Fourth Annual FAA UAS Symposium
Baltimore, MD
June 3 - 5, 2019

EXECUTIVE SUMMARY

The Federal Aviation Administration (FAA), in conjunction with the Association for Unmanned Vehicle Systems International (AUVSI), hosted the 2019 Unmanned Aircraft Systems (UAS) Symposium on June 3-5. This staple event served as a platform for the FAA and the UAS industry to come together and chart a path forward to safely integrate drones, discuss evolving technologies, and foster innovation.

The Baltimore Convention Center in Baltimore, Maryland, served as the venue for the fourth annual FAA UAS Symposium with over 1,215 pilots, manufacturers, and representatives from over 20 different countries in the UAS community in attendance — a 19% increase over 2018's event. Millions more followed the event online and engaged with the FAA through our various social media channels.
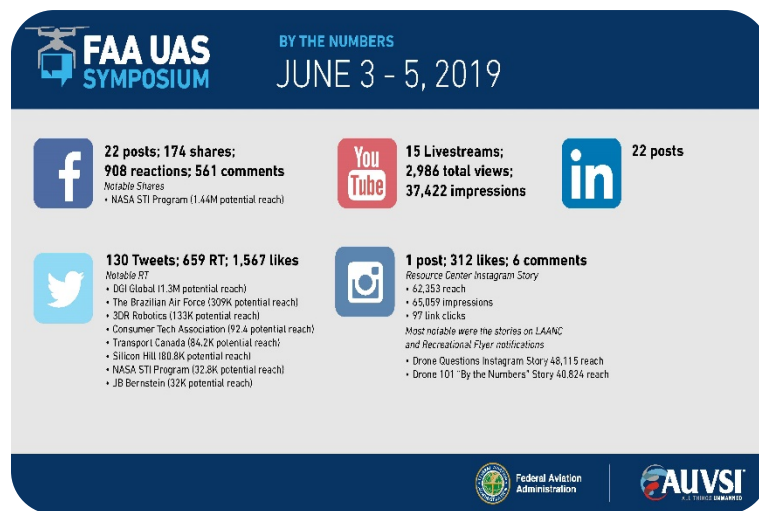
Feedback provided by 2018's Symposium attendees was used to craft this year's agenda. A primary focus was to bring industry partners and FAA representatives together to discuss how the FAA is working with industry for future integration. It was also important to highlight the importance of safety in conjunction with future innovations.

Similar to previous years, plenary session speakers, workshop participants, and panelists were selected from government and industry based on their expertise on topics ranging from safety, operations, stakeholder input, public aircraft operations, certification overview, and airspace navigation.

Elaine L. Chao, Secretary of the Department of Transportation, opened this year's ceremony with a video welcome message to attendees. She announced two new rulemakings, which would allow UAS operations over people and night operations without waivers, provided drones are properly equipped and operators are properly trained. While the FAA set the stage at last year's Symposium to announce accomplishments, including the National Beta Test for Low-Altitude Authorization and Notification Capability (LAANC), as well as UAS Integration Pilot Program (IPP) Lead Participants, this year's conference provided updates. The UAS IPP has

allowed for collaboration among the FAA; UAS operators; and state, local, and tribal governments to test drone operational concepts under current regulations. This provides hope for the limitless future of drone technology.

Since the first Symposium in 2016, seamless integration of drones in the National Airspace System (NAS) can be attributed to our dedication to the agency's number one mission: to provide the safest, most efficient aerospace system in the world. As we strive daily to reach the next level of safety, whether through conducting research on how to best close gaps that still exist between in technological innovations or by establishing policy in rulemaking, this was the point driven home by many FAA representatives throughout the Symposium: we are "getting down to business and making history together, in real-time."

This 2019 UAS Symposium Report captures conference highlights and identifies several lessons learned to keep in mind for future conferences. Additionally, this report includes a UAS Stakeholder Survey, which encompasses a variety of topics ranging from event attendance and attendee satisfaction to improved stakeholder engagement. Presentations of plenary sessions, workshops, and policy dialogues can be found here.

Welcome Message from U.S. Department of Transportation Secretary Elaine L. Chao

A lot has happened since last year. In January, the Department of Transportation announced two new rulemaking initiatives. One rule would allow Unmanned Aircraft Systems (UAS) operations over people and night operations without waivers if the drones are properly equipped and the operators are properly trained. The second one sought public comments on safe and secure operations of drones. The comments period for both have just closed.

The UAS Integration Pilot Program Lead Participants were announced late last year. Under this program, nine state, local and tribal governments will work with private sector entities to test drones operations under currently restricted conditions. We are already seeing positive results of this program. For instance, a drone operator started making regular medical package deliveries and drones are being used in Kansas beyond visual line of sight to survey infrastructure and agricultural fields.

First responders are also using drones to help save lives. The Choctaw Nation is using drones to bait feral hog traps to improve occupational safety for farm and agricultural workers. These drone operations give us a glimpse of the amazing future for UAS technology. The American spirit of innovation is among our greatest strengths. We need to work together to shape a future in which drones can safely be developed, tested, deployed and integrated into the National Airspace System (NAS) so that the United States can remain a global leader in aviation innovation.

Dan Elwell, **Acting FAA Administrator**

This symposium keeps growing. The age of unmanned aircraft has arrived. Development has become production, which has given way to applications and is well down the road to operations and integration. The technology has hit a sweet spot where the right thing is happening at the right time and in the right way. As we accelerate toward seamless integration, becoming a full-fledged part of the national airspace system is not the stuff of technology or development or application. It remains all about safety. Safety should remain fundamental to our collective mission. We believe safety, innovation, and progress can coexist and together we are making history in real time.

Understanding Your Options and Getting Your Operations Started

- **Rick Domingo**, Executive Director, FAA Flight Standards Service
- **Maurice Hoffman**, Director, FAA Airspace Services
- **Jim Williams**, Aviation Consultant, JHW Unmanned Solutions

Panelists discussed four different scenarios for operating unmanned aircraft systems (UAS) and the FAA's approach toward evaluating these operations. The scenarios included high altitude and long endurance operations, UAS medical test package delivery, UPS UAS cargo carrier, and UAS cargo delivery to an offshore rig. To enable these operations, experts said it was important to develop technologies such as detect and avoid (DAA). Some view ADS-B as a viable solution for DAA but confirming this requires more information. The FAA's operational review process involves collaboration between multiple offices to make sure that the proposed UAS operations are safe.

Medical test sample deliveries are taking place under Part 135 (as an air carrier) beyond the pilot's visual line of sight. Operating under Part 135, the FAA has to have a sense of the reliability of the system. Pilots under Part 135 must have some level of training. The FAA looks at these applications on a case-by-case basis. There is no one-size fits all method.

The Makings of a BVLOS Solution

- **Tom Walsh**, Unmanned Program Manager, Flight Technologies and Procedures Division, FAA Flight Standards Service
- **Paul Albuquerque**, Aerospace Engineer, FAA Flight Standards Service
- **John Page**, Air Traffic Specialist, FAA Emerging Technologies Team
- **Captain Kenneth Voiret**, Palm Beach County Sherriff's Office
- **Jennifer Player**, BNSF
- **Eileen Lockhart**, Xcel Energy
- **Joey Neptune**, General Atomics Aeronautical Systems, Inc.

The session discussed what operators need to fly beyond visual line-of-sight (BVLOS). The panelists talked about remote identification, operational control, and detect and avoid. Industry experts shared lessons learned for building a safety case to expand UAS operations. Companies are using drones to inspect infrastructure, such as railway tracks. Extensive coordination and cooperation takes place between various FAA offices to ensure the safety of all these operations. The FAA offices develop policies, procedures, and process waivers. Public operators get a Certificate of Authorization (COA) from the FAA to operate UAS for the public good.

The FAA has a review process for all COA applications. On receiving a request, the FAA informs the applicant if it needs additional information. The FAA encourages operators to share their concepts of operation in advance and answer any follow-up questions. To solve the challenge of BVLOS, the FAA needs collaboration with and support from the UAS industry. The transition from visual line-of-sight to BVLOS is going to be a new journey and no one group has answers to all the questions yet.

While there are no shortcuts to getting FAA approval, panelists said skills and qualities go a long way. For instance, excellent writing significantly helps. Xcel Energy's first application was 800 pages and made every effort to make the company's concept of operation as clear as possible. Applicants must be able to convince the FAA why their operation matters and how it will benefit their communities. Panelists reiterated that the FAA takes safety very seriously to protect the national airspace system, so every applicant must have a convincing safety plan. Even public operators need to present a strong BVLOS safety case before the FAA.

The selection of a drone completely depends on the nature of its operation and its mission. On BVLOS for populated areas, the FAA leans on industry to determine standards and technology essential for these operations.

What Does the FAA Reauthorization Act Mean for the Drone Industry?

