canal Drop 5 structure failed, closer assessments of the damage could be made safely using UAS. MDT also uses UAS frequently whenever a public roadway is inundated with floodwater to ensure the road is safe and to engineer modifications against future events.

The Future is Now

Technological advancement has removed many of the limitations on drone operations. Thanks to their advantages of efficiency, accessibility, mobility, durability, and safety, UAVs are a good solution for many remote sensing needs. Combined with machine learning (deep learning and artificial intelligence) these developing technologies can assist in enhancing and improving services to citizens. UAVs are a powerful tool that can reduce labor costs, obtain vital information faster for critical decision making, provide even yet-unknown services to citizens, and provide professionals with a better understanding of their data and our world – all while saving time, saving money, and saving lives.

Section 3 Risks and Dangers of Government use of UAS

Even though there are clear benefits for government agencies to have a UAS program, there are some potential risks and dangers. Main potential risks the Council identified are public safety, privacy rights, data handling, and liability.

Safety

Safety should be prioritized in any UAS program. Some factors that may impact the safety of a UAS program are inexperienced or untrained pilots; equipment failures; weather; and other situational/environmental issues. Any of these factors could cause the UAS to crash leading to possible injuries, death, damage to property or loss/damage to the UAS. The Montana UAS plan has protocols that will help to reduce the risks. Two areas that will help reduce the safety risks are Training and Maintenance.

Training

Only authorized operators who have completed the required training shall be permitted to operate a State owned UAS. State of Montana UAS pilots will be required to become Certified Remote Pilots under the FAA regulations in Part 107 or by the agencies having a Certificate of Authorization (COA). To assist with the safety management of a UAS, the Montana UAS Plan will establish Operational Procedures which will help to mitigate the safety risk. These procedures include Pre-Flight check lists/report; Mission Control; Post Flight Reports; Emergency Procedures; Flight Time and Duty Days; and Biannual Reporting, and should be required by all state agencies.

Maintenance

UAS need to be maintained in a suitable condition for safe operations. Regular maintenance and inspections will help to ensure the airworthiness of the UAS. The Montana UAS Plan will require a UAS Airworthiness Criteria which includes maintenance/repair logs, flight logs, and aircraft manuals. Even though agencies' policies should mandate routine and scheduled maintenance, the UAS should be inspected prior to each flight by the Pilot in Command (PIC). This is part of Mission Control and the ultimate responsibility for the airworthiness' is with the PIC for that particular flight.

Privacy Issues

Another key risk to consider for a UAS government program is respecting people's privacy. Using UAS in a responsible and ethical manner will ultimately lead to a lower risk as well as greater public acceptance of the technology. Simple precautions can be taken to avoid breaching an individual's reasonable expectation of privacy. The Montana UAS Plan specifically addresses Citizen Interaction, Privacy Concerns, and Transparency. Even though all national airspace is under the sole authority and control of the FAA, Montana state agencies, when conducting

operations over private property should attempt to notify property owners before their flight(s). This is done as a courtesy and will help with overall transparency between the state and its citizens. Another example in the Montana UAS plan to help address privacy concerns is to try and contact property owners of public places if the state agency is planning on recording data from the flight. Additionally, if images are captured of citizens in public settings, the state agency should have all identifying information removed before publicizing the data.

Data

A UAS usually will collect data of the surrounding environment for the operator of the mission. Care in handling the data will be necessitated, and the level of care will be determined by the nature of the data, just as in any other governmental system. Data handling and security procedures must be followed in accordance with state policy, and data collected by a UAV must be handled with the same diligence as other departmental systems, as is appropriate for the classification level of the data. Care must be taken also in the collection, whether intentional or incidental, of imagery Personally Identifiable Information (PII) and how that is securely handled.

Liability Concerns

Even though the recommendations in Montana UAS plan will help to mitigate risks with its protocols, it can't completely eliminate potential accidents due to unforeseen events. The state will ultimately pay damages for the cost of property damage, medical expenses for injuries, and any physical damage to the UAS system that occurred as result of an accident. The state may also incur the expense of any litigation pertaining to any claims. The State of Montana vehicle program is self-insured, and UAVs fall into this category. As soon as a UAV procurement is complete, the device is covered with standard liability insurance. More insurance is available if elected for higher coverage as deemed by each department for their respective program missions.

It should be noted that manual flights carry the same risks, plus a risk to the pilot and crew. Similar diligence for training and maintenance should be given to UAS program as a manned flight program. However, with a much lower cost barrier to entry for the benefits to be gained, having a UAS program far outweighs the potential risks and liability when proper operating procedures are dutifully followed.

Section 4 The Legislative Audit of UAS in Montana

In June of 2019, The Montana Legislative Audit Division ('LAD') delivered their report to the Montana Governor's office regarding an Information Systems audit they had conducted over the previous year titled "Unmanned Aircraft Systems Deployment and Oversight."[2] The audit encompassed a thorough review of the use of UAS technology by State of Montana departments and compared that to what other states were doing with their respective UAS programs.

While the audit found all eight state agencies that currently were implementing UAS technologies were following both Montana and Federal Aviation Administration guidelines and regulations, the LAD observed that efficiencies and benefits could be obtained with a more centralized approach in organizing UAS policy and operational guidelines within the State of Montana.

The LAD gave five main recommendations to the Governor's Office:

Recommendation #1

The Governor's Office require a cost-benefit analysis be performed before the procurement of an unmanned aircraft by state agencies.

Recommendation #2

The Governor's Office designate a central unmanned aircraft resource to provide oversight and coordinate statewide unmanned aircraft efforts and ensure agencies report on unmanned aircraft numbers and usage.

Recommendation #3

The Governor's Office ensure information is available to state agencies, the public, local government, and legislators on the application, viability, regulations, and best practices of unmanned aircraft.

Recommendation #4

The Governor's Office develop statewide unmanned aircraft policy that ensures regulatory compliance is met at the state and federal level.

[2] The Montana Legislative Audit Division. "Unmanned Aircraft Systems Deployment and Oversight." June 2019. Unmanned-Aircraft-Systems-Deployment-and-Oversight-information-systems-audit-17DP-05 (mt.gov).

Recommendation #5

The Governor's Office work with State Information Technology Services Division to develop statewide policy addressing IT risks on unmanned aircraft data standardization, privacy, security and risk management, procurement, and asset management.

The Governor's Office concurred with the findings in the report, and in July 2019 by executive order (EO-11-2019, as amended by EO-04-2020 and extended by EO-14-2020) established the Unmanned Aircraft Systems Council to address these concerns.

Section 5 The Montana UAS Council

Recent developments within state agencies have highlighted the benefits of UAS technology to reduce risk, increase safety, improve operational effectiveness, better manage environmental conditions, and save taxpayer dollars. Along with these benefits, the 2019 Legislative Audit revealed the opportunity for state agencies to coordinate efforts for better stewardship and fiscal responsibility; therefore in July 2019 Governor Bullock issued Executive Order No. 11-2019forming the UAS Council.[3] To account for Covid-19 related delays, Executive Order 04-2020 extended deadlines for achievement of the Council's objectives.[4]

The Council was charged to provide recommendations and strategies toward a centralized and organized approach for employing UAS technology in state operations and to ensure that federal guidance from the FAA was being followed. These recommendations were to address best practices in operations, guidance regarding preferred procurement processes, create safety and fiscal stewardship policy, identify dissemination opportunities, protect citizen privacy, and formalize compliance with FAA regulations.

Specifically, the UAS Council was to complete the following:

1) Issue recommendations for a statewide procurement process for UAS and UAS related procurements, including a cost-benefit analysis and recording/reporting of the analysis and procurements;
2) Issue the Montana Unmanned Aerial System Plan that would provide recommendations regarding:
   a) How to best establish centralized oversight and control of state agency UAS and to foster inter-agency collaboration;
   b) How state UAS shall interact with Montana citizens, particularly regarding their right to privacy, flights over private property, disseminating data, and addressing citizen complaints;
3) Consult with the Montana University System regarding coordination and integration of the MUS regarding guidance, training, and procurements.

[3] Bullock, Steve. Office of the Governor "Creating the Montana Unmanned Aerial Systems Council – Executive Order 11-2019." https://formergovernors.mt.gov/bullock/docs/2019EOs/EO%2011-2019_Creating%20UAS%20Council.pdf

[4] Bullock, Steve. Office of the Governor "Creating the Montana Unmanned Aerial Systems Council – Executive Order 04-2020." https://formergovernors.mt.gov/bullock/ExecutiveOrders.html#2020

The UAS Council is composed of members from the following departments, expert organizations, and key stakeholders:

- Department of Environmental Quality
- Department of Natural Resources and Conservation
- Department of Fish, Wildlife and Parks
- Montanan Department of Transportation
- Department of Livestock
- Department of Justice
- The Montana University System
- Three (3) stakeholders from state, county, local, or tribal governments and/or the private industry.

The Council's timelines and duties were extended by Executive Order 14-2020 to continue until December 15, 2022.

Section 6 Definitions of terminology used in this document

Airspace The area of atmosphere above ground level (AGL). FAA rules apply to all airspace above the ground over the entire country. According to FAA regulations, there is no such thing as "unregulated" airspace. There is however a difference between controlled and uncontrolled airspace. Controlled airspace is found around some airports, and at certain altitudes where air traffic controllers are actively communicating with, directing, and separating all air traffic. Other airspace is considered uncontrolled in the sense that air traffic controllers are not directing air traffic within its limits. In general, UAS flights in uncontrolled airspace are conducted below 400' AGL. Commercial UAS pilots are required to get permission from the FAA before flying in controlled airspace.

ATC Air Traffic Control

Autonomous aircraft An aircraft that does not require a pilot and is able to operate independently.

Autonomous operation. An operation during which a remotely-piloted aircraft is able to operate without pilot intervention in the management of the flight.

Certificate of Authorization (COA) An authorization issued by the Air Traffic Organization to a public operator for a specific UA activity.

Lost link. The loss of command and control link contact with the remotely-piloted aircraft such that the remote pilot can no longer manage the aircraft's flight.

National Airspace System (NAS) The FAA created the NAS to protect persons and property on the ground, and to establish a safe and efficient airspace environment for civil, commercial, and public (aka government) aviation. The NAS is made up of a network of air navigation facilities, ATC facilities, airports, technology, and appropriate rules and regulations that are needed to operate the system. Airspace is broadly classified as either controlled or uncontrolled. Airspace designated as Class A, B, C, D, or E is controlled airspace. Class G airspace is uncontrolled airspace. The FAA is the sole authority over the NAS. However, laws traditionally related to state and local police power – including land use, zoning, privacy, trespass, and law enforcement operations – generally are not subject to federal regulation, thus providing opportunities for state legislatures to pass laws related to those operations.

National Transportation Safety Board (NTSB): an independent federal agency charged by Congress with investigating every civil aviation accident in the United States and significant accidents in other modes of transportation. See website here for more info.

Operator. A person, organization or enterprise engaged in or offering to engage in an aircraft operation.

Pilot in Command (PIC). See Remote Pilot in Command.

Program Manager. Person assigned by the Director of a given State Agency to serve as lead contact for the agency with other State and Federal Agencies. Duties and responsibilities as assigned by the Director.

Part 61. Federal Aviation Administration (FAA) rules that govern the certification of pilots, as well as flight and ground instructors. It establishes eligibility, aeronautical knowledge, and minimum flight time requirements to obtain various pilot licenses (excepting part 107).

Part 91. Federal Aviation Administration (FAA) rules that govern general operations and flight for all civil aircraft (excepting part 107).

Part 107. The Federal Aviation Administration (FAA) adopted rules to allow the operation of civil small unmanned aircraft systems (sUAS) in the National Airspace System (NAS) for purposes other than hobby or recreation. (14 CFR Part 107)

Public aircraft means an aircraft used only for the United States Government, or an aircraft owned and operated (except for commercial purposes) or exclusively leased for at least 90 continuous days by a government other than the United States Government, including a State, the District of Columbia, a territory or possession of the United States, or a political subdivision of that government.

Public operation is operated for purposes that meet the statutory criteria of a 'governmental function', and that is not operated for commercial purposes (i.e., operations for compensation or hire).

Remote Pilot-in-command (PIC). The pilot designated by the operator (and COA), or in the case of general aviation, the owner, as being in command and charged with the safe conduct of a flight with a FAA issued Part 107 Certificate.

Small Unmanned Aircraft System (sUAS). An aircraft weighing less than 55 pounds and its associated elements on takeoff, including everything that is on board or otherwise attached to the aircraft; all of which are operated with no pilot on board.

Unmanned Aircraft (UA): An aircraft operated without the possibility of direct human intervention from within or on the aircraft.

Unmanned Aircraft System (UAS). An unmanned aircraft and its associated elements (including communication links and the components that control the unmanned aircraft) that are required for the safe and efficient operation of the unmanned aircraft in the national airspace system.

Unmanned Aircraft Systems Council - In July 2019 by executive order (EO-11-2019 as amended by EO-04-2020 and extended by EO-14-2020) established the Montana Unmanned Aircraft Systems Council to provide recommendations and strategies for the State of Montana to determine the best way to provide oversight and control of state agencies UAS programs. The Council was appointed by the Governor with representatives from state government (7 agencies) and stakeholders (3 members).

Unmanned Aircraft Systems Program - A set of related measures or activities involving an UAS with a particular long-term aim. May include but not be limited to the equipment, personnel, objectives, funding, and operations to conduct UAS missions for a specific purpose within or for an organization.

Unmanned Aircraft Program Manager – a qualified person that assumes the responsibility of the management of the UAS operations for a specific government agency.

Unmanned Aircraft Vehicle - Any aircraft operated without the possibility of direct human intervention from within or on the aircraft.

Visual line-of-sight operation (VLOS). An operation in which the PIC maintains direct visual contact with the aircraft to manage its flight and meet separation and collision avoidance responsibilities.

Beyond Visual line-of-sight operation (BVLOS). An operation in which the PIC does not maintain direct visual contact with the aircraft to manage its flight and meet separation and collision avoidance responsibilities.

Visual Observer (VO) A person acting as a crew member who assists the small UA remote PIC and the person manipulating the controls to see and avoid other air traffic or objects.

Waiver. A waiver is an official document issued by the FAA which approves certain operations of aircraft outside the limitations of a regulation.

Other Definitions

All definitions under the Code of Federal Regulations for small unmanned aircraft systems (CFR – Title 14 Chapter I Part 107.1 Definitions) apply to this policy.

Part II

Legal and Regulatory Analysis

Section 1 Constitutional Law

Given the opportunities, benefits, risks, and liabilities around UAS operations, it is prudent to conduct a review of existing law and regulations to ascertain the proper use of this technology. As so often is the case with any new or rapidly developing technology, the implementation and adoption of such often outpaces the guiding governance and regulations that may be in place, or eventually required, to maintain safe and ethical conduct in its application.

A UAS system is comprised of several other sub-component systems that individually may be addressed in statute or have existing legal case law determinations. A UAS is essentially a remote information system that can collect and determine information from a source at a distance. It incorporates aerial devices (flight vehicle), radio frequency (communications) and a sensing device (which can vary from hyperspectral imagery to infrared sensors to meteorological sensors and more). Without going into a review of all these sub-component systems, most discussion and concern around the UAS is in relation to its most frequent use, and that is of an aerial high-definition camera or video capturing device. This is not largely different than a satellite orbiting the earth; however, due to the low cost and ready availability of a consumer/prosumer (and even the relatively more expensive commercial) devices, and the high-visibility nature of them to general observers on the ground, this application is the most addressed when it comes to existing law. That said, there still is not an overtly large amount of statute nor case law specific to the UAS at this time, either in Montana or the other states, to varying degrees.

United States Constitution

At the highest level of law, the United States Constitution, the legal discussion generally revolves around where “life, liberty, and property” (Amendment XIV, Section 1) might be regulated to protect others in pursuit of the same either in like manner (in this case, flying an unmanned aerial vehicle) or those on the ground, without infringing on their freedom and right to pursue the same. Most often, however, the Constitutional legal discussion regarding UAVs is around their use and when such might infringe upon the fourth amendment, which states “The right of the people to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures, shall not be violated...” Given that a UAV obtains an observation platform that would otherwise be unavailable to the general public, the question often needing consideration is when there is a reasonable expectation of privacy and when such observations become a “warrantless search.” This becomes further complicated as some courts have ruled that images taken at distance (higher elevations) did not constitute a “search” as it may have if taken at lower elevations, which really becomes a matter of imagery resolution. This brings forth the more difficult determination of when the presence of a UAV becomes an “intrusion” into privacy and the reasonable expectation to be free from disturbance (trespass) or targeted observation.

One of the more well-known U.S. Supreme Court cases in this area is the 1946 *United States vs. Causby*[5] case. Regarding this balance between FAA controlled airspace and a citizen's right to privacy, Kristen Juras notes in her article *The Game of Drones: Federal and State Rules of Play and Their Intersect with Property Law* that the Supreme Court provided two general guidelines to help states determine when a trespass has occurred:

(1) The landowner must have "exclusive control of the immediate reaches of the enveloping atmosphere," including space that can be occupied or used in connection with the land.

(2) The landowner is also entitled to a buffer zone within which intrusions would be so immediate and direct "as to subtract from the owner's full enjoyment of the property and to limit his exploitation of it."[6]

A specific elevation, height, or distance in the case was rightfully not determined, as it is not in the Supreme Court purview to create law for the states. Whereas privacy and trespass are not the same thing, they are closely related; it should be noted that an intent to invade privacy from a distance (a more intangible trespass) can be overcome by other technologies such as magnification. These all have implications when it comes to newer technologies such as a UAS.

The finer definitions of real property rights and privacy are largely recognized to fall under States' purview, and not under that of the Federal Government.

Montana Constitution

The Montana Constitution, Article II, Section 10 states that "The right of individual privacy is essential to the well-being of a free society and shall not be infringed without the showing of a compelling state interest." This guarantee of a right to privacy is seen as a greater level of right than that given in the U.S. Constitution, yet the State Constitution contemplates privacy invasion by state action only. Montana Constitution Article 2, § 11; *State v. Malkuch*, 154 P.3d 558, 336 Mont. 219 (2007); and State v. Long, 216 Mont. 65, 71, 700 P.2d 153, 157 (1985).

This has potential implications in the practice of UAS operations by the State of Montana. The Montana Constitution requires more than that the state simply not impose an undue burden on a person's exercise of his or her right of individual privacy; rather, the government must demonstrate a compelling state interest for infringing this right. Const. Art. 2, § 10. *Armstrong v. State*, 1999, 296 Mont. 361, 989 P.2d 364. As a result, State agencies should use extreme caution when conducting UAS activities that risk violating this right of privacy. Conduct to execute the mission of the state agency may likely not meet the merits of this provision.

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[5] Douglas, William Orville, and Supreme Court Of The United States. *U.S. Reports: United States v. Causby, 328 U.S. 256*. 1945. Periodical. https://www.loc.gov/item/usrep328256/.

[6] Kristen Juras, "The Game of Drones: Federal and State Rules of Play and Their Intersect with Property Law," *The Practical Real Estate Lawyer,* (2017) 27.

To determine whether a constitutionally protected privacy interest exists under the Montana Constitution, the Montana Supreme Court applies a two-part test: whether the person involved had a subjective or actual expectation of privacy, and whether society is willing to recognize that expectation as reasonable. Const. Art. 2, § 10. Associated Press, Inc. v. Montana Dept. of Revenue, 4 P.3d 5, 300 Mont. 233 (2000).

With the absence of significant case law to date in regards to UAS operations, legal professionals today must rely upon similar instances that correlate to the issues faced when conducted with a UAS. Given such considerations noted above, until further statute and determinations are established, state and local governments should recognize the number of factors that must be considered when conducting missions on behalf of government entities. We advise that state agencies proceed with caution, and when in doubt, to err on the side of the protection of citizen privacy. *(For guidance regarding protecting citizen privacy when conducting UAS missions, see the Montana UAS Plan, Section 5.)*

Section 2 Federal Aviation Administration Regulations

The US Department of Transportation Federal Aviation Agency (FAA), established in 1967 following the 1938 establishment of the Civil Aeronautics Authority, has oversight of the entire national airspace system (NAS). While government agencies, law enforcement, and public safety entities have been able to qualify to fly UAS as Public Aircraft under 49 U.S.C. § 40102(a)(41) and §40125, civil/commercial UAS operations were not easily permitted. In § 333 of the FAA Modernization and Reform Act of 2012 (Public Law No. 112-95), Congress directed the Secretary to determine whether UAS operations posing the least amount of public risk and no threat to national security could safely be operated in the National Airspace System (NAS) and if so, to establish requirements for the safe operation of these systems in the NAS. Thus, UAS are aircraft now subject to regulation by the FAA to ensure the safety of flight and safety of people and property on the ground.

In December 2015 the FAA announced that all UAVs weighing more than 250 grams (approximately 0.55 lbs.) flown for any purpose must be registered with the FAA. On June 21, 2016, the FAA and Office of the Secretary of Transportation (OST), Department of Transportation (DOT), released Rule Part 107, finalizing the regulation regarding the use of commercial UAS. While the structure for regulating commercial UAS is in place, many details of such operations continue to evolve and changes to regulations need to be monitored.

On January 14, 2019 the FAA announced proposed new rules and a pilot project on regulating UAS activity in close proximity to large gatherings, critical infrastructure, and certain other facilities. This effort is being coordinated with input from the Departments of Defense, Homeland Security, and Justice, with a focus on activities that could pose a threat to public safety or national security. The result led to the most recent Part 107 amendment on April 21, 2021 to allow for night-time operations and operations over people and to establish the requirement for Remote Identification of all UAS falling under the applicable Part 107 definitions.[7]

All UAS operations conducted by state agencies must be done in full compliance with either FAA 14 C.F.R. Part 107 regulations or under an FAA Certificate of Authorization (COA) as a public aircraft. Either option requires additional considerations and processes for UAS operations. Under part 107 the following have a direct effect on public safety such as;

- Operation from a moving vehicle or aircraft (§ 107.25)
- Daylight operation (§ 107.29)
- Visual line of sight aircraft operation (§ 107.31)
- Visual observer (§ 107.33)
- Operation of multiple small unmanned aircraft systems (§ 107.35)

[7] see https://www.faa.gov/uas/commercial_operators/operations_over_people/ and https://www.faa.gov/uas/getting_started/remote_id/

- Yielding the right of way (§ 107.37(a))
- Operation over people (§ 107.39)
- Operation in certain airspace (§ 107.41)
- Operating limitations for small unmanned aircraft (§ 107.51)

Some operations are ineligible from operating under Part 107 and may be conducted under public operations or with waivers or exemptions to Part 107 to satisfy certain regulatory problems. Public operators have options and can operate under different regulatory rules depending on the need. For example, government UAS operators can fly as civil aircraft under Part 107[8] or fly as public aircraft under 49 U.S.C. § 40102(a)(41) and §40125. [9] Special consideration should be given to best meet the needs of a given mission. Given that most state agencies at the current time are operating under Part 107, a brief summary of the guidelines are provided below. The FAA website should be regularly referenced for the most comprehensive and up to date authoritative source for state UAS program regulation.[10]

FAA Part 107

Operation Provisions

The following are some of the primary provisions of operating an UAS that most state personnel must adhere to if operating under the FAA Part 107 regulations:

- At all times the small unmanned aircraft must remain close enough to the remote pilot in command and the person manipulating the flight controls of the small UAS for those people to be capable of seeing the aircraft with vision unaided by any device other than corrective lenses.
- Small unmanned aircraft may not operate over any persons not directly participating in the operation, not under a covered structure, and not inside a covered stationary vehicle unless flying an approved aircraft.
- Night operations must be conducted with appropriate anti-collision lighting.
- Must yield right of way to other aircraft.
- May use a visual observer (VO) but not required.
- First-person view camera cannot satisfy "see-and-avoid" requirement but can be used as long as the requirement is satisfied in other ways.
- Maximum groundspeed of 100 mph (87 knots).
- Maximum altitude of 400 feet above ground level (AGL) or, if higher than 400 feet AGL, remain within 400 feet of a structure.

[8] https://www.faa.gov/uas/commercial_operators/

[9] https://www.faa.gov/uas/public_safety_gov/drone_program/public_aircraft_operations/

[10] https://www.faa.gov/uas/; also https://www.ecfr.gov/current/title-14/chapter-I/subchapter-F/part-107

- Minimum weather visibility of 3 miles from control station.
- Operations in Class B, C, D and E airspace are allowed with the required Air Traffic Control (ATC) permission.
- Operations in Class G airspace are allowed without ATC permission.
- No person may act as a remote pilot in command or VO for more than one unmanned aircraft operation at one time.
- No operations from a moving aircraft.
- No operations from a moving vehicle unless the operation is over a sparsely populated area.
- No careless or reckless operations.
- No carriage of hazardous materials.
- Requires preflight inspection by the remote pilot in command.
- A person may not operate a small unmanned aircraft if he or she knows or has reason to know of any physical or mental condition that would interfere with the safe operation of a small UAS.
- External load operations are allowed if the object being carried by the unmanned aircraft is securely attached and does not adversely affect the flight characteristics or controllability of the aircraft.
- Most of the restrictions discussed above are ‘waivable' if the applicant demonstrates that his or her operation can safely be conducted under the terms of a certificate of waiver.

Part 107 Remote Pilot in Command Certification and Responsibilities

A FAA issued Part 107 Remote Pilot Certificate is mandatory for anyone planning on flying a UAS for all non-recreational purposes. A person operating a small UAS must either hold a remote pilot airman certificate with a small UAS rating or be under the direct supervision of a person who does hold a remote pilot certificate (the remote pilot in command).

A remote pilot in command must:

- Make available to the FAA, upon request, the small UAS for inspection or testing, and any associated documents/records required to be kept under the rule.
- Report to the FAA within 10 days of any operation that results in at least serious injury, loss of consciousness, or property damage of at least $500 (See Accident Reporting below)
- Conduct a preflight inspection, to include specific aircraft and control station systems checks, to ensure the small UAS is in a condition for safe operation.
- Ensure that the small unmanned aircraft complies with the existing registration requirements specified in § 91.203(a)(2).

Ensure the Part 107 regulations are followed for each mission conducted under the remote pilot in command's oversight.

Part 107 Aircraft Requirements

- The remote pilot in command must conduct a preflight check of the small UAS to ensure that it is in a condition for safe operation.
- The aircraft must meet the qualifications of the Part 107 definition for a small unmanned aircraft.