- **William Crozier**, Deputy Director, FAA UAS Integration Office
- **Mark Aitken**, Senior Policy Advisor, Akin Gump Strauss Hauer & Feld LLP
- **Doug Johnson**, Vice President, Technology Policy, CTA
- **Brian Wynne**, President and CEO, Association for Unmanned Vehicle Systems International
- **Jenny Rosenberg**, Founder, JTR Strategies
- **Scott Gore**, Senior Congressional Liaison, FAA Office of Government & Industry Affairs

With approximately 130 pages worth of UAS-related sections in the legislation, the FAA Reauthorization Act of 2018 was signed in October of that year. It is a significant step for the FAA and the drone industry, providing clarity and direction on creating the next rules and regulations for UAS integration. The panel discussed what the Act means to UAS operators and what they expect from the FAA as it implements these new mandates. While the Act is a lot of work for the FAA, the Agency also realizes that it is a lot of work for industry as well. It is important to remember that while the Act is an important step, nothing happens without appropriations. Lessons learned from the Integration Pilot Program will be extremely helpful for future work and rulemaking.

The Act authorizes the activities and programs of the FAA and provides legal authority for the Agency's work. It provides the FAA with over 50 UAS-related provisions, many of which will enable operations for both civil and public operators and focus on security measures. The Act includes a wide range of directives, from providing the FAA authority over all UAS operating in the national airspace system (NAS) to providing authority to various security partners to engage in counter-UAS activities in order to address security risks.

The Reauthorization focuses on getting down to business with safety remaining as a top priority. The FAA is committed to working with Congress and the UAS community to ensure that drones are safely integrated into the NAS. While the Act means different things to different people, the UAS provisions in the bill have largely been viewed as positive as they advance the collective goal of safe and secure integration into the NAS. It is a five-year piece of legislation and the Agency has a lot of work to do to meet Congress' requirements and to further the integration of UAS into the NAS. The Act emphasizes the need for education and authorizes $5 million for the *Know Before You Fly* educational campaign. The Section 349 knowledge test for recreational users is another significant change introduced by the Act.

Lunch Plenary: Crawl, Walk, Fly – Getting to Full Integration

- **Jay Merkle**, Executive Director, FAA UAS Integration Office
- **Earl Lawrence**, Executive Director, FAA Aircraft Certification Service
- **Rick Domingo**, Executive Director, FAA Flight Standards Service
- **Ed Donaldson**, Deputy Vice President, Air Traffic Services

Integrating UAS in the world's safest yet most complex airspace system requires extensive collaboration between various FAA offices as they leverage past successes to build a regulatory framework for the future. The panelists provided updates on progress made in enabling UAS integration into the NAS. They also discussed key components, such as remote identification, a streamlined UAS type certification process, and others.

Since 2018, the FAA has developed a better understanding of what the industry wants and it has moved more toward part 135 certifications. Last year, FAA executives visited Australia to better understand how they are conducting their UAS operations and approvals.

Being successful in obtaining a waiver needs persistence. Applicants should follow the philosophy of "apply, apply, and apply!" The Low Altitude Authorization Notification Capability (LAANC) is very helpful with the airspace approval process.

When asked about the acceptable distance for beyond visual line of sight operations, panelists said we should start from existing regulations, and then assess those operations and proceed from there.

To address the current shortage of UAS pilots, there were specific requests from Congress to include UAS curriculum at two- and four-year colleges to prepare future generations to become UAS pilots.

Unmanned Traffic Management is vital and an important step toward achieving it is remote identification. There are several paths that can help us soar, including completion of the business model. However, moving forward too quickly based on what we know now is flying too close to the sun. It is important for folks in industry to retain the strong culture of safe operations.

DAA – State of Play

- **Jay Merkle**, Executive Director, FAA UAS Integration Office
- **Jarrett Larrow**, Aerospace Engineer, FAA Flight Operations Branch
- **Ally Ferguson**, Director, Airspace Research, PrecisionHawk
- **Edward Lester**, Chief UTM Architect, AiRXOS
- **Jonathan Daniels**, CEO, Praxis Aerospace Concepts International Inc.
- **Dallas Brooks**, Director, Raspet Flight Research Laboratory, Mississippi State University

The ability to detect-and-avoid (DAA) obstacles, including manned and other unmanned aircraft, is one of the biggest challenges facing the drone industry today. The panel discussed how we should adapt one of the most basic responsibilities of a manned aircraft pilot for drone operators. The discussion focused on the evolving technologies necessary for drones to safely avoid other aircraft and the gaps that still exist.

Part 107 expects operators to scan the airspace and yield to all aircraft. A main challenge for beyond visual line-of-sight (BVLOS) operations is to know what else is there in the airspace. Knowing the right performance requirements is one of the main challenges. Understand that getting a BVLOS waiver takes time, commitment and consistently safe operations.

Currently, there is a lot of work in developing technology standards to build a regulatory framework. There are still several gaps in research but not all gaps are related to research. The FAA is trying to make sure that it does not stop or disrupt innovation. The agency is meticulous and careful while going through details to make sure that all operations are safe.

The FAA has invested in learning more about other systems. There are technological challenges but new radars, systems, and standards are being developed to address those areas. Moreover, while the technology should be able to detect the unknowns, we should not allow the absence of new technologies to stop us from continuing with what we are currently doing.

Operators must not be discouraged when the FAA turns down their applications or asks for additional information. The FAA generally does not say yes to the very first request. The Agency usually has follow-up questions that it wants the applicants to clarify. People who are averse to being asked many questions and still must deal with the FAA are possibly in the wrong industry. In other words, operators should not stop flying in Kansas just because they cannot fly in Manhattan.

To get out of the valley of death, it is important to complete the work on standards. It is easier to guide an operator once there are standards. Then, technology can take care of the rest. Companies are finding it difficult to decide the redesign of their equipment because they do not know what would be acceptable. There is a need to activate the stagnant standard cycle.

Standards, once developed, are going to be a game-changer.

Get Advice From the Approvers

- **Everette Rochon**, Acting Manager, General Aviation and Commercial Division, FAA Flight Standards Service
- **Randy Willis**, Manager, FAA Emerging Technologies Team

Attendees in this session got a unique chance to hear from the FAA experts who review part 107 applications and waivers. Instead of treating applications as business cases, the FAA views them as safety cases first. They explained what safety cases looked like by discussing best practices and tools that applicants could use to get through the process faster.

To develop a better part 107 application, operators must clearly identify their proposed operations without assuming that the reviewers know their operational needs and the details involving the operation. When requesting permission to operate in controlled airspace, most applicants only need to request an airspace authorization and not an airspace waiver.

The session focused on part 107 waivers and the waiver application process.

In waiver applications, the FAA looks for quality as opposed to quantity. For example, the Agency cares more about the risk mitigations than a company's history. There must be a method or procedure in the document on how the operations are going to take place. Applicants should know what they are asking for relief from the FAA in their waiver applications. Copying and pasting from another application does not help because not all operations are the same.

The FAA's DroneZone is a great resource for waiver applicants. Additionally, the Low Altitude Authorization Notification Capability (LAANC) gives approval in under 15 seconds. For non-automated approvals for part 107.41, it takes about 37 days. Air Traffic Control is involved in developing the facility map grids that LAANC is based on.

The FAA has made considerable progress in tackling the backlog of waivers. At one point, there was a backlog of 14,000 waivers, which is now down to 1,800 with 800 applications having an in-process status.

Type Certification for UAS – Back to the Future

- **Melvin Johnson**, Deputy Director, Policy and Innovation Division, FAA Aircraft Certification Service
- **James Foltz**, Manager, Programs & Procedures, FAA Aircraft Certification Service

Themes: Understanding what Type Certification is and how it is applied to UAS; Discussing plans for a streamlined Type Certification process for UAS.

Participants learned about the future of UAS type certification by getting a sense of how past practices of utilizing demonstrated reliability can be a part of compliance substantiation. Panelists provided an overview of what is type certification. They spoke about the process to earn an FAA design approval for UAS that can facilitate operations beyond part 107. Attendees learned that 14 CFR 21.17(b) is a unique part of the rule that allows for type certification of UAS without seeking exemption from part 21. The FAA can use this rule to develop a streamlined type certification process for UAS.

Panelists quoted former FAA Administrator Michael Huerta's remarks in reference to the issuance of part 23 that, in the past, it made sense to be quite specific about what one needs to do to build the airplane. The FAA would view its role as overseeing and telling the industry how it should build the plane to ensure safety. However, technology has come a long way, and the pace of innovation has increased at exponential rates. Hence, the FAA has also adopted risk-based decision-making and it is evolving much more broadly to performance-based regulations.

Panelists provided an overview of prescriptive and performance-based regulatory systems and discussed the pros and cons. While a prescriptive regulatory system establishes specific technical requirements that must be met by applicants and approval holders, a performance-based regulatory system establishes outcomes that must be achieved and allows for flexibility in how the applicant or approval holder achieves those outcomes.

The panelists said title 49 U.S.C. § 44701 directs the FAA to promote flight safety for civil aircraft by prescribing minimum standards. The FAA does this by prescribing minimum standards for the design, material, construction, quality of work, and performance of the aircraft, aircraft engines, propellers, and appliances. When the FAA finds a product that is properly designed and manufactured, performs accordingly, and meets prescribed requirements, it issues a design approval in the form of a type certificate.

The FAA's current process and requirements have developed over the course of more than 50 years of certification experience and it reflects decades of aviation lessons learned through accidents and incidents.