UAS Registration

UASs must be registered with the FAA. When registering the UAS, you must select to register as per Part 107.[11]

Registration Highlights:

- All drones must be registered, except those that weigh .55 pounds or less (less than 250 grams) and are flown exclusively under the Exception for Recreational Flyers.
- Drones registered under part 107 may be flown for recreational purposes as well as under part 107.
- Drones registered under the Exception for Recreational Flyers cannot be flown for Part 107 operations.

Airspace Authorizations

Operations in Class G airspace are allowed without ATC permission. Operations in Class B, C, D and E airspace need ATC authorization.

The 'Low Altitude Authorization and Notification Capability' (LAANC) uses desktop and mobile apps designed to support the volume of drone operations with almost real-time airspace authorizations. It is now live at more than 530 FAA ATC facilities covering over 726 airports throughout the country and many authorizations are granted within seconds of being submitted.

Currently, LAANC only applies to FAA ATC facilities (and does not yet include contract or Department of Defense ATC facilities). Authorizations for those facilities need to follow the manual process through FAA's DroneZone website.[12]

[11] https://www.faa.gov/uas/getting_started/register_drone

[12] https://faadronezone.faa.gov/#/

State agencies and their personnel must follow all appropriate ATC regulations regarding waivers and authorizations as they apply to the relevant class of airspace for each mission.

FAA Remote ID

Remote ID is the ability of a UAS, while in flight, to provide identification and location information that can be received by other parties. All UAVs must transmit a Remote ID by September of 2023. This is a significant change to the operation of UAS across the country. It is important that agencies remain informed of the FAA's regulations and any possible changes prior to implementation. It is recommended that agencies continue to visit https://www.faa.gov/uas/getting_started/remote_id/ for up-to-date information leading up to the deadline(s).

The FAA's Notice of Proposed Rulemaking (NPRM) on Remote Identification of Unmanned Aircraft Systems was published on December 31, 2019. The final rule was published in the Federal Register on January 15, 2021. Corrections made to the rule and published in the Federal Register on March 10, 2021 delayed the effective date to April 21, 2021.

There are three ways that UAS pilots can meet the identification requirements of the remote ID rule:

- Operate a Standard Remote ID UAS that broadcasts identification and location information of the drone and control station. (A UAS that is produced with built-in remote ID broadcast capabilities.)
- Operate a UAS with a remote ID broadcast module giving the drone's identification, location, and take-off information. A broadcast module is a device that can be attached later to a UAS (i.e. as an upgrade).
- Operate (without remote ID equipment) at FAA-recognized identification areas (FRIAs) sponsored by community-based organizations or schools.

Most of the final rule on remote identification became effective on April 21, 2021.

The published final rule includes compliance dates:

- September 16, 2022:
    - Manufacturers and producers of UAS must comply with the final rule's requirements for them.
- September 16, 2023:
    - UAS pilots must meet one of the three ways to comply with the rule when flying their aircraft.

Whether using a Standard Remote ID Drone or a remote ID broadcast module, nearly all of the message elements are the same and they must be broadcast from take-off to shutdown.

A Standard Remote ID UAS must broadcast the following message elements:

- A unique identifier for the UAS. (i.e. the UAS's serial number or a session ID, an alternative form of identification);
- An indication of the UAS's latitude, longitude, geometric altitude, and velocity;
- An indication of the control station's latitude, longitude, and geometric altitude;
- A time mark; and
- An emergency status indication.

A UAS with a remote ID broadcast module must broadcast the following message elements:

- The serial number of the broadcast module;
- An indication of the drone's latitude, longitude, geometric altitude, and velocity;
- An indication of the latitude, longitude, and geometric altitude of the drone's take-off location; and
- A time mark.

Again, the deadline for operational compliance is September 16, 2023 and state sponsored missions need to comply. State agencies are responsible for ensuring their UAVs are properly transmitting the unit's remote ID.

Accident Reporting

- Mandatory Reporting:
    - Report an "accident" or "serious incident" immediately to the National Transportation Safety Board (NTSB) Response Operations Center (reference 49 CFR 830.5) by contacting the NTSB's 24-hour Response Operations Center (ROC) at 844-373-9922 to file a report. Reference 49 CFR 830.6 to understand what needs to be reported.
    - Submit NTSB Form 6120.1 within **10 days** for an accident.
    - Notify supervisor immediately in accordance with the State of Montana procedures outlined at https://rmtd.mt.gov/claims/agenciesreportclaims
    - Notify the FAA within **10 days** of the occurrence of an accident (107.9 "accident") that meet the following criteria:
        - Serious injury to any person or any loss of consciousness; or
        - Damage to any property, other than the small unmanned aircraft, unless one of the following conditions is satisfied:
            - The cost of repair (including materials and labor) does not exceed $500; or

        - The fair market value of the property damaged does not exceed $500 in the event of total loss.
- Voluntary Reporting:
    - Anyone involved in UAS operations can file a form with the National Aeronautics and Space Administration (NASA) Aviation Safety Reporting System (ASRS) to report close calls, hazards, violations, and safety related incidents under a confidential, voluntary, nonpunitive system.[13] Shared lessons learned contribute to safer UAS operations.

Summary

In 2016, the U.S. Department of Transportation's Federal Aviation Administration finalized the first operational rules for routine commercial use of UAS operations, opening pathways towards fully integrating UASs into the nation's airspace. The FAA's provisions are designed to minimize risks to other aircraft, people, and property on the ground. Though operators are responsible for ensuring a UAV is safe before flying, the FAA is not requiring small UAS to comply with current agency airworthiness standards or aircraft certification.

The FAA regulations work to harness new innovations safely, to spur job growth, to advance critical scientific research, and to save lives. It is important that state agencies remain informed of the FAA's regulations and any possible changes that apply to state missions. It is recommended that agencies continue to visit https://www.faa.gov/uas/ for up-to-date information.

[13] https://asrs.arc.nasa.gov/uassafety.html

Section 3 Legislative History of UAS in Montana

Unmanned aircraft systems (UAS) are aircraft subject to regulation by the FAA to ensure safety of flight, and safety of people and property on the ground. States and local jurisdictions are increasingly exploring regulation of UAS or proceeding to enact legislation relating to UAS operations.

Currently, both the Federal Government and several states have established regulations for UAS operation – using US codes and federal regulations on the federal level and by statute on the state level. The Federal Aviation Administration (FAA) focuses primarily on safety while state statutes focus on the appropriate use of UAS and the protection of privacy. While the FAA and States have major roles in providing guidance and regulation for UAS operations and management, it is important to note that other users also play important roles. As such, airports, law enforcement, pilots, and the UAS operators also have important responsibilities in the safe and appropriate operation of UAS within the National Airspace System (NAS).

Laws traditionally related to state and local police power – including land use, zoning, privacy, trespass, and law enforcement operations – generally are not subject to federal regulation.

Because Federal registration is the exclusive means for registering UAS for purposes of operating an aircraft in navigable airspace, no state or local government may impose an additional registration requirement on the operation of UAS in navigable airspace without first obtaining FAA approval. Substantial air safety issues are raised when state or local governments attempt to regulate the operation or flight of aircraft.[14]

In Montana there are a number of statutes (MCA) passed relating to UAS operations:[15]

7-1-111 Powers denied.

A local government unit with self-government powers is prohibited from exercising the following:

(20) any power to enact an ordinance governing the private use of an unmanned aerial vehicle in relation to a wildfire.

[14] Visit: https://www.faa.gov/uas/resources/policy_library/media/UAS_Fact_Sheet_Final.pdf for a brief overview of the federal framework and UAS regulation.

[15] Note: only the portion of the following statutes that applies to this discussion is shown here. For a full reading of each statute, please visit https://leg.mt.gov/bills/mca/index.html

45-5-223 Surreptitious visual observation or recordation

1) A person commits the offense of surreptitious visual observation or recordation in a place of residence if the person purposely or knowingly hides, waits, or otherwise loiters in person or by means of a remote electronic device within or in the vicinity of a private dwelling house, apartment, or other place of residence for the purpose of:
   a) watching, gazing at, or looking upon any occupant in the residence in a surreptitious manner without the occupant's knowledge; or
   b) by means of an electronic device, surreptitiously observing or recording the visual image of any occupant in the residence without the occupant's knowledge.

Comment: *Though this section of law does not specifically mention 'UAS', law enforcement across Montana are able to employ it due to the broad language in (1)(b): 'by means of an electronic device….'*

46-5-109. Limitations on unmanned aerial vehicles

1) In any prosecution or proceeding within the state of Montana, information from an unmanned aerial vehicle is not admissible as evidence unless the information was obtained:
   a) pursuant to the authority of a search warrant;
   b) in accordance with judicially recognized exceptions to the warrant requirement; or
   c) during the investigation of a motor vehicle crash scene that occurs on or involves a public roadway.
2) Information obtained from the operation of an unmanned aerial vehicle may not be used in an affidavit of probable cause in an effort to obtain a search warrant unless the information was obtained under the circumstances described in subsection (1)(a), (1)(b), or (1)(c).
3) For the purposes of this section, "unmanned aerial vehicle" means an aircraft that is operated without direct human intervention from on or within the aircraft. The term does not include satellites.

76-13-214. Obstruction of aerial wildfire suppression effort

1) A person may not obstruct, impede, prevent, or otherwise interfere with a lawful aerial wildfire suppression response by a state or local government effort by any means, including by the use of an unmanned aerial vehicle system.
2) As used in this section, the following definitions apply:
   a) Unmanned aerial vehicle" means an aircraft that is:
      i) capable of sustaining flight; and
      ii) operated with no possible direct human intervention from on or within the aircraft."
   b) Unmanned aerial vehicle system" means the entire system used to operate an unmanned aerial vehicle, including:
      i) the unmanned aerial vehicle

ii) communications equipment
iii) navigation equipment
iv) support equipment; and
v) autopilot functionality

81-7-506. Prohibition against harassing livestock.

While engaged in flying an aircraft, no person, whether or not lawfully authorized to aerially hunt, may knowingly harass, injure, or attempt to injure any livestock except with the express permission of the owner of that livestock.[16]

Recent Montana UAS Bills

Over the last decade, as the issue of UAS has expanded, state legislatures have seen bills introduced regarding their use. Below are the bills that have been introduced in Montana since 2013. Of the introduced bills, only one has been passed: HB257 (2019). HB257 made a change to law (46-5-109 MCA) that allows law enforcement to employ a UAS to acquire evidence at traffic accidents without a search warrant.

Besides the bills in the list below, there were a number of 'bill requests' that were never drafted or introduced (and therefore not listed in this document). The laws that have been added or amended relating to UAS operations (above) have not appeared to have infringed on the FAA's role in regulating the NAS.

2013

SB150 (*Driscoll*) Prohibit state government from owning or using unmanned aerial vehicles (Died).

2015

HB278 (*Essmann*) Generally revise fish and game laws with respect to unmanned aerial vehicles (Died).
HB593 (*Essmann*) Establish the Montana unmanned model aerial vehicle act (Died).

2017

SB172 (*Hinebauch*) Provide civil liability for unmanned aerial vehicle trespass (Died).

2019

HB257 (*Curdy*) Allow certain UAV information to be admissible (Passed: 46-5-109 MCA).

[16] NOTE: The above sections of Montana law (MCA) were previously existing and were amended to add references to 'Unmanned Aerial Vehicle' to accommodate the new technology.

HB655 (*Dooling*) Revise Drone Laws (Died).

Section 4 Review of Other States' Legislative Activity regarding UAS Oversight

Other state legislatures have debated if, and how, drone technology should be regulated considering the benefits of their use, privacy concerns, and their potential economic impact.

Below is an overview of the 2020 state legislative sessions relating to UAS issues:

- **Florida, Idaho, Minnesota and South Dakota** — allowed UAS operations by emergency management workers, including wildfire management.
- **Minnesota and Missouri** — prohibited UAS flying over certain property, including correctional and mental health facilities and open-air facilities such as sports stadiums.
- **Idaho and Minnesota** — permitted law enforcement agencies to operate UAS for specified purposes, including traffic crash reconstruction, search and rescue missions, and training purposes.
- **Vermont** — prohibited law enforcement from operating UAS while using facial recognition, except for purposes such as search and rescue and assessing wildfires, floods, and storms.
- **Florida, Massachusetts and Virginia** — appropriated funds for UAS-related certifications, programs, and public-private partnerships.
- **Virginia** — empowered localities to regulate the takeoff and landing of UAS on property owned by the locality. Previously, localities were preempted from regulating UAS.

Regulation activity in other states

As the UAS industry has grown, at least half of the states have passed legislation that addresses the ability of public and private drone operators to take photographs, make recordings, or engage in surveillance activities. Other states believe that their general privacy laws provide adequate protection in regard to drone use. Below are some examples of the types of activity occurring in other states; a comprehensive review of each state was beyond the capability of the council, as the landscape continues to change too rapidly to present here.

In 2013 Idaho added a new law regarding UAS operations and conduct that includes the definition of UAS, and the private and public use, and violation damages (Idaho Code 21-213). This section of Idaho law is similar to a general section of Montana law regarding 'Surreptitious visual observation': 45-5-223 MCA.