Certification manages risk through "safety assurance" giving the confidence that a proposed product or action will meet FAA safety expectations to protect the public. The FAA risk-based processes are well proven. Certification is also an acknowledgement that FAA requirements have been met for an aircraft, aeronautical products, airmen, mechanics, controllers, operators, etc.

§ 21.17(b) allows the FAA to tailor the certification basis for each product.

The Los Angeles Aircraft Certification Office often holds workshops on the type certification process and the utilization of performance-based airworthiness criteria and reliability as a means of compliance.

Building Your Operational Risk Assessment

- **Jarrett Larrow**, Aerospace Engineer, FAA Flight Operations Branch
- **Jeremy Grogan**, Part 107 Waiver Team Lead, FAA Flight Standards Service
- **Mark Blanks**, Director, Virginia Tech Mid-Atlantic Aviation Partnership (MAAP)
- **Andy Thurling**, Chief Technology Officer, NUAIR
- **Alexandra Florin**, Drones Project Manager, European Aviation Safety Agency (EASA)
- **Nicholas Flom**, Executive Director, Northern Plains Unmanned Aircraft Systems Test Site

Operation Risk Assessment (ORA) is a way to analyze a proposed concept of operations (ConOps) and identify if there are sufficient mitigation means to conduct an operation with an acceptable level of risk. Operators need an ORA for waivers, exemptions, and type certificates.

Operators start with a defined ConOps and a defined vehicle and system that they are using to accomplish the ConOps. Afterward, they proceed into the ORA, where they use the ConOps and the product. They use a method to tease out the hazards that operation is going to present to people on the ground, manned aircraft, and to infrastructure on the ground.

Risk-based safety case development comprises four stages: operational context definition, data collection, safety case, and FAA approval. The stages focus on ConOps, risk assessment, test planning, testing and demos, safety case compilation, and receiving FAA approval once all hazards are addressed and an acceptable level of safety is achieved.

Panelists discussed traditional versus holistic approaches. Traditionally, manned aviation requires certification of the aircraft, approval of the operator, and a licensed pilot. Certification, approval, and license provide a high level of assurance that aircraft operation can be conducted with an acceptable level of risk.

Unmanned aircraft are expected to meet the same Target Level of Safety (TLS) as manned aircraft. In manned aviation, TLS is the general term that designates the minimum required safety objectives expressed in terms of probability of potential fatalities on the ground or in the air.

An ORA is a way to analyze a proposed ConOps and identify if there are sufficient mitigation means to conduct an operation with an acceptable level of risk. The SORA

developed by the Joint Authorities for Rulemaking on Unmanned Systems provides a systematic methodology to identify in a holistic way risks associated with a UAS operation. This approach is used in Europe to develop an operation-centric, performance-based, and risk-based drone regulation.

Around 70-80% of waiver applications are denied due to incomplete information. The average waiver application is only 1-2 sentences long and many do not address the whole risk and regulatory compliance for the proposed operation.

Contacting the FAA and engaging in a conversation as early as possible is a good way to obtain feedback. It is also helpful to reach out to the Agency to discuss what an applicant is planning to do. Such collaboration improves the quality of the application and lessens the chance of an initial rejection.

IFR, VFR…and now, UTM – The Future of Air Traffic Services

- **Jay Merkle**, Executive Director, FAA UAS Integration Office
- **Steve Bradford**, Chief Scientist, FAA Architecture and NextGen Development
- **Scott Campbell**, Head of System Design, Airbus
- **Ken Stewart**, CEO, AiRXOS, GE Aviation
- **Lorenzo Murzilli**, Manager, Innovation and Advanced Technologies, Swiss Federal Office of Civil Aviation
- **Dr. Marcus Johnson**, Deputy Project Manager, Aviation Systems Division, NASA Ames Research Center

With the Low Altitude Authorization and Notification Capability (LAANC) now deployed nationwide, panelists discussed the critical questions of what is next and what this means to everyone. Experts spoke about the future of facilitating highly automated low altitude operations. They reiterated that realizing the full economic benefits and societal impacts of drones depends on integration, not segregation, of UAS into the national airspace system (NAS).

Panelists said segregation could also be a form of integration because it is important to have some rules and regulations to keep the NAS safe. Doing so is a critical piece of the UAS integration goal because all operators must prioritize safety no matter where they fly. Integration means viewing all operations as aviation instead of separately classifying them as manned or unmanned. There is, however, a difference between self-segregation and restricted segregation. While restricted segregation can be destructive and causes resentment, self-segregation is beneficial because it encourages safe and legal operations.

NASA is working with different partners on Unmanned Traffic Management (UTM) as operators declare intent on what they want to do in the airspace so that there is no conflict. By doing so, they are promoting a culture of safety.

Interactions with drone manufacturers suggest that segregation will not work because it will have a negative impact on their business. Companies want regulators to move beyond what is currently in place because industry is moving from the experimental phase to full development of their business models. The pressure now seems to be on regulators and mere ad-hoc regulatory systems will not help in the end.

Building all the services needed to integrate UAS fully into the NAS is an ongoing but not easy process because regulators have to listen to all stakeholders' perspectives. It is not

possible for regulators to allow people to go out and fly without following specific rules and regulations.

While working on UTM, regulators also come across Air Traffic Management (ATM) regulations. Integrating something new and different in an established system is a challenge. Non-cooperative operators remain a major challenge and only coordination between different stakeholders can help address that issue.

As we move forward, the need for more standards and resources will also arise. The FAA has shown the initial path. Now it is time for industry and all stakeholders to get involved and develop standards that are critical to advanced operations. The culture is changing as companies compete on products.

While remote identification is critical, the big piece that will follow it will be beyond visual line-of-sight operations. The UAS integration puzzle includes several pieces, including an authoritative registry, improving the authorization and waiver system, and working with law enforcement to address security threats.

Morning Keynote (Day 2)

- **Garrett Graves**, House Aviation Subcommittee Ranking Member
- **Michael Chasen**, Chief Executive Officer, PrecisionHawk

Congressman Garret Graves:

I had chance to be a lead responder on the BP oil spill in the Gulf Coast. We faced the largest oil spill in history and it was incredibly difficult to find resources to clean up the spill. There was hundreds of miles of coastline with oil all over the place. One day we go out to the coast and see a barge being loaded with porta-pottie trucks that were sucking out the oil from the water. The Coast Guard informed us the next day that we could not use the porta-potties to suck out oil. They were worried they the porta-potties may spill the oil that they were attempting to extract from the water. There was a disconnect between the first responders and the Coast Guard on what can or should be done. You may see me limping up here. That's because I had a personal disconnect last week. I used to play soccer and recently there was a congressional soccer game. They had some professionals on the team. I played soccer 20 years ago. Mentally that's where I was, but I am 20 years older and there was a disconnect between my body and mind.

Today, drone technology is pioneering; it is disruptive, revolutionary, and totally changing the game, whether it's delivering food or providing emergency services. There is a disconnect on what drones could or should do, just like the Coast Guard example and my soccer game. We are here to try to help understand the perceptive of industry and where you are going. We want to make sure government doesn't get in the way of that. We are here as the regulators but want to make sure we can understand each other's perspective and concerns. The way we resolve tensions is to help understand each other stance and accomplish goals together. Last fall, Congress passed the FAA reauthorization bill and took into account the perspective of the industry. There are 200 deadlines in the bill to help move government agencies quickly on drone issues so industry has regulatory certainty.

The other big agenda is the regulatory agenda. We do not need to keep old and outdated regulations. We can achieve both environmental safety and public safety by modernizing our regulations. We rescinded 24 old regulations for every new one issued. Our goal is to modernize, while also providing regulatory certainty. This is what this conference is about.

During my time in Congress, I have been working on transportation issues, in particular water management, roads, and coastal projects. In those sectors, we are working on ideas from 1970s. One exciting thing about aviation and drones is that it is new, exciting and disruptive. You are driving the rules, the sector, the technology; and government is giving you a runway and trying to insure we are not impeding, but rather partnering, with you. We want to make sure we take full advantage of this conference so you can convey what are the technology and regulatory challenges. FAA has done a good at providing regulatory structure. And other countries look at us for regulatory framework. But how do we insure we keep looking toward the future, not 2019 but 2030, and keep providing regulatory certainty.

Thank you for attending and I look forward to working with you to understand each other's perceptive and regarding the future of drones so that we can provide the certainty, provide the runway, and implement solutions instead of being an impediment.

Michael Chasen:

I am honored to accept the position of Chairman of the Drone Advisory Committee (DAC) and excited to talk you about what is happening in the industry today. What I am seeing is unlike what I saw even a year ago. I believe the unmanned aerial vehicle (UAV) industry is at the precipice of taking that next step forward, of seeing the next step towards exponential growth. I was co-founder and Chief Executive Officer (CEO) of a large learning company with my college roommate. We grew it to be a company of 3,000 employees and 20 offices. I took the company public as one of the youngest CEOs and sold it for just under $2 billion. At the very beginning, we tried to get capital investors to get the company going. I remember speaking to the first venture capital investor and he shared that he had spoken to numerous universities about using our e-learning software. They told him that they were never going to use our e-learning tech. A few months later, we had 300 schools using our software. After a year, it was 1,000 schools, and eventually we had up to 30,000 institutions using our tech. Clearly, what the industry thought was incorrect; there was massive adoption around the corner. I am seeing parallels to what is happening in UAV spaces.

What does the Market want?

Henry Ford once said, "If I had asked people what they wanted, they would have said faster horses." What would the public say it wants, if asked about drones? They would

probably say: "I want faster deliveries or better resolution cameras for their drones or when flying taxis might be available." But they are really saying is that they want tech that works better and carries more payload safely, and to have policies that can support all the cases we are thinking of for drones but also don't limit what we can think of tomorrow.

Where is the market today?

If you look at the different drone markets, you find the military drone market is $20 billion and will be $50 billion by 2025. The consumer market is currently $5 billion but expected to grow to $20 billion by 2020. The commercial drone section is just getting started. Why is that? Prior to 2016, it was against FAA regulations for a business to use drones without receiving an exemption. In 2016, FAA came out with part 107 that allowed businesses to use drones as long they followed a set of easy to comply with rules. In 2017, many companies started to launch pilot programs to test using drones. In the last two years, we have seen massive deployment of drone technology. We are right there on the precipice of the hockey stick curve if you overlay it on top of the market adoption chart. We then see we are through the early market stage and starting to see the exponential growth. We are starting to see mass adoption of drone technology at PrecisionHawk and other companies. Survey results show that companies are deploying drones to collect data and produce actionable results.

How do we build technology that allows drones to operate safely, increase range, etc.? And how do we make sure to implement the right policies that will help growth and not limit the ideas we will think of tomorrow.

There are three key pillars the industry can use to accomplish these goals and they are being used at PrecisionHawk.

First, we have a drone pilot network, consisting of pilots who are certified in part 107, but also have additional training in flying transmission lines, Infrared (IR) sensors, etc. We are also automating flight operations as much as possible.

Second, artificial intelligence (AI) and machine learning. PrecisionHawk collects the data and uses AI to help analyze this data. Our AI is geared toward identifying assets and problems that might arise.

Lastly, Public-Private Partnerships. As the DAC chairman, I will work with the FAA and DAC members to deliver quick, actionable insights and recommendations to identify and tackle the most pressing issues related to the UAS integration. I will also work to assist the FAA to fulfill its mandate of safely and efficiently integrating UAS into the NAS.

Leveraging my experience in growing startups to large public companies, I hope to help grow the emerging drone industry into a legacy industry alongside traditional aviation.

PrecisionHawk has been involved in PPP for a long time; we were a member of the FAA's Pathfinder Program for three years. We worked with the FAA to understand the risks and mitigations needed to support assessment of waivers and future rulemaking.

Through these three pillars, we are doing our part to help industry progress forward. But for this all this to work, all of industry need to work more closely together to help accomplish this or it is pointless.
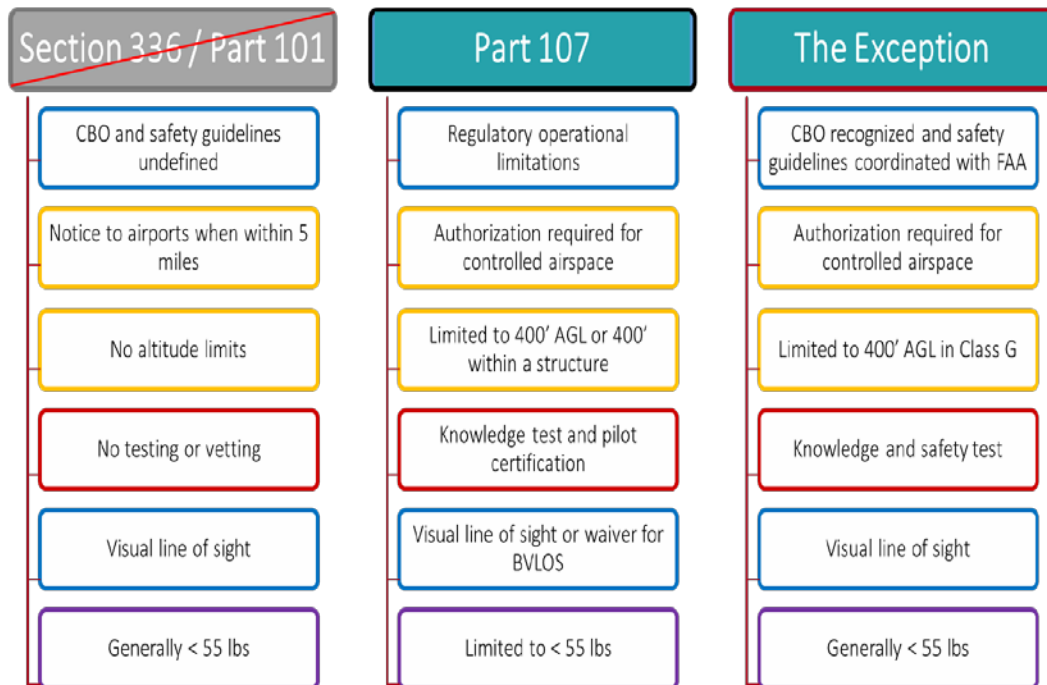
Recreational Flying – What's New?

- **Danielle Corbett**, Aviation Safety Inspector, FAA UAS Integration Office
- **Kevin Morris**, Aviation Safety Inspector, FAA Flight Standards Service
- **Bill Stanton**, Manager, FAA UAS and Commercial Space Operational Integration
- **Richard Hanson**, President, Academy of Model Aeronautics
- **Jim Williams**, Aviation Consultant, JHW Unmanned Solutions

The 2018 FAA Reauthorization Act has changed the way recreational drone flyers can fly in the NAS. These changes also bring a common level of safety for all drone pilots. The session discussed what these changes mean for the drone community. Attendees had the opportunity to hear the latest on how this new law is being implemented and to ask related questions.

The FAA is working closely with industry on the development of the knowledge test, which is intended to educate recreational flyers. The Low Altitude Authorization Notification Capability (LAANC) will also be available for recreational flyers this summer. The Agency is working with the Academy of Model Aeronautics to establish letters of agreement for fixed flying sites.

In August 2016, parts 107 and 101 became effective resulting in inconsistent airspace and operational requirements for small UAS operations, confusion on how to apply and enforce the rules, and uncertainty in the field. The FAA and industry wanted clear and consistent rules to promote safety and advancement. The Reauthorization provides an exception for limited recreational operations of unmanned aircraft.

Section 336 / Part 101	Part 107	The Exception
CBO and safety guidelines undefined	Regulatory operational limitations	CBO recognized and safety guidelines coordinated with FAA
Notice to airports when within 5 miles	Authorization required for controlled airspace	Authorization required for controlled airspace
No altitude limits	Limited to 400' AGL or 400' within a structure	Limited to 400' AGL in Class G
No testing or vetting	Knowledge test and pilot certification	Knowledge and safety test
Visual line of sight	Visual line of sight or waiver for BVLOS	Visual line of sight
Generally < 55 lbs	Limited to < 55 lbs	Generally < 55 lbs

While we are waiting for LAANC to switch on, a recent Federal Register notice provides interim guidance for recreational flyers. In summary, recreational flyers are allowed to operate in uncontrolled airspace in class G airspace up to 400 feet.

However, the new change leaves people in the lurch. Getting the B4UFLY app and figuring out another park that is class G can be solutions to this challenge. The law requires people to operate under the guidelines and safety programming of a community-based organization.

As the FAA gives clearance to operators, another challenge remains knowing who is operating in the NAS. With the phased implementation in the next six months, things will begin to look different.

Better education and outreach can help in addressing many of these challenges. It is difficult for the FAA to know who doesn't know what. Flight Standards will have to get information to the public in a manner that everyone can understand. The knowledge test is a great opportunity to educate the public about UAS, and to inspire them to learn more about safety.

Supporting Safety Through Industry Standards
Theme: *Standards, Standards development necessary to enable UAS Integration*

- **Art Hinaman**, Manager, Technical Operations, FAA UAS Integration Office
- **James Foltz**, Manager, Programs & Procedures, FAA Aircraft Certification Service
- **James McCabe**, Senior Director, Standards Facilitation, American National Standards Institute (ANSI)
- **Philip Kenul**, Senior Vice President, Aviation and Operations, TriVector Services Inc.
- **Tracy Lamb**, VP of Regulatory and Safety Affairs & Chief Pilot, Association for Unmanned Vehicle Systems International
- **Albert Secen**, Vice President, Aviation Technology and Standards, RTCA

The session provided an overview of the activities of various organizations engaged in the UAS standards development process. The speakers addressed inquiries on the specifics of their organizations' standards involvement. They talked about key developments such as command-and-control, beyond visual line of sight (BVLOS), cybersecurity, and others that are needed to enable UAS Integration.

In the expanding world of UAS, industry-driven standards will help establish a framework to develop a common understanding for aviation authorities and the public on what drones can or cannot do, and how we interact with them. This panel discussed the completion of the UAS Standards Roadmap, progress toward filling the standards gaps, and what lies ahead in the world of UAS standards development.