In North Carolina, the 2013 Legislation gave their State CIO oversight of UAS in state and local government for procurement, operations and oversight with instructions to conduct a study and report back to the legislature. Today, the state's central oversight is housed in the North Carolina Department of Transportation Division of Aviation with a program focus "on enabling the

beneficial use of UAS (drones) in the state and supporting the growth and development of the state's drone economy."[17]

In 2015 the Illinois legislature created a Task Force to "provide oversight and input in creating comprehensive laws and rules for the operation and use of drone technology within this State, subject to federal oversight and regulation." Their action directed the Task Force "to study and make recommendations for the operation, usage, and regulation of Unmanned Aerial Systems."[18] The Task Force released their report in 2016 titled *UAS Recommendations Report*.[19] The Task Force authority was later repealed, and subsequently appears to be now managed by the Illinois Department of Transportation.

Florida has a law prohibiting the use of a UAS to capture an image of privately owned property without consent if a reasonable expectation of privacy exists. 934-50 also addresses law enforcement use: 'A law enforcement agency may not use a drone to gather evidence or other information'[20] with some exceptions.

In California UAS law 1708.8 states 'A person is liable for physical invasion of privacy when the person knowingly enters onto the land or into the airspace above the land of another person without permission or otherwise commits a trespass in order to capture any type of visual image, sound recording, or other physical impression of the plaintiff engaging in a private, personal, or familial activity and the invasion occurs in a manner that is offensive to a reasonable person.'[21] A person violating their state law could be subject to penalties up to $50,000. This is a lengthy section of law that includes some exceptions.

North Dakota is very invested in the UAS industry and recognizes future growth in the years ahead. Their state legislature has passed laws over the last several years relating to UAS operations and appropriated tens of millions of dollars supporting the development of this important industry in their state. They also have worked in concert with the FAA in their law passage, programs, and grants. In 2019, the state of ND invested $28 million in funding for a statewide network supporting UAS flights beyond visual line of sight. The network built on previous UAS advancements in the state and supports the safe integration of UAS into the NAS.

North Dakota also does not require a person to register a UAS with the state; while Century Code Section 2-05-11 requires *aircraft* operating within the state to be registered annually with the Aeronautics Commission, along with a fee based on the weight of the aircraft, the

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[17] Excerpt taken from the sUAS News press release advertising a vacant UAS program manager position; https://www.suasnews.com/2020/04/ncdot-unmanned-aircraft-systems-uas-program-manager/

[18] http://www.ilga.gov/legislation/ilcs/ilcs3.asp?ActID=3664&ChapterID=5 (June 20, 2016)

[19] https://idot.illinois.gov/Assets/uploads/files/Transportation-System/Reports/Aero/IUASOTF/UAS%20Recommendations%20Report-IUASOTF-2016-06-30.pdf

[20] https://www.flsenate.gov/laws/statutes/2017/934.50

[21] https://leginfo.legislature.ca.gov/faces/codes_displaySection.xhtml?sectionNum=1708.8.&lawCode=CIV

Aeronautics Commission has not interpreted that statute to require UAS be registered with the commission.

In 2013, the Texas Legislature passed H.B. 912. The bill required that no earlier than January1 and not later than January 15 of each odd-numbered year, a municipal law enforcement agency located in a county or municipality with a population greater than 150,000 that used or operated an UAS during the preceding 24 months shall issue a written report to the Governor, the Lieutenant Governor, and each member of the Legislature. In 2018, Texas established the authorized use and operational guidelines for their UAS program within the Texas Department of Public Safety. Their UAS program is a function of the individual divisions who are responsible for purchasing, maintaining, manning, operating, and storing UAS, but with oversight advisory for compliance to regulations by the Aircraft Operations Division (AOD) Chief Pilot.

Texas has made considerable progress in implementing UAS technology into their law enforcement through the Texas Police Foundation, addressing Community Engagement, System Requirements, Operational Procedures, and Image Retention. Their document titled *Community Policing & Unmanned Aircraft Systems – Guidelines to Enhance Community Trust* includes an emphasis on personal rights found within the Constitution regarding privacy.[22]

Conclusion

Since 2013, over 40 states have enacted drone-related laws, regulations, or both. States have addressed privacy issues, criminal penalties for drone misuse, commercial and government drone operations, and recreational drone use. At least 12 states have passed legislation preempting localities from enacting drone regulations. At least 19 states, including North Dakota, require law enforcement agencies to obtain a search warrant to use UAS for surveillance or to conduct a search.

Twenty-three states have laws criminalizing certain uses of UAS. These laws include criminal penalties for UAS interference with police, firefighters, or first responders providing emergency services; UAS operation over or near critical infrastructure or correctional and military facilities; and unlawful weaponization of UAS. Several states also prohibit the use of UAS for hunting or fishing while some states prohibit using UAS to interfere with other individuals lawfully hunting or fishing.

As adoption of UAS technology continues to grow across so many industries and applications, it is expected that states will continue to pass statute and regulations to address the appropriate application of UAS within their boundaries. Many states seem to be following a model of centralized coordination; these are generally operated out of their respective departments of Emergency Services, departments of Justice, departments of Commerce, or departments of

[22] https://rems.ed.gov/docs/COPS_Community-Policing-UAS.pdf

Transportation. For current updates on state laws and regulations regarding UAS, see the National Conference of State Legislatures website[23] regarding the UAS state law landscape.

[23] https://www.ncsl.org/research/transportation/current-unmanned-aircraft-state-law-landscape.aspx

Section 5 Respecting Citizen Privacy: Citizen Interaction, Privacy Concerns, and Transparency

Conducting UAS missions over private property is at best, a complicated issue for state government agencies. The rights of citizens to privacy in Montana is found in the State Constitution itself, as noted earlier in this document. Case law on what this means, however, has a high degree of subjectivity regarding "reasonable expectation," the "immediate reaches of the enveloping atmosphere," the extent of a "buffer zone," and one's "full enjoyment of the property." This can make it difficult for state agencies to successfully integrate the technology into their workflows and mitigate the risks of inadvertently transgressing the law. Based on the previous discussions of Constitutional law, FAA regulations, and State statutes, the following are emphasized as three areas legally that state agencies must pay close attention to in order to maintain successful programs and positive citizen relations without legal transgression.

Citizen Interaction

Public participation and interaction is essential to our government processes and decisions. In Article II, Section 9, the Montana Constitution states:

'No person shall be deprived of the right to examine documents or to observe the deliberations of all public bodies or agencies of state government and its subdivisions, except in cases in which the demand of individual privacy clearly exceeds the merits of public disclosure.'

Regarding UAS, public participation is essential in the formation of state policy regarding the operations of UAS programs. Even though all national airspace is under the sole authority and control of the FAA, as a courtesy, and prior to conducting operations over private property, state agencies should attempt to notify property owners before their flight(s). Notification should indicate the purpose of the mission and where citizens may obtain and view the data collected. This property owner interaction is to enhance open government and transparency. If the landowner is not available to notify, the state agency should use their discretion for their operation, keeping in mind Part 107 restrictions, citizen privacy concerns, and other applicable state statutes. To maintain positive public relations, if the property owner insists to oppose flights over their property ownership, the agency may consider delaying, canceling, or altering the flight; but should make such determination within the need and public benefit of the intended flight mission. All such missions over private property should keep in mind Article II, Section 10 of the Montana Constitution discussed below.

Also, agencies that are utilizing UAS technology should work together to develop and maintain an internet based information system to facilitate a citizen's ability to interact with their government. This system should provide the ability for citizen comments, feedback, questions, and concerns regarding any operations in the NAS, and should be augmented with a process by which such interaction is addressed.

Privacy Concerns

Article II, Section 10 of the Montana Constitution guarantees the 'Right to Privacy.':

'The right of individual privacy is essential to the well-being of a free society and shall not be infringed without the showing of a compelling state interest.'

This should be the guiding principle for all state agency UAS use when it comes to flight missions around citizens and anthropogenic activities. The laws pertaining to UAS and privacy are evolving rapidly. Agencies using UAS should be aware of the privacy implications of doing so.

Typically, where there is public access in such traditional public forums as a sidewalk or a park, recordation may be made of anything in plain sight (i.e. buildings, people) because in such places there is no reasonable expectation of privacy. In other areas that are generally open to the public but may be privately owned (such as a mall) recording may be restricted either by posted signs or by the property ownership personnel.

Current case law is not clear at what height above ground level (AGL) over private property an UAV needs to be to prevent the full enjoyment of the property by the landowner and to not infringe on the reasonable expectation of privacy by the same. Since maintaining positive citizen relations regarding state agency use of UASs is of paramount importance, state agencies should be certain the compelling state interest in flying over private property against a landowner's wishes outweighs the merits of positive citizen relations. It is recommended that legal counsel advise agency programs in this matter, as each state agency UAS mission is different. State agencies should make significant effort to achieve the mission of the organization in a means that maintains citizen privacy and positive citizen relations.

The State of Montana may wish to consider, either through policy, rule, or statue, a more definitive elevation AGL which meets the objectives of not infringing upon the property owner's rights in the use and enjoyment of their property. This would resolve different state legal counsel across state agencies from the complication of differing opinions on the matter. Again, in order to avoid confrontations with property owners, it is advisable to inform them before proceeding with such missions.

The Council hesitates to require state agencies to *ask* for permission of private land owners, as this may infer a legal right that may not exist. This practice may be found to be more confusing on the issue and ultimately could complicate legal cases.

In Montana, 45-5-223(1)(b) MCA addresses 'Surreptitious visual observation or recordation':

'by means of an electronic device, surreptitiously observing or recording the visual image of any occupant in the residence without the occupant's knowledge.'

While the observation and recording of occupants in a residence has little place in most state agencies, the broader topic of observing or recording citizens without their knowledge is something the state should be cautious to avoid, and when it may occur, to take appropriate mitigation. Missions over public settings should have some means of attempting to notify the public. Images captured in a public setting of identifiable citizens that are not participating in the state agency's operation should have identifying information removed (i.e. faces, license plates, etc.) when possible, so that the original source information cannot be known (aka 'anonymize' the data). Obtaining image data of public places, right of ways, highways, parks, etc. would be accepted as inadvertent acquisition.

State agencies are also encouraged to review the *Department of Commerce National Telecommunications and Information Administration (NTIA)* best practices, which address privacy, transparency and accountability issues related to commercial use of UASs (Appendix A).

Prior to each UAS flight, an agency should determine whether changes in law may impact the flight. In addition, agencies should consider whether privacy rights might be infringed upon and consult agency-specific policies and legal teams regarding any potential issues involved in a planned UAS flight. Before using or releasing any data obtained from a UAS flight, agencies must consider whether confidential information may be present in the data, and either remove it or obtain permission to use such information, as outlined in the Data Handling section of the Montana Plan.

In addition to limitations based on privacy rights, agencies should consider whether law enforcement or regulatory use may infringe upon other constitutional rights (e.g., if use may constitute a search, a warrant may be necessary).

Transparency

Working hand in hand with a citizen's ability to interact with their government is government transparency. Citizens could become concerned if a UAS is being used by government agencies near their homes or personal property. In order to address these concerns and perceptions, state agencies shall take steps to mitigate and reduce these risks and concerns. As much as is allowed legally, it is important to assure the citizens of Montana that the use of UAS technology is done legally and in an open manner, with as much information as possible provided. Citizens must also be assured that safeguards have been put into place to prevent misuse of the technology that would harm a free and prosperous Montana.

State Agencies with UAS programs should have information regarding their program publicly published. Information on the State's protocols and guidelines for operations should also be centrally located and published (most likely via the internet) so that the public can readily see the requirements and safeguard the state follows to keep citizens safe and their privacy protected.

Besides notifying citizens regarding UAS programs, prior to conducting UAS missions (especially when a citizen impact can be expected) state agencies should also make available information regarding their UAS missions and, when appropriate, the ability for citizens to request and obtain the publicly available information gathered by the mission. Citizens should also have a means to make inquiry and file complaints regarding agency use of UAS. At minimum, a web portal to meet these objectives should be established and maintained by the UAS coordinating agency for all state agencies.

Part III

The Montana UAS Plan

Section 1 Procurement and the Cost-Benefit Analysis

Recommended Requirements

The Council submits the following recommendations to the Governor regarding the procurement and acquisition of UAS programs and resources.

General Requirements

Unmanned Aircraft Systems (UASs) are being leveraged across numerous industries to improve services at lower risk and cost than alternative methods.[24] In order to ensure proper state procurement laws, rules, and policies (see sections V-VIII below) are being adhered to, the following guidance is given.

A UAS is comprised of four main components: 1) An airframe/power plant; 2) remote sensing devices that attach to the airframe; 3) a flight control mechanism and 4) data. According to the 1958 Federal Aviation Act, the UAS operates under the Federal Aviation Administration (FAA) authority. As such, the airframe/power plant is similar to any other aviation device; accordingly, acquisition of such must follow normal state procurement rules and adhere to the appropriation authority and budget availability given to state agencies. The device(s) that attach to the airframe include such remote sensing sensors as cameras, infrared sensors, multi-spectral imaging sensors, atmospheric sensors, LiDAR sensors, or even non-sensor payloads such as equipment haulers, emergency service supplies, documentation, or any number of other types of payloads. The procurement of such periphery devices should also follow standard state procurement laws, rules, and policies. If such a device is intended to connect to the state network in order to retrieve the data collected by the device, an Information Technology Procurement Request (ITPR) should be filed with the Department of Administration's State Information Technology Services Division (DOA SITSD) in accordance with ARM 2.12.204.

The data collected by such devices and owned by the State of Montana is subject to 2-15-114 MCA. It is also subject to data security laws in MCA 2-17-534 along with other applicable federal and state security and privacy laws. Such information collected, processed, transmitted, or stored by the State must meet State IT Policy requirements for the handling of state data in accordance with applicable law. In some instances, there may need to be procured software for flight planning and/or processing of data collected by a UAS device. Such software procurement falls under the purview of ARM 2.12.204.