Standards are needed for several reasons. The FAA needs standards because they form a bridge between rulemaking and research. Industry needs standards to ensure safety, reliability, and quality. They facilitate free and fair global trade and are used for interoperability. Standards are also critical to the integration of UAS into the NAS, especially in areas such as remote identification, operations over people and at night, detect and avoid, command and control, UAS Traffic Management plus the design, construction, and modernization of special airworthiness certification.

There are several bodies engaged in developing standards.

AUVSI's mission is to advance the shared interest through advocacy, education, and market growth. The work of the association fosters the technical and commercial success of the members and contributes to the societal benefits of safe, accessible, and affordable advanced technology. It has been involved with the standards industry

through the Trusted Operator program. One of its key missions is to develop standards and have them recognized by the FAA.

ANSI's mission is to enhance the global competitiveness of U.S. business and the U.S. quality of life by promoting and facilitating voluntary consensus standards and conformity assessment systems, and safeguarding their integrity. ANSI's UAS standardization collaborative activities include participation in a cross-sector coordinating body whose charge is to describe current and future standards needed to integrate UAS into the NAS. The overarching aim is to support growth of the industry with a focus on civil, commercial, and public safety applications. It will be publishing a new version of the UAS Standards Roadmap around June 2020.

The F38 Mission is to produce practical, consensus standards that facilitate integrated UAS operations at an acceptable level of safety. These standards include the design, manufacture, testing, maintenance, and operation of UAS as well as the training, qualification, and certification of personnel relevant to UAS operations. Committee F38 supports industry, academia, government organizations and regulatory authorities. Formed in 2003 through a memorandum agreement with the FAA, it currently has more than 230 members, including 30 regulators. So far, it has approved 18 standards and more than 25 are in development. It is currently working on the development of a Remote ID standard. Its key focus areas include standards and methods for UTM USS-USS functionality, an approved training provider program, BVLOS strategy, AC 377 autonomy in design, and operations in aviation.

RTCA's mission is to inspire the creation and implementation of integrated performance standards that meet the changing global aviation environment and ensure the safety, security, and overall health of the aviation ecosystem. Currently, their top priorities in standards development include design and construction standards, command and control linkage, cybersecurity, BVLOS, operations over people, remote tracking, counter-UAS, and others.

The FAA invites industry organizations to play an active role in the standards development process. However, the acceptance of any standards by the FAA depends on the details. Acceptance is on a case-by case situation and depends on the goals the agency is trying to achieve.

Public Agencies: To Fly Under Part 107 or as a Public Aircraft Operation

- **Mike O'Shea**, Program Manager, Safety & Integration Division, FAA UAS Integration Office
- **Karen Petronis**, Senior Attorney for Regulations, FAA Chief Counsel's Office
- **Deputy Rick Hassna**, UAS Team Lead, Alameda County (CA) Sheriff's Department
- **Charles Werner**, CEO Drone Responders Public Safety Alliance (Fire Chief Ret.)
- **Robert "Bob" Brock**, Kansas Department of Transportation

Public entities have two options for flying drones: under part 107 or as a public aircraft operation. This session focused on how to start a drone program and the benefits reaped by some of the public entities that have already used drones. Attendees learned about their options and discussed the right fit for their operations.

Public entities often ask under what rule they should operate their drones and one simple, frequently repeated response is that it depends on the operator's needs and the airspace where they want to fly.

Most people conducting public operations have no aviation background. They simply buy a drone and believe they too can fly.

What it takes to qualify as a public aircraft operator is defined in 49 USC 40102(a)(41) in terms of the aircraft although it is only effective when federal, state and tribal governments or the armed forces operate the aircraft. The limits on qualification are significant. An aircraft does not qualify as a public aircraft when it is used for commercial purposes or to carry an individual other than a crewmember or a qualified non-crewmember. There is a limited list of things that qualify as governmental functions. Volunteer fire departments; universities and schools; and state, public, or government entities that seek compensation do not qualify as valid governmental functions.

Panelists discussed the challenges they had faced as public operators while starting their respective UAS programs. For instance, when the Alameda County (CA) Sheriff's Department, one of the first public entities in California to use UAS, decided to launch its drone program, the more than 1,000-member department encountered tremendous resistance. It applied a robust outreach program and met with members of the community, including representatives from the American Civil Liberty Union, to address their concerns.

Public entities use drones for a variety of purposes, from investigating murders to fighting wild fires and detecting explosives. Panelists applauded the FAA for its

commitment to the integration of UAS into the NAS. They also acknowledged that the great work being done to enable public operations has not happened in a vacuum. The UAS Symposium is a rare example of an event where a government agency goes to the stakeholders and asks them to evaluate its work. That shows that the FAA is truly open for business and willing to work with industry and public entities to facilitate safe UAS operations.

The Integration Pilot Program (IPP) is another great opportunity for the FAA and public and private entities to work closely on shared objectives, values, and common goals.

The Kansas Department of Transportation (KDOT) is using drones for inspecting highways, railways, electrical infrastructure, precision agriculture, disaster response and research and rescue. It is also using UAS during floods and tornados. KDOT has engaged 15 different organizations in a team-approach to support their work. Otherwise, it would be impossible for these organizations to do their work alone. The department also spoke to the local community in advance of launching its operations. The relationship with the community was extremely helpful as KDOT assured them that drone operations would not invade their privacy. There is a lesson learned from KDOT's experience: Having a straight and honest conversation with the community pays off.

Security Risks: Where Are We with Counter-UAS and What is Next?

- **Angela Stubblefield**, FAA Deputy Associate Administrator for Security and Hazardous Materials Safety
- **Carissa VanderMey**, Senior Advisor, Department of Homeland Security
- **Justin Barkowski**, Staff Vice President, Regulatory Affairs, American Association of Airport Executives
- **Joe Mazel**, Chief, Operational Technology Law Unit, Federal Bureau of Investigation
- **Brian Throop**, Director, FAA System Operations Security

This session discussed recent counter-UAS authorities granted by Congress, limitations on applying them, what they mean to operators, and where counter-UAS technology is headed. The session also analyzed what security and critical infrastructure owners may or may not do now, and what opportunities are on the horizon. It was clear from the discussion that collaboration between all stakeholders is important and it is not possible for one Department or Agency alone to ensure safe drone operations. Currently, there is a lot of uncertainty among the owners of critical infrastructure. They want to know who owns what technology and how it can be used.

Technology is not the only solution. There are processes that also need development.

Following the passage of the 2018 FAA Reauthorization Act, the Departments of Homeland Security and Justice have joined the Departments of Defense and Energy to have counter-UAS powers to help protect critical infrastructure.

The new authorities also require significant internal coordination between various agencies, which in itself is a huge challenge. The FAA is working with the White House to make sure that the counter-UAS technologies are used to keep aircraft in the NAS safe without hampering the ongoing growth of the UAS industry.

As the FAA hears concerns from large airports about possible disruptions of operations caused by Gatwick-like incidents, it is communicating with different partners telling them what they can and cannot do. Bigger airports are more concerned than smaller ones as they are afraid of significant financial losses, chaos at airports, flight cancellations, and long lasting airport shutdowns.

Airports are currently faced with two types of threats: Genuine security threats and incidents that come from the careless and clueless operators.

There are mitigation systems available for use by airports but these systems require approval and there is no perfect mitigation system.

Currently, the FAA does not support or encourage the idea of airports acquiring counter-UAS technology. There are legal implications in terms of complications that such systems pose so airports must consult their legal office before deploying such systems. Recent guidelines that went out to all airports stated that the FAA supports their authority to address potential threats and malicious attacks, but their approach must be risk-based.

After the Gatwick incident, officials from the FAA and the Department of Homeland Security met and agreed that they had to work together to address the increasing threat. DHS, in coordination with the National Security Council and the DOD, has developed a concept of operations on persistent threats that will start at 34 airports. DHS has also been working with the FAA, FBI, and DOJ to identify sites where it would conduct testing of existing technology.

The Transportation Safety Authority is also working with airports to get their feedback. In case of an accident that cannot be addressed locally, the DOD must be involved because it has the technological capability to address such a situation. A recent assessment of threats to airports coordinated by the FAA and DOJ offered several recommendations on how the FAA sees its interaction with state and local entities.

The FBI has determined that drones will be used at some point to attack a mass gathering and it is working with the FAA to thwart any such attacks. All agencies have a role in preventing these attacks.

Despite a dearth of resources, keeping the NAS safe is a collective responsibility and government departments can make significant progress by collaborating with each other and other stakeholders.

The FAA has done an impressive job in keeping UAS away from critical infrastructure. Better infrastructure and technologies are needed to help the airports. The FAA believes it is the time for remote identification, as it will help address safety and security concerns.

Drones and other unmanned technologies are evolving very quickly. Airports that have installed their own mitigation systems should be careful with such self-help because some of these systems have interrupted authorized operations.

Is Your UAS Safety Case Ready for Flight – Leveraging Research and Operations to Get to YES

Themes: Discussing the characteristics of Part 107 waiver applications that lead to approvals and disapprovals.

- **Sabrina Saunders-Hodge**, Director, UAS Research Division, FAA UAS Integration Office
- **Paul Strande**, Deputy Director, UAS Research Division, FAA UAS Integration Office
- **Jeremy Grogan**, Part 107 Waiver Team Lead, FAA Flight Standards Service
- **Mark Askelson**, RIAS Interim Executive Director, University of North Dakota (ASSURE)
- **Mark Blanks**, Director, Virginia Tech Mid-Atlantic Aviation Partnership (MAAP)
- **Todd Binion**, Manager, P&C Claims Vendor Management & Strategy Office, State Farm

This session encouraged attendees to apply research, operational validations, risk assessments, and more to improve their safety cases and inform the expansion of operational capabilities toward the full integration of UAS. Panelists discussed the optimum data sets and safety case framework to support consistent and repeatable approvals. They discussed how research results could help applicants demonstrate safety to the FAA as they heard from operators who have successfully done so.

When completing a part 107 waiver application, applicants must first identify their needs, finding existing technologies that thoroughly meet those needs. They should explain all aspects of the operation by providing data to support risk mitigations, and work with the FAA to resolve any concerns. The panelists presented trends on part 107 waiver applications from the DroneZone system to discuss characteristics of a waiver application that may lead to approval or denial.

The key to a successful waiver application will be a robust safety case that effectively addresses all potential risks and hazards associated with the operation and validates the conclusions through testing that provides relevant supporting data.

State Farm has been looking at drone activity since 2012. It requires the ability to quickly assess damage after significant weather events to provide claim service to its policyholders. Drone technology provides a technical capability to quickly deploy over an event site and assess damage from the air. Data obtained from drone flights can be used for determining severity of the event for better resource allocation as well as enabling claim decisions.

To get FAA approval, applicants must collaborate with subject matter experts and write clear and detailed waiver applications that are supported by data. They should reach out to and engage with the FAA early in the process to explore their needs.

The Alliance for System Safety of UAS through Research Excellence (ASSURE) is engaged in developing an enhanced test data collection framework and safety analysis tool to inform the UAS Integration Research Plan.

The Research Division within the FAA's UAS Integration Office pulls the research thread on drone safety cases. It works with UAS research partners, including the Integration Pilot Program, and analyzes research data to support the goal of full integration of UAS into the NAS. The UAS research is aligned to operational capabilities toward full UAS integration. More information about UAS research can be found on the ASSURE website at www.assureuas.org

Integration Anticipation – Industry Insight Into What Is Next

- **Mike Lukacs**, Deputy Division Manager, Forecast and Performance Analysis Division, FAA Office of Aviation Policy & Plans
- **Christopher Lawson**, Aerospace Corporation
- **Meredith Langstaff**, McKinsey & Company
- **Steven Hummel**, Senior Research Analyst, CTA

Expanding drone operations in the United States and throughout the world are transforming our daily lives, and changes that are even more dramatic are in store. To know what to expect and what it means for business, this panel provided attendees an opportunity to hear from experts on what they are anticipating from this emerging market. One thing the discussion made clear was that there is enormous potential for commercial UAS.

New registrations have dropped roughly 50% in 2016 – 2017 and again in 2017 – 2018. There are currently over 1,000,000 registered drones, but we may be reaching a plateau. Initially, there was 5.5% growth, but it is projected to level off to 5% by 2023. In 2018, there were over three times as many registrations per month as the entire time registration has been available. This jump has occurred after the announcement of the UAS Integration Pilot Program and the rollout of the Low Altitude Authorization Notification Capability (LAANC) in 2017. Better price points and battery life improvements have also been made. California, Texas and Florida are especially dense in terms of registrations. The current active fleet includes 400,000 and it is expected to reach 835,000 by 2023. The public is becoming more aware and comfortable with drones.

By the end of 2017, the FAA had issued 116,000 remote pilot certificates, which also includes remote pilots who took the initial knowledge test and current pilots who took online training in lieu of the knowledge test. The FAA believes there are about 2.5 vehicles per remote pilot registration and forecasts nearly 350,000 remote pilots by 2023. The agency intends to revise these numbers for more accuracy as it continues the safe integration into the NAS.

Detail on the UAS forecast can be found here: https://www.faa.gov/data_research-aviation/

Currently, 13% (15.6 million) of 120 million households own drones. With 21.9 million drones in 2019, that means an average of approximately 1.4 drones per owner. Typical owners are in the south, married, and have kids. The majority of drones are small (toy)

and medium (enthusiast) models. Surveys reveal that 99% of responders said they operate a UAS for recreational use. About 3/4 of them said general purpose, followed by aerial photography and videography, commercial use, and then drone racing. Twelve percent of households (14.4 million) are likely to purchase a drone in 2019; 43% of them would be repeat purchasers. People base their purchase decisions on four factors: battery life; flight range; safe technology and camera resolution.

There is an enormous opportunity in urban air mobility (UAM), as it promises $30-45 billion in annual GDP impact across a number of industries. UAM will be used mainly to transport people, deliver goods, and for surveillance operations and imagining. The estimates for transporting people and delivering goods through UAM vary widely from tens of millions of U.S. dollars to hundreds of millions in the next few decades. The estimated time for maturity is a little further out.

Enabling UAM requires infrastructure development and that will depend on the regulatory timeline and technical capability. It is important to see what use cases are worth investing in, identify economic drivers, and make sure that there is a real business piece behind unlocking these cases. Currently, infrastructure seems to get the least attention in UAM discussions although it is the time to focus on the Unmanned Traffic Management, counter UAS, and vertiports and vertistops plus charging stations, distribution hubs, and receiving vessels.

Over the past few years, UAM has captured close to $500 million in venture capital investment. However, that has not focused on the infrastructure piece seemingly because this is a new class of infrastructure. UAM is exciting but solving the infrastructure problem is critical to make sure that we can get there. Public-private partnerships seem a possible solution.

Public Safety Operations – Getting Airborne When Every Second Counts

Carol Might, Special Operations Liaison, FAA System Operations Security

Attendees in this session got a better understanding of their options to fly a drone in an emergency or other public safety situation. They discussed their options in the wake of search and rescue operations, firefighting, and post-disaster damage surveillance, and the critical steps needed to coordinate their operations and deploy rapidly and safely.

The session provided information on obtaining an immediate (emergency) waiver. First responders and other organizations responding to natural disasters or other emergencies for the public good may be eligible for expedited approval through the Special Governmental Interest (SGI) process. Operations that may be considered include:

- Firefighting
- Search and Rescue
- Law Enforcement
- Utility or Other Critical Infrastructure Restoration
- Incident Awareness and Analysis
- Damage Assessments Supporting Disaster Recovery-Related Insurance Claims
- Media Coverage Providing Crucial Information to the Public

To apply for a waiver through the SGI process, one must be an existing part 107 Remote Pilot with a current certificate or have an existing Certificate of Waiver or Authorization (COA). To submit a waiver through this process, they will have to fill out the Emergency Operation Request Form and send it to the FAA's System Operations Support Center (SOSC) at 9-ator-hq-sosc@faa.gov. If approved, the FAA will add an amendment to the applicant's existing COA or Remote Pilot Certificate that authorizes them to fly under certain conditions for the specified operation. If denied, operators should not fly outside the provisions of their existing COA or part 107. However, they have the option to amend their requests.

Operators cannot fly if they are not part 107-certified or do not have a COA. If they meet these criteria and call, they would be asking because they need a waiver to something in part 107 (if they are part 107-certified) or because they need an addendum to their COA.

The SOSC knows what the background, such as which regulations need to be waived, and how to mitigate the risk within the air traffic system. When a public entity is trying

to get an operation up quickly, they should know what will be asked and how to answer. When seeking an immediate waiver from the SOSCs, they will be asked:

- Are you 107-certified?
- Is the timeframe incompatible with the regular COA process?
- Are you a government entity, sponsored by someone, or able to articulate a public good?
- Is this for active enforcement, emergency relief, etc.?

The SOSCs will explain what kind of risk mitigations will be necessary.

Once approved, applicants will have to fill out paperwork to justify the waiver.

Drone Delivery

Brad Palmer, Representative of the FAA Flight Standards Service, Executive Director for the UAS Integration Pilot Program
James Foltz, Manager, Programs & Procedures, FAA Aircraft Certification Service
Sean Cassidy, Director of Safety and Regulatory Affairs, Amazon Prime Air
Margaret Nagle, Head of Policy and Government Affairs, Wing

On drone delivery, we have transitioned from asking "Is this possible?" to "How and when can we get down to business?" New rules may be coming in the future, but the FAA is adapting existing regulations to approve operations today. This session drew tremendous interest from the participants, particularly those interested in drone delivery. It was their opportunity to hear from the FAA on where we are and what it will take businesses to get in the air.

It became clear from the discussion that not only are big companies like Amazon and Google capable of drone delivery, but smaller companies as well if they have the right knowledge and guidance. While drone delivery can be for everyone, it is going to take time and effort. Everyone has to be patient with the process as the FAA makes sure that the safety of the NAS is not jeopardized. Drone delivery is scalable and expandable if it is offered with the right safety plan.