Recently, certain UASs have come under scrutiny due to the sourcing of flight and data collection components originating from foreign nation states that may have an ulterior intelligence interest in U.S remotely sensed data. Each device should therefore be measured in

[24] In Montana, a 2021 conservative analysis within DNRC showed that in the first 65 flights the department saved approximately $50,000, mostly in staff time that was then turned into additional productivity. The MDT has shown similar cost savings within their engineering department.

regards to FAA security guidance, National Institute of Standards and Technology (NIST) guidance, Department of Homeland Security (DHS) guidance, State of Montana security guidance, any other applicable security guidance, and the intended nature and purpose of the UAS for state agencies.

Cost and Benefits Analysis

In accordance with Executive Order No. 04-2020 Section 1.1, the council recommends that all state agencies seeking to establish a *UAS program* shall conduct an analysis to consider the expenses (costs) and savings (benefits) pursuant to the establishment and operation of a UAS *program* within their agency. Whereas the June 2019 legislative audit titled *Unmanned Aircraft Systems Deployment and Oversight* suggested a Cost-Benefit analysis be conducted before procuring a Unmanned Aerial Vehicle (UAV) device, the Council found that a Cost-Benefit analysis per device may be overly encumbering and less than beneficial if the program itself has already been vetted by such an analysis. With a vetted program, an additional device is analyzed as to how it pertains within the overall program, and if it is still within the cost-benefit of an established program to add or replace a UAV device. Regarding the $1,000 threshold for an analysis, the Council reviewed current state policy and suggests that procurement of Unmanned Aircraft Systems or UAS Services from an authorized service provider that are in excess of *five-thousand dollars* ($5000) should be reviewed to ensure it fits within the Cost and Benefit analysis for the program. This five-thousand dollar figure aligns with current state procurement policy, and justification of an artificial lower threshold for UAS procurements and not the myriad of other state procurements is lacking. Anything beyond a simple prosumer type UAV device will likely exceed this threshold and would fall under state procurement guidelines which should include a Cost-Benefit analysis.

The Cost-Benefit analysis should include, at a minimum, a consideration of:

1) Business Need Justification – an outline of the need for the UAS and what service it will perform for the organization
2) Goals & Objectives – a description of the desired outcome to meet the business need
3) Outline of Options – identification of the current solution(s) and the various options available to meet the business need
4) Options Analysis – a consideration of the expenses, savings, risks, and benefits of each option
5) Recommendation and Justification – a description of the recommended course of action and the justification for the decision
6) Authorizing Signature – approval signature of the authorized budget agent or Chief Financial Officer of the organization for the analysis, and for the appropriated funds to be expended for the recommended solution (if appropriate).

When considering the establishment of a new UAS program or for significant procurements requiring a full competitive procurement process, a more comprehensive business case analysis

is recommended. See the Montana State Procurement Bureau guide for more information regarding such financial analyses.[25] An exemplary Cost-Benefit analysis form is attached to this policy as Appendix B for convenience; agencies may prefer to capture the same information in another digital solution format.

Alternately, any state agency who contracts a UAS operation must confirm contractor pilots are current FAA certified remote pilots and have necessary insurance. Requirements for contracts is addressed in part VI of MOM-SFSD-POL-Advanced Procurement Requirements and Issues.[26]

Shared UAS Resource Pool

The June 2019 legislative audit regarding UAS Deployment and Oversight suggested there may be benefit in establishing a shared pool of UAS resources for agency use, similar to the State Motor Pool. After careful review, the Council made the following determination and gives this recommendation:

Unlike motor vehicles, a UAS has constant software upgrades, training regimes that vary depending on UAS type (i.e. aircraft size, rotary vs fixed wing, etc.), and requires vigilant maintenance oversight. For example, unlike a standard vehicle, UAS flight logs need to be separately monitored for malfunctions and/or unreported accidents after each mission (per FAA requirements). Protocols for remedying issues in log reports is very dependent on the aircraft manufacturer. Typically, in a UAS program, there is a designated individual with the ability to maintain the aircraft, who then confirms airworthiness. This is designed to reduce risk and exposure to liability for the organization as well as the general public.

To ensure aviation safety, President Franklin Roosevelt signed the Civil Aeronautics Act in 1938, creating the Civil Aeronautic Authority (CAA). In 1958, President Eisenhower signed the Federal Aviation Act, which transferred the CAA's functions to a new independent Federal Aviation Agency (FAA), that is responsible for civil aviation safety in the National Airspace System (NAS). All aircraft operation, manned and unmanned, in the NAS is subject to FAA rules and regulations. The FAA has developed an exam process for UAS government/commercial pilots called the Remote Pilot Certificate. All Remote Pilots in Command (PIC) must possess a current FAA Certificate while operating the UAS. This is a non-transferable certificate for the PIC that must be renewed every 24 months - also by passing an exam. FAA's certification of manned and unmanned PICs is essential for the safety of the public. It is the responsibility of the PIC to ensure that all UAS equipment is maintained and operations are safely conducted. It is very important that all UAS operations by state agencies adhere to current FAA regulations.

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[25] The guide can be found at https://spb.mt.gov/Procurement-Guide.

[26] The guide can be found at https://montana.servicenowservices.com/citizen/?sys_kb_id=5b773fa81bdc70103de00d08ec4bcbcb&id=kb_article_view&sysparm_rank=1&sysparm_tsqueryId=b28c63ba1b613010ed0ca64ce54bcbc0

Safety and liability are significant topics of concern by the Council. Although all state UAS fall under state insurance coverage, there is a question of increased liability for PICs conducting missions with UAVs that have not been under their control and that may have been compromised by a previous user, agency, or even general excessive use. Additionally, pilots not intimately familiar with the flight controls of a particular model of UAS might fly with increased risk, as models will more frequently be replaced in a shared pool model due to the increased use and replacement schedule of each device with newer models.

Furthermore, with a fairly low financial barrier to entry into developing a small UAS program, and the rapid adoption of the advantages of the technology for ad hoc missions, a shared pool offers little in the way of cost savings. What savings are seemingly achieved will be consumed by the logistical efforts to manage the pool and to acquire a shared device for distributed missions across the state, and will be quickly offset by the increased risks and liability outlined above.

Therefore, the Council has unanimously determined that given the increased risks associated with shared devices and the logistics around maintaining proper inventory availability, equipment delivery around the state, and tracking each mission log and maintenance performance records, a shared UAS pool is not a cost benefit at this time.

However, if the State still wanted to adopt a shared pool of UAS resources, the Council recommends:

1) The definition of a "shared" resource should include both the UAS *and* a qualified pilot. Meaning, a dedicated pilot is reserved and provisioned with the pooled UAS device to operate that device on each specific mission.
2) A centralized statewide UAS office should be established and funded that officially owns all the UAS equipment along with personnel to provide training, maintenance activities, scheduling of resources, collection of mission reports, and pilot services. A budget estimate for this office is approximately $650-$750k annually[27] for 4-5 FTE and maintenance/replacement costs, plus operations billed to serviced agencies.

The Council does not see the cost and cost recovery model of such a centralized service model being readily adopted by the limited budgets of the departments at this time.

The Council also recommends that departments with limited UAS resources consider either procuring UAS services from the private sector through already established contracts (NASPO, etc.), or leveraging a Memorandum of Understanding (MOU) with departments having mature UAS programs to cover the cost of a device and an associated pilot from the provisioned

[27] This estimate was made in early 2021 and does not account for recent inflationary trends. By the time of this publication, it is likely low.

department to conduct the mission. Either model might cost effectively satisfy the need for infrequent UAS use depending on the need and scope of the mission, without having to fund a centralized office.

The real value in sharing when it comes to UAS is seen in the sharing of the data, not the devices. Data sharing can have tremendous benefit in reducing duplication of effort and obtaining increased value from already acquired mission data for secondary citizen services. The Council recommends that a data-sharing framework be developed that will encourage and enhance the ability for agencies to share the UAS data they collect with each other and the public, as may be deemed appropriate.

Additional Recommendations

1. State Procurement Bureau (SPB) statutes, administrative rules, and policies govern procurement in general. These recommendations are not intended to exempt agencies from complying with SPB procurement requirements or the public contract provisions defined in Montana Code Annotated Title 18. Federal purchasing requirements may necessitate a review of the Montana SPB procurement provisions regarding UASs, as in the interest of national security exceptions for UAS procurements may be necessitated.

2. Each department is to keep a compilation of the Cost-Benefit Analyses conducted in accord with their UAS program and make such available upon request.

Relevant Legislation (for reference)

1) Section 2-15-114, MCA
2) Section 2-17-512 , MCA
3) Section 2-17-534 , MCA
4) Section 2-6-1502, MCA
5) Section 18-4-402 , MCA

Relevant Executive Orders and Administrative Rules (for reference)

1) State of Montana Executive Order No. 11-2019
2) State of Montana Executive Order No. 04-2020
3) State of Montana Executive Order No. 14-2020
4) ARM 2.12.20
5) SPB Administrative Rules: ARM Title 2, chapter 5

Relevant Policies and Procedures (for reference)

1) SPB Policies in the Montana Operations Manual: Procurement
2) PRO-Information Technology Procurement Request Procedure

Relevant Guidelines and Standards (for reference)

Code of Federal Regulations for small unmanned aircraft systems *(CFR – Title 14 Chapter I Part 107.1,3 Definitions)* apply

Forms, Memoranda, and Other References

1) Appendix A-2, UAS minimum Cost-Benefit Analysis Form

Section 2 Centralized Oversight Structure Recommendation for Montana State Agencies

Purpose:

To establish requirements for centralized oversight and control of state agency Unmanned Aircraft System (UAS) resources to ensure consistency, prevent duplication of agency efforts, and implement effective UAS management.

Summary:

It is recommended that a permanent UAS Council/Board be established that would report to the Governor's Office and have oversight authority of state UAS operations to ensure compliance with state policy, statutes, and FAA requirements, and ensure transparency to the citizens of Montana regarding state UAS operations. The MDT UAS Operations Unit should provide logistical support to the Council/Board.

Oversight Recommendation

It is hereby recommended that a council/board be permanently established that would have oversight authority over UAS operations for the State of Montana and ensure compliance with FAA regulations by state agencies; and to assign a state agency program that would be responsible to collect identified information for each agency's UAS program and supply this information to the Council/Board. The MDT UAS Operations Unit is recommended to fill this role.

FAA Compliance

The Federal Aviation Administration (FAA) has full legal authority over all US airspace and has clearly defined operational guidance for UAS that should be followed (https://www.faa.gov/uas/). All Montana UAS pilots must adhere to current FAA regulations (14 CFR 107, 49 USC 40102 (a)(41)(A)-(F), 14 CFR part 48).

State of Montana Compliance

The Department of Administration (DOA) should consider establishing a base policy for UAS operations that would apply to each department in the Executive branch, and could be adopted by other branches as they see fit. Each state agency/organization within the State of Montana should draft additional policy as needed with regard to their particular UAS operations, that at a minimum are in accord with state policy, this guiding document, and in reference to the requirements of Part 107 and/or any Agency COA. Adoption of such policies will be finalized after review by the DOA and the established UAS council/board to ensure compliance and continuity with the State of Montana and FAA regulations.

Oversight Procedures

Oversight by the MDT UAS Operations Unit will be logistical (not authoritative) and should include maintaining a database for collection of all state-employed FAA certified Part 107 Remote Pilots, pilot training, pilot annual flight hours, aircraft registrations, and current state agency COAs/Waivers for operations, and any other information deemed necessary to aggregate at the state level to ensure compliance with FAA & State Operational Guidelines (see section 3 of the Montana UAS plan). This database should be updated annually, at a minimum. Additionally, each agency should establish documentation protocols for tracking UAS maintenance logs, airworthiness logs, software updates, cost-benefit analyses, and operations checklists subject to an annual audit at the request of the UAS council/board.