FAA officials said they want people to know that the Agency is open for business and it is working hard on important matters. Industry partners applauded the FAA for its support and guidance. They said partnerships with the FAA have been extremely fruitful and enlightening. Both sides have learned from these experiences.

Certification is a long process with five different phases. It begins with the applicant's concept of operations that informs the FAA what the applicant already knows and where they want to fly. The application is then reviewed to adjudicate the gap between what the applicant wants and what the FAA needs. The FAA examines if the applicant has all the resources they need to operate successfully. It does not expect applicants to submit a flawless application and get everything correct on the first attempt. There will always be several rounds of interactions, reviews, feedback and edits during the application process to make sure it meets all the requirements. The performance assessment phase also includes an interview and an administrative process.

Operators should not stop flying their drones just because not all standards are ready. They should still operate with whatever is currently available. Once they start, they will

learn and expand their operations with the passage of time. The FAA reviews each case on a performance basis. The agency does not employ a prescriptive approach, as its requirements are performance-based and there is no one size-fits-all approach. The FAA does not tell applicants what technology they should use. The agency primarily cares about safety.

Wing is planning to use drones to make delivery more sustainable, faster and safer. In Australia, merchants are the strongest supporters of drones because they offer faster delivery.

Since drones are a new technology, communities have limited or no experience dealing with them. Thus, engaging the community, telling them about its benefits and assuring them of safety are critical pieces of drone integration. It is important to get feedback from the public on what they want. This is a great learning process. Everyone, from the FAA to local communities and various stakeholders are learning from each other about this new technology.

Drones and Airports – Stranger Things Have Happened
Themes: *Exploring the potential uses of UAS at airports.*

John Dermody, Director, FAA Airport Safety and Standards
Bill Stanton, Manager, FAA UAS and Commercial Space Operational Integration
Jim Patterson, Manager, Airport Safety R&D Section
Chaim Van Prooyen, Hartsfield-Jackson Atlanta International Airport
Steve Weidner, UAS representative, National Air Traffic Controllers Association (NATCA)

There are obvious safety considerations and benefits for flying drones in an airport environment. Drones and the Low Altitude Authorization Notification Capability (LAANC) offer great benefits for airports, but that does not come without risks. Speakers in this session discussed best practices for airport operators and local authorities to ensure safe and efficient operations. There is great potential for the use of UAS at airports for various operations, including aircraft rescue, firefighting, runway pavement inspections, perimeter security, and more. LAANC uses facility maps to allow for almost real-time evaluation of airspace authorizations near airports. There is still much work to be done to determine how UAS will be safely integrated into airport operations due to factors such as turbulence from manned aircraft.

UAS research activities being conducted in various US airports include:

- Commercial aircraft inspections
- Wildlife hazing (scaring wildlife away)
- Perimeter security
- Aircraft Rescue and Firefighting (ARFF) efforts
- Thermal imaging technology

While UAS flights may be permissible at an airport, it may not always be safe to do so in close proximity to manned aircraft. With over 2,500 flights a day and a 4,700-acre campus, the Atlanta International Airport (ATL) is engaged in integrating UAS through several activities. It recently conducted the first UAS flight in Class B airspace under part 107 as well as the first UAS flight over a commercial service airport runway. ATL is also deploying UAS for capital improvement projects. In addition, it uses DJI Matrice aircraft to conduct runway pavement inspections with thermal imaging sensors that enable inspectors to learn more about the condition of runway pavement.

While trying to get approval, ATL coordinated with subject matter experts, the FAA, runway organizations, and other groups. Airports disseminate the information about an approved UAS operation in various meetings and events. It would also be great if airports could use drones for conducting Precision Approach Path Indicator and there is potential for using UAS for foreign object debris management. If an applicant is looking to conduct on-airport UAS operations, their chances of being approved may increase if they start their operations in "non-moving" areas – i.e., places with no other moving aircraft or air traffic.

New Kid on the Block: Engagement and Outreach Opportunities

Erik Amend, Manager, Executive Office, FAA UAS Integration Office
Jeannie Shiffer, FAA Deputy Assistant Administrator for Corporate Communications
Felix Meunier, Director, Remotely Piloted Aircraft Systems (RPAS) Task Force, Transport Canada
Tan Kah Han, Senior Director (Safety Regulation Group)/Director (Airworthiness Certification & Unmanned Aircraft Systems), Civil Aviation Authority of Singapore
Andrew Mutabaruka, Head of Quality and Safety, Rwanda Civil Aviation Authority
Colonel Vargas, Department of Airspace Control, Brazilian Air Force

While representatives from 20 different countries attended this year's UAS Symposium, this was the first truly international panel. Officials from various countries shared best practices and learned how the FAA communicates with UAS stakeholders in the United States. The session focused on connecting with communities on safety messaging, media strategies, and measurement of success. It was evident from the discussion that most countries face similar challenges while trying to integrate UAS into their respective airspace systems. The use of drones seems to be increasing everywhere and countries are using diverse approaches to educate their publics.

Singapore is successfully using drones in urban areas and it considers them a vital lifeline for the future of its economy. It has developed several educational programs to promote responsible use of drones. However, Singapore also punishes those who violate UAS regulations. The Singapore Civil Aviation Authority enjoys tremendous support from the government for its UAS integration efforts. It uses traditional and social media, public events, and educational materials sent via mail as part of its outreach efforts.

Canada is allowing drone flights over and close to people and beyond visual-line-of-sight in controlled air space. It is using various messaging tools to educate the public. Tourists who wish to fly a drone in Canada are required to contact Transport Canada in advance. Canadian UAS rules do not differentiate between commercial and model operators. The country has a solid aviation industry and a robust safety culture. The number of accidents and sightings has decreased by 30%. Drones are popular among young people and the news media are enthusiastic covering drone-related stories.

In Brazil, officials view drones as a threat as well as an opportunity. They use drones for various purposes, from pipeline inspection to disaster response and law enforcement. The country has a steady growth of drones, with around a thousand new drones added

each month. Brazil recently held a major UAS symposium, which will be followed by a similar regional conference aimed at promoting drone safety awareness.

Drones are used in Rwanda to improve operations in the health and agriculture sectors. Besides enforcement, the country's National Police also educates the public and local officers about safe and legal UAS operations. Rwanda published its first UAS regulations in 2015, dividing operations into three categories: basic, specific and complex operations. The nation has not witnessed a single drone accident since 2016.

The FAA's Office of Communications (AOC) is responsible for educating millions of people in the United States about drone safety. It applies various methods, from communications with traditional and social media to conducting informational webinars to spread awareness about drone safety. AOC finds the use of social media helpful in having a direct conversation with UAS stakeholders. It keeps all lines of communication open because it is constantly interacting with new stakeholders and does not assume that everyone knows where to locate safety information. While posting information on any platform, AOC makes sure that users are ultimately directed to the FAA's official website for accurate and credible information.

The Age of Automation - Future of Flight
Parimal Kopardekar, Director of NASA Aeronautics Research Institute (NARI)
Chris Anderson, CEO, 3DR
Dr. Tom Prevot, Director, Airspace Systems, Uber
Antonio Campello, President and CEO, Embraer X
Melissa Tye, Skyward

The central question under discussion in this session was how automation is changing the role of the regulator and what influences automated flight decks will have on the future of air travel. Industry leaders and regulators shared their thoughts on how automation could make aviation safer and more effective.

Panelists suggested allowing drones to operate with as little human interference as possible. At the outset, things might look extremely intimidating but we have to know that human error is the biggest enemy of automation. Drone users come from all walks of life.

Drones are still in the infancy stage and they have not delivered the desired level of efficiency that we wish to see. While currently one person manages a drone at a time, we will soon see drone operations on a mass scale. Today, a human survey costs $1,000, while drone surveys cost $100 and automated surveys cost only $10. Eventually, we will have to let machines take control and do their jobs without any human interruption. In Berkeley, robot cars deliver lunches. With self-driving cars coming, we will soon see this elsewhere as well.

In the backdrop of the rapidly changing landscape, panelists suggested that soon we would need an FAA-sponsored UAM Symposium. Traffic congestion is a global issue and industry is trying to bring electronic take-off to some of the world's most congested cities. Research shows that 300 million people worldwide commute more than 45 minutes in urban areas. Traffic congestion has a $100 billion impact on the economy. There is a big market available if someone can fix this problem. UAM seems to be the ultimate solution. This, however, means new technologies and infrastructure must be developed. Industry will be working with the FAA and NASA to prove its capabilities and demonstrate that the new technologies and solutions work. There are several lessons from the drone world that can be applied to UAM.

Skyward, a Verizon-owned company, is a provider of the Low Altitude Authorization Notification Capability and is interested in providing connectivity that supports drones. The company is going to roll out the fifth generation cellular network technology,

popularly known as 5G, which will be transformational not just for drones but for businesses and society as a whole.

Experts believe UAM operations will be more successful if human interference is minimized. After all, these operations are eventually going to get beyond human capacity to manage when we will have tens of thousands of machines running. Humans should be involved if they are properly trained and add any value in the process. Otherwise, they should be kept out of the world of automated machines.