MDT Responsibilities:

- Provision of and support for a shared process for database inputs
- Provision of and support for a shared statewide repository of UAS related policies, training, and operations
- Provide an annual written report of database information by agency given to the UAS council/board
- Set council agendas and schedule council meetings (council logistical support)
- Coordinate, develop, support and maintain a web site/portal for Citizen Transparency, Accountability, Data requests, and Citizen complaints, as outlined in this document.
- Coordinate the development of a centralized library for flight data

UAS Council/Board Responsibilities

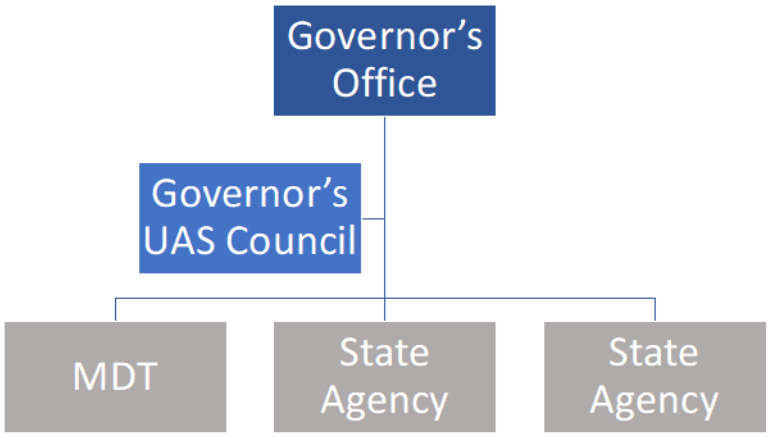
- Conduct an annual audit/review of state agency programs and policies
- Annually evaluate the UAS 'landscape' for furthering the State of Montana's interest in leading UAS operations nationally, making recommendations to the Governor's Office and/or legislature as necessary.
- Annually review and update the Montana UAS Plan.
- Conduct Quarterly meetings that shall:
    - review adoption of any new UAS policies
    - provide guidance on operational input for public and/or civil operations in adherence with new FAA regulations
    - provide guidance on leveraging interagency operations.
    - provide for public transparency of State UAS operations.
    - review any incidents or notable UAS operational activities in state agencies

Governor's UAS Council/Board Composition

To maintain operational best practices and transparency for citizens, it is recommended that a State of Montana UAS council be formed and comprised of representatives appointed by the Governor from UAS active state agencies, the MUS system, and the private sector. With a diverse assemblage of members, a comprehensive development of optimal guidelines in the future is more assured. Coordination services would be provided by the MDT UAS Operations Unit to facilitate interagency coordination, cooperation, communication, and operational transparency. This council can provide guidance for establishing agency specific training, facilitating the list of agency aircraft, operational input for public and/or civil operations, and establish language for memorandum of understandings (MOUs) for leveraging interagency operations and partnerships, both with the Montana University System, state departments, and other interested parties, as appropriate.

Governor's UAS Council/Board Authority

This oversight structure is recommended to maintain operational best practices, avoid duplication costs, to improve the safety, efficiency, and fiscal discipline of agency UAS programs, and to provide proper transparency to the citizens of Montana regarding state UAS operations. The council should have authority under the governor's office to issue corrective actions to state agency programs that do not meet requirements established in the Montana UAS plan. After a given timeline to address deficiencies, the council may recommend to suspend a program under the Governor's authority.



This recommendation is based on research into other states' UAS oversight and management structures[28] as well as consideration of the State of Montana's organizational structure, budgets, and procurement authority. Having centralized authority reside in one department (outside of the DOA) over its peers could be problematic to enforce both operationally and fiscally. A UAS Council can be conferred oversight authority that should not lie within a single state agency and

[28] See Part II Section 4 of this document.

would provide the broad representation of stakeholders envisioned to make up a proficient UAS Council. Additionally, the UAS Council represents transparency to, and inclusion of, the public to be involved in the oversight process, a facet deemed essential to a successful UAS program in Montana state government. This component seems either lacking or insufficient in many of the other state models when it comes to centralized oversight.

Section 3 Operational Protocols – Standards and Best Practices

The following recommendations are given to guide state UAS programs in the operational exercise of their UAS.

All flight operations should be conducted in accordance with current FAA regulations (14 CFR 107, 49 USC 40102 (a)(41)(A)-(F), 14 CFR part 48) and/or a COA, as appropriate; State & Agency Statute and Policy; the Montana UAS Plan; and the operator's manual for the subject aircraft. Only authorized operators who have completed the required training shall be permitted to operate a State owned UAS. Agencies shall collect information using a UAS, or use UAS-collected information, only to the extent that such collection or use is pursuant to an authorized purpose. In all other instances, legal counsel should be consulted.

FAA regulations[29]

There are two potential options for any operation of UAS as a state entity: *civil operations* or *public operations*. In simple terms, a state may choose to fly under Part 107 under civil operations, or they may choose to fly under public operations utilizing a Certificate of Authorization (COA). Each UAS mission or operation should be assessed on a case-by-case basis as to which operational regulations an entity will follow. If an agency determines they wish to operate under a COA, they may still fly individual operations under Part 107, but must still meet the reporting requirements of the COA.

CFR 14 part 107.1 provides applicability of conducting a civil operation. All operations that do not meet the public aircraft operations criteria constitute civil operations. Civil UAS operations are either recreational or commercial in nature. For example, UAS operations to take photographs for personal use would be recreational in nature, whereas operations to take photographs for compensation (e.g., real estate) or sale would be commercial.

Title 49 of the United States Code (49 U.S.C.) § 40102(a)(41) provides the definition of "public aircraft," and § 40125 provides the qualifications for public aircraft status. Public operation includes an aircraft that is owned or leased exclusively by the US government, the government of a US state, the District of Columbia, a territory or possession of the United States, a political subdivision of one of those governments, or a tribal government. Public operation is operated for purposes that meet the statutory criteria of a 'governmental function', and that is not operated for commercial purposes (i.e., operations for compensation or hire).

[29] (see the FAA UAS website: https://www.faa.gov/uas/ for the comprehensive and current requirements)

Civil Operation Specifics

For information on civil operations, reference CFR 14 parts 107, 47, 48, 71, and 91 for operating under part 107, Advisory Circular (AC) 107-2, Small Unmanned Aircraft Systems (sUAS) and FAA Order 8900.1, Flight Standards Information Management System (FSIMS) Volume 16, Chapters 1-5, focusing on:

- Volume 16, chapter 2 section 1
- Volume 16, chapter 3 section 1
- Volume 16, chapter 4 sections 3 and 6.

Civil operations over 55 lbs should reference Special Authority for Certain Unmanned Systems (49 U.S.C. §44807).

Waivers – To receive approval for missions outside the limits of the Part 107 regulation see https://faadronezone.faa.gov/

LAANC Authorizations- LAANC is the Low Altitude Authorization and Notification Capability, a collaboration between FAA and Industry. It directly supports UAS integration into the airspace.

LAANC provides:

- Drone pilots with access to controlled airspace at or below 400 feet.
- Awareness of where pilots can and cannot fly.
- Air Traffic Professionals with visibility into where and when drones are operating.

For more information on the LAANC system and how to utilize it, see https://www.faa.gov/uas/programs_partnerships/data_exchange/

Public Operation Specifics

Reference statutory requirements for public aircraft: 49 U.S.C. §40102(a), § 40125, Advisory Circular 00-1.1B Public Aircraft Operations—Manned and Unmanned, and FAA Order 8900.1, Flight Standards Information Management System (FSIMS) Volume 16, Chapters 1-5 focusing on:

- Volume 16, chapter 2 section 2
- Volume 16, chapter 3 section 2
- Volume 16, chapter 4 sections 1 and 7

Certificate of Authorization (COA) – is an authorization issued by the Air Traffic Organization to a public operator for a specific UA activity or broad range of activities. Some advantages of a

COA include self-training/certification for pilots and flights in certain airspace without pre-approval, but come with additional reporting and administrative processing requirements and potential legal responsibilities. To operate a specific UAS activity under a COA as a public entity, please reference the following: https://www.faa.gov/about/office_org/headquarters_offices/ato/service_units/systemops/aaim/organizations/uas/coa/

Recommendations for Montana Agencies

Standard operating procedures become policy

As noted earlier, the Montana UAS Council recommends DOA to establish a base UAS operational policy for the Executive Branch. Each agency/organization within the State of Montana should draft policies in reference to the requirements of Part 107 (see Part 2 Section 2 of this Plan) or an Agency COA, with regard to their particular UAS operations if needed beyond the base policy. Adoption of such policies will be finalized after review by the State of Montana UAS Council/Board to ensure compliance and continuity with State of Montana and FAA regulations. To ensure compliance in UAS program operations, a standardized operational checklist or use of a fleet management software package is recommended. Examples of Flight Checklists, Maintenance logs, Flight Logs, and accident/incident reports are provided in Appendix C through G. Each state of Montana entity shall designate a point of contact or responsible party for their overall UAS operations identified as the UAS Program Manager.

Training

All state agencies should adhere to rigorous training protocols to mitigate operational risk and state liability. All state employees who qualify as remote UAS pilots shall possess a current FAA certified remote pilot license (Part 107) and have passed an annual agency approved practical flight review for the type rating of aircraft to be flown. (See Appendix H for an example rotary flight review.) Agencies that desire to develop a more robust training requirement should refer to McKnight et al., (2020).[30]

[30] McKnight, C. V., Matt DeGarmo, Bill Foster, Carlos E Martinez, Janet S. Mittel and Laura Rodriquez 2020, Unmanned Aircraft System Pilot Training Program Analysis. MITRE Center for Advanced Aviation System Development for the Federal Aviation Administration, Project No. 0220BB06-FI

Operational Procedures

Pre-flight

Preflight activities are the duty of the PIC before the start of the flight operation. Activities include inspection of the aircraft, assessment of the operating location, briefing crew members involved in the operation, and equipment checkouts.

A pre-flight report shall be documented to include, at a minimum: mission purpose, date, location, personnel, required wavers or authorizations, verification of flight conditions and risk assessment, and equipment maintenance check.

Mission Control

The PIC will be responsible at all times for the supervision and operations of the UAS in accordance with FAA regulations and Montana state policy for UAS Operations (FAA Section 107.19 Remote pilot in command; Flight Standards Information Management System (FSIMS) Volume 16 chapter 2). Flight operations shall take into consideration citizen privacy rights and transparency requirements for operating a State of Montana UAS program as outlined in these recommendations (See Part II Section 5 of this document).

Post-flight

A post-flight report shall be documented to include, at a minimum: mission purpose, date, location, personnel, success/failure of the mission flight, and any pertinent notes of incidence regarding the mission.

Emergency procedure(s)

Aircraft Accidents, Incidents and Hazards

Hazards are inherent in the operation of UASs. A hazard identification process will be used to determine the possible situations, events, and circumstances that may expose people to injury, illness, disease, death, or may cause damage or loss of equipment and property, or damage to the environment. Each agency is responsible for incorporating UAS accident reporting into their current incident reporting policy. In the case of an accident or incident, follow all appropriate procedures as required by FAA regulations and state/agency policy. The PIC is required to report an accident or incident immediately to the Program Manager, supervisor, or head of the agency. In the event of loss of property or injury, the PIC must complete a Report of Incident form and follow the instructions provided (Appendix F). If there is an injury to state personnel, a First Report (Appendix E) must also be completed and submitted to the appropriate authority.

To maintain FAA compliance the following criteria, and subsequent activities, must be followed as per **Part 107.9**:

1) No later than 10 calendar days after an operation that meets the criteria of either paragraph (a) or (b) of this section, a remote pilot in command must report to the FAA, in a manner acceptable to the Administrator, any operation of the small unmanned aircraft involving at least:
   a) Serious injury to any person or any loss of consciousness; or
   b) Damage to any property, other than the small unmanned aircraft, unless one of the following conditions is satisfied:
   c) The cost of repair (including materials and labor) does not exceed $500; or
   d) The fair market value of the property does not exceed $500 in the event of total loss.
2) The PIC may also need to follow FAA order 8020.11D and 49 CFR §830.15 outlining the National Transportation Safety Board (NTSB) involvement:
   a) Report an "accident" or "serious incident" (Part 830's definitions) ***immediately*** to the NTSB Response Operations Center.
   b) Send NTSB Form 6120.1 in within **10 days** for an accident or **7 days** for an overdue aircraft that is still missing.

Montana State Reporting

Annual reporting of UAS operations for each State of Montana entity to the State of Montana MDT UAS Operations Unit shall include the number of flights, total flight hours, number of licensed remote pilots, and aircraft inventory. Each agency/organization should have records of a cost/benefit analysis, aircraft maintenance, and pilot training as referenced policy and available for review when contacted by the State of Montana MDT UAS Operations Unit or the UAS council/board. The MDT UAS Operations Unit will provide an annual written report to the UAS council/board summarizing agency UAS program activities. In addition to the above, the following is a list of the required records that are to be maintained by each State of Montanan entity operating a UAS:

A. Operating under FAA CFR 14 Part 107:

Records to maintain include:

- FAA Remote Pilot License (and currency documentation)
- Aircraft Registration
- Waiver or Exemption (if applicable)
- LAANC Authorizations

Waiver Application: The below documents are standard requirements for waiver and LAANC applications:

- Lost Link/Mission Procedures
- Emergency Procedures
- Lost Communication Procedures

Waiver specific requirements depend on the regulation being waived; for example, a description of the UAS maintenance program is needed for a Beyond Visual Line of Sight (BVLOS) waiver. See a list of the requirements for various types of waivers at:
https://www.faa.gov/uas/commercial_operators/part_107_waivers/

B. Operating with a FAA Certificate of Authorization:

Records to maintain include:

- For Application for a COA:
    - UAS Airworthiness Criteria – includes maintenance/repair logs, flight logs, and aircraft manuals
    - Lost Link/Mission Procedures
    - Emergency Procedures
    - Lost Communication Procedures
- Monthly Reporting under a COA:
    - Total operating hours per aircraft
    - Total ground station operating hours
    - Per flight; Date, aircraft operation hours, GCS operational hours, pilot duty time per PIC, location city/name, latitude, longitude, # of flights at location
    - Per lost comm event; date, event type, duration of event
    - Total Number of Equipment Malfunctions
    - Total Number of Lost Link Events
    - Total # of Deviations from ATC instructions and/or Letters of Agreement / Procedures
    - Take Off/Landing Damage
    - Describe any other Operational / Coordination issues which occurred during the month

C. FAA Recommended Best Practices:

FAA best practices of records to maintain include:

- Logbook of UAS maintenance, repairs, inspections, and alterations.
- Use of Feet management software is highly recommended.

Section 4 Data Handling Logistics – Standards and Best Practices

The most important concerns when discussing UAS data is in the collecting, handling, securing, storing, and proper dissemination of the data. Collection considerations are discussed in Part II Section 5 of this plan, *Respecting Citizen Privacy* and Part III Section 3, *Operational Protocols.* For the handling, securing, storing, and proper dissemination of data, the data collected by a UAS and owned by the State of Montana is subject to 2-15-114 MCA. It is also subject to data security laws in MCA 2-17-534 along with other applicable federal and state security and privacy laws. Such information collected, processed, transmitted, or stored by the State must meet State IT Policy requirements for the handling of state data in accordance with applicable law. UAS data is no different from many other types of information data, though the type of data (largely imagery) may have different processes for handling.

Data classification shall follow State Policy outlined in POL-Data Classification Policy from the State Information Technology Services Division (SITSD) which can be found here: https://sitsd.mt.gov/Governance/IT-Policies, under Data Classification".

Data security shall follow State Policy outlined in POL-Information Security Policy from the State Information Technology Services Division (SITSD) which can be found here: https://sitsd.mt.gov/Governance/IT-Policies, under "Information Security".

The Council does not see a need to revisit what is already in policy, other than to confirm that UAS data falls under the same purview as other state owned datasets.

The following recommended best practices are taken from the Cybersecurity and Infrastructure Security Agency (CISA) *Cybersecurity Best Practices for Operating Commercial Unmanned Aircraft Systems*.[31] These recommendations cover three main areas: Software/Firmware updates and maintenance; Securing UAS Operations; and Data Storage and Transfer.

Software/Firmware update and maintenance

The below recommendations regard software installation/updates for ground control station devices, and firmware updates to the UAS. Each agency should incorporate these practices as needed for their own policies.

- Ensure that the devices used for the download and installation of UAS software and firmware do not access the enterprise network. Data transfer should be performed

[31] CISA (Cybersecurity and Infrastructure Security Agency) *Cybersecurity Best Practices for Operating Commercial Unmanned Aircraft Systems (UASs)*, June 11, 2019, https://www.cisa.gov/sites/default/files/publications/CISA%20Cybersecurity%20Best%20Practices%20for%20Operating%20Commerical%20UAS%20%28508%29.pdf.

through intermediary storage devices (SD cards, Micro SD, etc.) that can be scanned by anti-malware software.

- Properly verify and securely conduct all interactions with UAS manufacturer and third-party websites. Take extra precaution to download software from properly authenticated and secured websites and ensure the app store hosts verified mobile applications.
    - Access these websites or app stores from a computer not associated with, or at least not connected to, the enterprise network or architecture. Software and firmware updates can be performed on the guest network or other internet connection that is external to the state firewall.
    - Ensure the management of security for mobile devices that will be directly or wirelessly connected to the UAS. Review additional information for enhancing security on mobile devices.
- Ensure file integrity monitoring processes are in place before downloading or installing files. Check to see if individual downloads or installation files have a hash value or checksum which is used to verify the integrity of the file. Agencies are encouraged to check with their IT program for guidance.
- Run all downloaded files through an up-to-date IT approved antivirus platform before installation and ensure the platform remains enabled throughout installation.
- Verify a firewall on the computer or mobile device is enabled to check for potentially malicious inbound and outbound traffic caused by the recently installed software. External network communications could be part of the installation process and could potentially expose your system to unknown data privacy risks.
- During installation, do not follow "default" install options. Instead, go through each screen manually and consider installing software on a removable device (external HDD or USB drive).
    - Deselect any additional features or freeware bundled into the default install package.
    - Disable automatic software updates. Necessary updates should follow the same process outlined for download and installation.
    - Thoroughly review any license agreements prior to approval. Consider involving a legal team in the process to ensure organizations do not unknowingly agree to unsafe or hazardous practices on the part of the vendor.

Securing UAS Operations

Consideration should be made to ensure data integrity, defined as "the completeness, consistency, and accuracy of data."[32] To achieve integrity, data should follow the Attributable, Legible, Contemporaneously recorded, Original, and Accurate (ALCOA) mnemonic device (See

[32] USDA *Data Integrity and Compliance with CGMP Guidance for Industry*, (2016), p.2. https://www.fda.gov/media/97005/download.

USDA 2016).[33] Each agency should incorporate these practices *as needed* for their own policies and programs.

- If a UAS data link is through Wi-Fi connections between the UAS and the controller:
    - Ensure the data link supports an encryption algorithm for securing Wi-Fi communications.
        - If available, use the most secure encryption standards available.
        - Use highly complicated encryption keys that are changed on a frequent basis. Ensure that encryption keys are not easily guessable, and do not identify the make or model of the UAS or the operating organization.
    - Use complicated Service Set Identifiers (SSIDs) that do not identify UAS operations on the network. Avoid using the specific make or model of the UAS or the operating organization in the SSID.
    - Set the UAS to not broadcast the SSID or network name of the connection. Change encryption keys in a secure location to avoid eavesdropping either visually or from wireless monitoring.
- If the UAS supports the Transport Layer Security (TLS) protocol, ensure that it is enabled to the highest standard that the UAS supports.
- Have the data links for UAS control, telemetry, payload transmission, video transmission, and audio transmission encrypted with different keys. Make sure the UAS is able to encrypt the data stored onboard.
- Use standalone UAS-associated mobile devices with no external connections or disable all connections between the Internet and the UAS and UAS-associated mobile devices during operations. Consider running wireless traffic analyzers during selected UAS operations to understand and monitor UAS communications traffic while in use.
- Run mobile device applications in a secure virtual sand-box configuration that allows operation while securely protecting the device and the operating system.

Data Storage and Transfer

While state policy applies to the storage and transfer of state data, the below recommendations are given to highlight a few important best practices.

- When connecting the UAS or UAS-associated removable storage device to a computer:
    - Use a standalone computer to connect to the UAS or removable storage device to ensure no access to the Internet or enterprise network.
    - Verify a firewall on the computer or mobile device is enabled to check for potentially malicious inbound and outbound traffic caused from the connection of

[33] USDA *Data Integrity and Compliance with CGMP Guidance for Industry*, (2016) https://www.fda.gov/media/97005/download.

the UAS or removable storage device. Verify and ensure that the computer has up-to-date antivirus installed.

- Data should be encrypted both at rest and in transit to ensure confidentiality and integrity.
- Authentication mechanisms should be in place for UASs with access to private or confidential data. Use MultiFactor Authentication (MFA) whenever possible for accounts associated with UAS operations.
- Follow data management policies for data at rest, data in transit, and any sensitive data.
- Erase all data from the UAS and any removable storage devices after each use once the data is properly and securely stored.

Data Privacy and Retention

Each agency is responsible for the security of their data,[34] particularly ensuring that Personally Identifiable Information (PII), sensitive, or confidential information is removed from data sets or controlled for public access (See also Part II, Section 3 and Part III Section 5 of this Plan). Each state agency that maintains the personal information of an individual shall develop procedures to protect the personal information as per 2-6-1502 MCA. Long-term retention of datasets with PII is not advised, if it is not germane to the mission of the organization and the UAS program.

Images captured in a public setting of citizens that are not participating in the state agency's operation should also have identifying information (i.e., faces, license plates, etc.) removed prior to use or dissemination, so that the original source information cannot be known (aka 'anonymized'). However, obtaining image data of public places, right of ways, highways, parks, etc. would be accepted as inadvertent acquisition.

Each Agency is also responsible for developing and implementing a retention policy for UAS data as per Agency needs. UAS data, particularly unprocessed/raw data, tends to be massive in space requirements. In developing this policy, a balance must be kept in maintaining accountability for the data and the ability to reduce storage size by eliminating unneeded data. It is recommended that only finished, produced products be tagged as the record data unless the raw data is required to be retained for mission purposes. Key elements to consider are:

Duration*:* Length of time needed to retain the data. This may be months, or years. Given the potential size of UAS datasets, keeping only the most necessary data is paramount.

Data Type*:* Type of data to be retained (unprocessed, encrypted, RAW, finished product). Is unprocessed data only kept till processing is done and a finished product produced, or is it kept in reserve for later reprocessing or availability to the interested public?

[34] See 2-15-114 MCA

Cost*:* Mass storage is relatively cheap, depending on the type. Consider the costs of also backing up large amounts of data.

Location: Where is the data physically located. Is it stored on the cloud, employee computer hard drives, external Hard Drives, local agency or state servers? What are the considerations for data security, network usage and backup?

Accessibility*:* There is no point in keeping the data if it cannot be accessed. How easy is it for agency employees to access the data for use or possible distribution to the public if requested? Is there a process in place for allowing access to the data?

Data Sharing Efficiencies

The real value to shared resources when it comes to UAS programs is in the data. To reduce costs and duplicative efforts, data acquisition from state agencies should be pooled as a shared resource for use across agencies when and where legally appropriate. Specifics of this data pool are to be determined by UAS program agencies working with the MDT UAS Operations Unit as how to best aggregate and disseminate these datasets through an online interface or website. It is envisioned that agencies would regularly post their missions, mission location and purpose, the date, and a link to the final production copy of the dataset created from the mission.

Section 5 Transparency and Accountability Recommendations

As noted before, there are risks of legal liabilities for state agencies if a structured and organized approach to UAS programs is not followed. In order to assure the public that such mechanisms are in place and adhered to, Montana state agencies must employ accountability mechanisms to help ensure that privacy protections and transparency policies are enforced. Montana's UAS program should properly record access to, and use of, UAS data to ensure usage is proper and legal. UAS program missions and objectives should be documented and published to ensure data use is in line with the agency mission.

To further ensure state UAS programs follow FAA, state, and other federal guidelines and regulations, it is recommended to ensure that the general public/private sector have representation on future UAS Councils to provide oversight and recommendations that will ensure state practices comply with state policy and legal requirements.

Public communication options today are varied and encompass many possible channels. At a minimum, a website should be created and maintained that allows for:

- A description of the Montana UAS Plan
- Links to each agency UAS Program Mission statement
- Identification of mission flights, purpose, location, and what agency conducted them
- Instruction on how to view, request, or download a copy of the final dataset from the mission (as may be feasible, useful, and legally made available)
- A means by which to submit privacy and security complaints or concerns.
- A means by which to receive public recommendations or requests.
- Legal disclaimers for the use of the data

An important part of accountability is the development of oversight processes and procedures that ensure compliance with policies and regulations; this will also serve as another layer of security and improve the overall integrity of the program. There should be adequate supervision of personnel and a process for personnel to report suspected cases of misuse or abuse.

There should be a regular schedule of submitted reports documenting all unmanned aircraft system activities and complaints received during the prior reporting period. Reports should be submitted at least annually, at a minimum.

The U.S. Department of Homeland Security provides guidance to government agencies in establishing UAS programs in regards to developing policy around protecting privacy and providing transparency. The following checklist is adapted from their bulletin titled *Best Practices for Protecting Privacy, Civil Rights & Civil Liberties in Unmanned Aircraft Systems*

Programs[35] and is recommended to be the guide for state agencies to follow to ensure solid practices in accountability and transparency are followed in the State of Montana.

Checklist:

1) Consult legal counsel regarding privacy, civil rights, and civil liberties in regards to the utilization of UASs in the pursuit of agency missions. Ensure the purpose of the program and all operations are in compliance with laws and regulations.
2) Clearly identify the purpose of the program. Documenting the program and making available to the public the purpose of the program, what prompted the program to be created, and the benefits realized, will help the public appreciate the agency's reasons for utilizing the technology.
3) Conduct a Privacy Impact Assessment and Document Privacy Compliance. Agencies should conduct a property and privacy impact assessment on privacy rights, civil rights, civil liberties, and property rights in regards to the purpose and mission of the agency's UAS program. The assessment should identify risks and mitigation strategies to ensure the protection of individual identities, sensitive information, and citizen rights throughout the program's operational workflow.
4) Designate a Responsible Person. Identify the person responsible for oversight and review of compliance with relevant private property and privacy laws and regulations. The person should have a direct line to the person responsible for the UAS program.
5) Data Management. Keep data collection, use, dissemination, and retention relevant to and in accordance with that which is legally acquired and within the stated purpose of the program.
    a) UAS program managers should employ safeguards (technological, administrative, or otherwise) to ensure incidental collection of private property or identification of individuals not relevant to the mission are not disseminated or unnecessarily viewed. Where feasible or necessary, such images should be scrubbed to remove PII, critical infrastructure, or other features that may be sensitive in nature (blur features, faces, etc.)
    b) Identify & Manage Records. Determine which files are transitory and which are to be retained as a record. Establish an approved records retention schedule with processes to ensure it is followed that is compatible with the type of data and the needs of the program for the data. Dispose of data that is no longer required nor relevant to the agency mission.
    c) Agencies should develop data dissemination procedures to ensure data dissemination is authorized and follows all relevant policies so that sensitive information is not incidentally distributed. Re-distribution of state data by others should be managed by the permission of the data owner.

[35] "Best Practices for Protecting Privacy, Civil Rights & Civil Liberties in Unmanned Aircraft Systems Programs." United States Department of Homeland Security. 2015. https://www.dhs.gov/sites/default/files/publications/UAS%20Best%20Practices.pdf.

    d) Where necessary and appropriate, ensure data records management policies are established and followed for any data sharing agreements with third parties, particularly if involving data with a sensitive nature.
6) Respect Constitutionally Protected Activities
    a) Be alert to the privacy risks and legal ramifications of inadvertently capturing data of U.S. or Montana constitutionally protected activities; agencies should have guidelines and controls to safeguard against the misuse of such data (anonymizing, deleting, etc.).
    b) UAS data should not be collected, disseminated, or retained solely for the purpose of monitoring U.S. or Montana constitutionally protected activities including but not limited to freedom of speech, freedom of religion, right to assembly, redress of grievances (protests, demonstrations) etc.
7) Data Security and Storage. Data classification, security, and storage must follow state policy for data handling as outlined by the Department of Administration State Information Technology Services Division.
8) Personnel Training. Personnel involved in an agency UAS program should be trained in the collection, handling, and processing of UAS data in accord with these recommendations and state policy, particularly in the areas of privacy rights, personal information, and property rights. The best mitigation in regards to handling sensitive information is to avoid its collection if possible.
9) Have a redress program that includes UAS programs. Citizens filing complaints in regards to UAS activities by state programs should have ready access to a robust redress process. Adequate procedures must be established to allow for challenges alleging inappropriate data capture, investigating complaints, and resolving allegations of a violation of property, privacy, or civil liberty rights, or in regards to other sensitive information.
10) Ensure adequate transparency measures are in place for UAS programs. Transparency regarding program operations including the mission, purpose, benefits, schedule, mitigation of risks, dissemination of data, data retention, and data handling processes and procedures, where appropriate and without compromise to security or law enforcement operations, should be made publicly available. A process by which citizens can submit inquiry and/or data requests in regards to state UAS missions and operational procedures should be easily identified and made available.
11) Accountability. Each agency should designate the person or persons who are accountable to ensure the department's UAS program is following FAA regulations, all legal requirements, state policies and guidelines, and the Montana UAS Plan's best practices for government use of UAS. Such person(s) should have broad oversight of all UAS operations and ensure documentation and reports are maintained and submitted to the Council through the designated centralized oversight organization.

This Montana UAS Plan Document provides guidance regarding applicable UAS laws and regulations, state agency policies for flight safety, maintaining records of all agency UAS activity and addressing privacy protections of Montana citizens.

The FAA and partner organizations have also published basic guidelines online that may help UAV pilots to balance their right to fly with citizen's rights to privacy.[36] These are targeted more toward recreational users and give guidance to "neighborly" conduct while operating a UAS. Though useful, they should be reviewed & adjusted in each agency by legal staff as appropriate, as they are only intended to ensure courteous interactions with citizens and not for setting policy.[37]

Public support is essential for a UAS program's success. A program that is not transparent according to applicable laws, agency policies, and best practices may quickly lose support and create misperceptions about the program's intended goal(s). As the purpose of a UAS program may evolve over time, changes to the UAS program's stated purpose should be reviewed openly. Any changes to the UAS program's primary purposes should be reflected in documents readily available to the public prior to implementing those changes.

Following these recommendations will ensure transparency and accountability is maintained throughout the use of UAS in state government programs. As new applications of the technology are developed, periodical review of established processes and practices should occur and a determination made if new guidance is necessary, to maintain a high level of integrity.

[36] https://knowbeforeyoufly.org/how-to-fly/uas-best-practices

[37] For convenience, the guidelines are listed in Appendix A, p.5-8.

Section 6 Coordination Opportunities with the Montana University System

Purpose: The Montana University System (MUS) offers unique educational and research applications for Unmanned Aircraft Systems (UAS). As such, MUS could coordinate with State of Montana Agencies through two main avenues that can translate into revenue savings for Montana taxpayers.

1) **Training** - The Mission of the Montana University System is to serve students through the delivery of high quality and accessible postsecondary educational opportunities, while actively participating in the preservation and advancement of Montana's economy and society. MUS strives to hold academic quality to be the prime attribute of its institutions. Due to its mission and vision, as well as track record for educational excellence, MUS is a natural partner with State of Montana Agencies to provide training as outlined in section 3 of this plan. Much of this training is already in place, particularly at the University of Montana and Montana Tech; therefore expanding these offerings to State of Montana Agencies through a straightforward Memorandum of Understanding (MOU) would be an effective means of coordination.
2) **Research** – In another part of its vision statement, MUS encourages scientific development and technology transfer, interactive information systems, economic development, and lifelong learning. MUS is again well situated to provide consultation and technology testing for State of Montana Agencies considering proof of concept or pilot projects involving UAS. Through numerous grants, including the State of Montana's initial investment in UAS (through the Montana Research and Economic Development Initiative) to UM, and the FAA's investment in the UAS Center of Excellence (ASSURE) at MSU, the MUS has unique sensors and aircraft not readily available on the commercial market that can be demonstrated for projects prior to investment by State of Montana Agencies. Thus, successful projects can then lead to commercialization development by businesses in the state of Montana (SBIR/STTR) to further UAS economic development.

Both of these proposed collaborations further the mission and vision of MUS while providing revenue savings for Montana taxpayers in leveraging current State of Montana investments.

Part IV

Conclusion and Recommendations

UAS programs are already providing significant benefit to State of Montana programs. They are helping organizations gain workflow efficiencies, lower costs, reduce risks to health and safety, respond to emergencies, and make better decisions with higher quality information, often in near-real time. They do, however, come with new considerations, risks, and potential liabilities to address. These are largely mitigated by following the structure of the FAA Part 107 operational regulations for UAS, and can be further reduced with the recommendations set forth in this Montana UAS Plan document.

As current state operations are showing, the benefits far outweigh these mitigated risks, an organized approach to UAS program operations in the state of Montana is warranted to ensure the State maximizes the opportunities and mitigates the risks. This Montana UAS Plan Document provides guidance regarding applicable UAS laws and regulations, state agency policies for flight safety, maintaining records of all agency UAS activity and addressing privacy protections of Montana citizens.

The UAS Council recommends that this organized approach include an oversight board or council to oversee judicious operations within state government; that governance practices and policy be established to ensure regulatory compliance; financial investments be justified for prudent use of taxpayer dollars; system and data security is maintained; citizen privacy is protected; and government transparency measures are enforced.

Many of the Montana Plan's recommendations are found in Sections in Part III - 'The Montana Plan'. For a full understanding of the recommendations of the Montana UAS Council, please read the document in its entirety. For convenience, however, the more significant recommendations of the Montana UAS Plan are summarized below.

Procurement and Cost-Benefit

The council recommends that all state agencies seeking to establish a UAS *program* shall conduct an analysis to consider the expenses (costs) and savings (benefits) pursuant to the establishment and operation of a UAS program within their agency. The Council suggests that procurement of Unmanned Aircraft Systems or UAS Services from an authorized service provider that are in excess of *five-thousand dollars ($5000)* should be reviewed to ensure it fits within the Cost and Benefit analysis for the program, as this aligns with current state procurement policy. When considering the establishment of a new UAS program or for significant procurements requiring a full competitive procurement process, a more comprehensive business case analysis is recommended.

Due to the inherit risks, liabilities, and safety concerns, the Council does *not* recommend a shared UAV resource pool among the agencies. Furthermore, one of the emerging benefits of a UAS is the ability to capture information with a UAV at the time the need is discovered, often in the field. The logistical expense of managing a centralized pool of UAVs across the state is likely to exceed the benefit, particularly given such a low financial barrier to entry and opportunity for real-time efficiencies. For departments with limited UAS resources, the Council

recommends either procuring UAS services from the private sector through already established contracts (NASPO, etc), or leveraging a Memorandum of Understanding (MOU) with the MUS or departments having mature UAS programs.

Each department is to keep a compilation of the Cost-Benefit Analyses conducted in accord with their UAS program and make such available upon request.

Centralized Oversight

It is recommended that a State of Montana UAS council/board be permanently established that would have oversight authority over UAS operations for the State of Montana and ensure state agency UAS programs comply with FAA requirements, state policy, and the mitigation of risks and liabilities; and to assign a state agency program (MDT UAS Operations Unit) that would be responsible to collect identified information for each agency's UAS program and supply this information to the Council/Board.

This central council/board would work to maintain operational best practices; avoid duplication of expenses; improve safety, efficiency, and fiscal discipline; guide the future developments of the technology and its use in Montana; and ensure transparency in government operations of UAS programs to the citizens of the state. It is recommended that the council/board be comprised of representatives appointed by the Governor from UAS active state agencies, the MUS system, and the private sector to ensure this mission.

Operational Protocols

The Council recommends that all flight operations should be conducted in accordance with current FAA regulations (14 CFR 107, 49 USC 40102 (a)(41)(A)-(F), 14 CFR part 48) and/or a COA, as appropriate; State & Agency Statute and Policy; the Montana UAS Plan; and the operator's manual for the subject aircraft. Only authorized operators who have completed the required training shall be permitted to operate a State owned UAS. Agencies shall collect information using a UAS, or use UAS-collected information, only to the extent that such collection or use is pursuant to an authorized purpose. In all other instances, legal counsel should be consulted.

It is further recommended that the Department of Administration establish a base UAS policy for all executive agencies to include standardized operational procedure requirements, training, and a flight procedure checklist. All state employees who qualify as remote UAS pilots shall possess a current FAA certified remote pilot license (Part 107) and have passed an annual agency approved practical flight review for the type rating of aircraft to be flown. (See Appendix H for an example rotary flight review.) Operational procedures should include pre-flight, mission control, post-flight, and emergency procedures and reports.

Reporting of agency UAS program operations should be conducted annually, at a minimum; these should include the number of flights, total flight hours, number of licensed remote pilots,

aircraft inventory, a cost/benefit analysis, aircraft maintenance, pilot training, and any additional reports required by the FAA.

A standardized operational checklist or use of a fleet management software package is recommended.

Data Handling Logistics

The real value to UAS programs is in the data. To reduce costs and duplicative efforts across state government, data acquisition from state agencies should be pooled as a shared resource for use across agencies when and where legally appropriate. For the handling, securing, storing, and proper dissemination of data, the data collected by a UAS and owned by the State of Montana is subject to 2-15-114 MCA. It is also subject to data security laws in MCA 2-17-534 along with other applicable federal and state security and privacy laws. Such information collected, processed, transmitted, or stored by the State must meet State IT Policy requirements for the handling of state data in accordance with applicable law. The Council does not see a need to revisit what is already in policy, other than to confirm that UAS data falls under the same purview as other state-owned datasets.

The Council does recommend a number of best practices for data handling in Part III Section IV that should be followed by state agencies to maintain data integrity. These include the use of anti-virus software, using data encryption where appropriate, protecting devices and the state network from unsecured downloads and firmware updates, and proper handling of UAS data that contains PII. Data retention should be in accord with an agency's mission for the UAS program.

Transparency & Accountability

Transparency is essential to a successful government UAS program, and the Council recommends that however the State of Montana manages its UAS programs, that the public have insight and involvement in the formation and oversight of the State's use of UAS. In addition, Montana state agencies must employ accountability mechanisms to help ensure that privacy protections and transparency policies are enforced. An important part of accountability is the development of oversight processes and procedures that ensure compliance with policies and regulations, along with designated personnel who are responsible for their proper implementation.

The Council recommends the adapted checklist outlined in Part III Section V should be employed in each agency UAS program and reporting conducted annually. To highlight:

1) Consult legal counsel regarding privacy, civil rights, and civil liberties.
2) Clearly identify the purpose of the program and communicate that publicly.
3) Conduct a Privacy Impact Assessment and Document Privacy Compliance.
4) Identify the person responsible for oversight and review of compliance to laws, policies, and regulations.

5) Keep data collection, use, dissemination, and retention relevant to and in accordance with that which is legally acquired and within the stated purpose of the program.
6) Respect Constitutionally Protected Activities.
7) Data classification, security, and storage must follow state policy for data handling as outlined by the Department of Administration State Information Technology Services Division.
8) Personnel involved in an agency UAS program should be trained in the collection, handling, and processing of UAS data.
9) Have a redress program that includes UAS programs.
10) Ensure adequate transparency measures are in place for UAS programs and provide a means by which the public can request information.
11) Each agency should designate the person or persons who are accountable to ensure the department's UAS program is following FAA regulations, all legal requirements, state policies and guidelines, and the Montana UAS Plan's best practices for government use of UAS.

The Council recommends that a website should be created and maintained that outlines the mission and purpose of each agency UAS program and their operations, that allows for the dissemination of information and imagery, and provides communication with the public regarding any recommendations or requests they may have.

Coordination with the Montana University System

The MUS has invested significant effort into research and education for UAS, and have programs more developed than most government entities in Montana. The Council recommends that the state pursue partnerships that provide UAV training to staff through the programs developed by the MUS. The Council also recommends that the state leverage opportunities for research and development through consultation and technology testing with the MUS. This would allow state agencies to test products and applications in partnership with the MUS at lower costs prior to investing in significant procurements.

In Closing....

By applying the concepts and recommendations provided in this document, the Montana UAS Council believes the State of Montana can leverage the advances this rapidly developing technology offers for the citizens of Montana in a safe and judicious manner. With an effective oversight structure, the State will be able to address future developments and regulation requirements to put Montana at the forefront of leveraging remote sensing technologies for the benefit of citizen services.

The members of the Montana UAS Council would like to thank all the participating agency members, private citizen members, and especially the Governor's office for the patience and support required to research and produce this work. It is the Council's hope that this will be the foundation of auspicious governance around the proper use of UAS in the State of Montana

government programs, and that it also might be useful for local governments, tribal governments, and private business in the establishing and managing a safe and effective UAS program.

Part V

References and Appendices

Contents

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