People should have realistic expectations from UAM. It will not solve all the problems of ground mobility or congestion and there is still a lot of work that needs to be done. UAM will give people the freedom to make trips in less time and the right to decide how to use their time. UAM will give people the choice to fly over a city in a very safe way. Aviation is safer than driving, so if big cities can have millions of cars in narrow roads, then it should be feasible to have tens of thousands of drone vehicles in the airspace.

Meet the UAST
Jay Merkle, Executive Director, FAA UAS Integration Office
Sean Cassidy, Director of Safety and Regulatory Affairs, Amazon Prime Air
Fred Roggero, Resilient Solutions
Ken Kranz, Cognizant
Corey Stephens, Operations Research Analyst, FAA Integrated Safety Teams Branch

The Unmanned Aircraft Safety Team (UAST) is an industry-government partnership committed to ensuring the safe operations of unmanned aircraft systems. FAA Administrator Michael Huerta announced its formation on August 2, 2016. UAST is adopting the same collaborative model as the General Aviation Joint Steering Committee (GAJSC) and Commercial Aviation Safety Team (CAST). The UAST supports the safe integration of UAS with data-driven safety enhancements and collaboration amongst members of the UAS industry.

In this session, UAST leadership explained the organization's mission, ongoing projects, and plans. They discussed how the drone revolution and general aviation are merging safety culture into remote identification, part 107 regulations, new flight standards for remote pilot certification, and how the UAST will impact general and unmanned aviation in 2019.

The UAST is committed to finding a way to educate the public to combat careless and clueless behavior. It is constantly exploring ways to encourage best practices. It is inspired by the safety legacy of manned aviation and its guiding principles include safety in a data-driven manner, and being aviation and technology inspired; balanced and adoptable; innovative; and transparent, proactive, non-punitive and impartial.

To move the safety needle forward, the UAST has clearly stated its safety policy, which includes a data-driven risk mitigation system, safety assurance program, and safety promotion.

This year, the UAST is engaged in a tremendous amount of outreach efforts. It will feature prominently in the Drone Safety Awareness Week and will leverage the Safety Reporting System program. This year, the UAST also finalized a white paper in advance of the request for information (RFI) for the knowledge test.

The UAST has provided "Safety in a box" voluntary guidelines for manufacturers.

The FAA works closely with the UAST as the Agency deems the UAST's four working groups as the cornerstone of safety. The FAA wants the UAST to be the place where the

UAS community comes together around safety. The Agency is excited about the UAST because it gets people together, creates clear expectations of getting actionable and practical safety work, and is not stuck in analysis paralysis.

The UAST's safety reporting can help advance the cause of drone safety. There are so many drones flying with so much data, that protecting that data is essential to gain the public trust of the UAS Safety Reporting System. Otherwise, people will be hesitant to supply the data. The UAST plans to develop a PIREPS for drones to protect the data.

During the session, CAST and the GAJSC were also reviewed. Everything the UAST does has industry and government components. While what the UAST does is data-driven and focused on implementation, the group is non-regulatory and it looks for a path to voluntary implementation.

The UAST is striving to produce standardized materials. The community can help in amplifying the safety message. The Drone Safety Awareness Week will be a great opportunity to spread that message. It is important to encourage colleges and high schools to promote a culture of safe and responsible operations. The UAST measures its success by looking at the public's viewpoint of drones.

Get Your Drone Business Flying: Tips and Best Practices from FAA Insiders for Getting to YES for Your Part 107 Operational Approvals

Themes: *Tips for developing a better part 107 operational waiver application, Understanding why part 107 operational waivers are accepted or denied, Understanding Airspace Authorizations and when to request them.*

Sabrina Saunders-Hodge, Director, UAS Research Division, FAA UAS Integration Office
Paul Strande, Deputy Director, UAS Research Division, FAA UAS Integration Office
Jeremy Grogan, Part 107 Waiver Team Lead, FAA Flight Standards Service
John Page, Air Traffic Specialist, FAA Emerging Technologies Team
Rachel Carlstrom, FAA UAS IPP SLT Program Manager

Part 107 waivers are the primary avenue for drone operators to expand their operations beyond visual line-of-sight (BVLOS) and over people, but operators are continually vexed by how to be approved. The session covered the common elements of waivers that receive FAA approval plus common waiver application mistakes and how they can be avoided. Panelists shared best practices within the FAA to assess risk and develop a safety case.

Under the UAS Integration Pilot Program (IPP), the FAA is working with nine Lead Participants to assist them with accelerating the progress of their part 107 waiver applications. These include night operations, flights over people, BVLOS, package delivery, detect and avoid technologies, and reliability and security of data links.

Partnerships between the FAA and the Lead Participants can be described as one of the key successes of the IPP. Panelists specifically lauded participants like Matternet IPP North Carolina DOT, which is conducting medical package delivery operations, and IPP Choctaw Nation of Oklahoma, which is conducting agricultural, disaster response, and other missions. They came to the Agency with very well developed concepts of operations (ConOps) and were able to explain them in detail. The clarity in their applications helped them to get approvals.

Many IPP Participants have used a "Crawl, Walk, Run" approach for their operations. They started with simple operations, identified and mitigated risks, and then developed more complex operations over time.

FAA officials said a review of the DroneZone database showed that incomplete applications are the biggest cause for most of the waiver denials. Approval rate for part

107 is low mainly because 70-80% of the applications are incomplete. Applicants must communicate their needs clearly and concisely if they want to be approved.

DroneZone and LAANC are the two methods of obtaining an airspace authorization for UAS operations.

Part 107 language had initially determined that airspace waivers were for long-term, recurring operations, and that authorizations were for shorter operations. That definition was subsequently modified to mention using technologies that keep the operation safe.

When asked about the difference between the processing of an IPP waiver request versus a regular waiver, FAA officials said IPP waiver requests get priority and move to the top of the waiver processing pile.

Navigating Security Restrictions

Guy Turner, FAA National Security Programs & Incident Response
Rob Sweet, Manager, Strategic Operations Security, FAA Air Traffic Organization
Joe Morra, Director, Safety & Integration Division, FAA UAS Integration Office
Janet Riffe, Manager, Enforcement Standards and Policy Division, FAA Office of Security and Hazardous Materials Safety
Charles Raley, Senior Attorney for UAS, FAA Chief Counsel's Office

The FAA's 2018 Reauthorization Act has significantly changed the UAS landscape, particularly when it comes to protecting national security assets and missions from UAS threats. This session discussed how to navigate the newly emerging security restrictions, so that legally authorized operators are not mistaken for clueless, careless, or criminal flyers. Attendees learned how to identify what locations to avoid, and what steps they could take to ensure the accomplishment of their mission.

It was clear from the discussions that there was significant interest in knowing whom to notify when one sees reckless or unsafe operations. This amounted to recognizing and supporting the role of the Law Enforcement Assistance Program (LEAP) agents and the FAA. It was also obvious that airports are showing continued interest in installing detection systems to avoid any drone incidents. However, they were advised to contact and consult the FAA before doing so. The panel emphasized that as long as there are unsafe operators interfering with firefighters and emergencies, safe emergency operations cannot take place. Panelists discussed the positive sides of the Act, showing that rather than restrict operations, it enables them.

To ensure safe UAS operations, one has to take into account several things, including training, operations manuals, curriculum, and cultural factors that operators bring to the table. In the long-term, the FAA will focus on beyond visual line of sight (BVLOS) and other complex operations. The Act reinforces Unmanned Traffic Management (UTM) implementation. The Agency has an excellent partnership with NASA and is doing whatever possible to create an environment where the UTM industry can thrive. The implementation of UTM started with the registration of UAS and then went to Low Altitude Authorization Notification Capability (LAANC). Remote ID will be the Agency's next big milestone. An aviation rulemaking committee is working on it.

As we approach UAS integration with expanded BVLOS operations, the FAA is working with its partners and stakeholders to address all security concerns. The Agency is cognizant of scenarios where people have malicious intentions and want to cause

disruption and harm. That, however, needs to be balanced with risk-based concerns. The FAA deems it important to allow legitimate UAS operators, but it also takes the security concerns seriously. There has to be a clear balance.

Through LEAP, the FAA's Office of Security and Hazardous Materials Safety has developed a toolbox for public safety entities on the enforcement of drone regulations and the procedures to start a drone program. Additionally, the FAA is working on a robust outreach and education program targeting the law enforcement community. These initiatives include a series of webinars, printed materials, a 19-page document on legal operations, and a roll call training video. All of this information is available online.

Under the Reauthorization Act, Congress repealed Section 336, which was the original rule for model operators. New Section 349 provides clearer guidelines for recreational use.

The Departments of Energy, Defense, Homeland Security, and Justice have the right to deploy counter-UAS systems. They can do so when they perceive a threat to their facilities.

Several laws criminalize the destruction of a drone. The FAA encourages compliance through education. It is making efforts to provide all the necessary information to the public but it is incumbent upon UAS operators who want to access the NAS to be aware of the airspace where they are operating. The Act provides criminal provisions and violations can lead to a fine of up to $20,000. So far, the FAA has taken enforcement action in at least 90 cases. The majority of them involved reckless operations.

The Gatwick Airport drone incident is a frequently cited case of drone disruption. This incident has alarmed many airports who are now contemplating to install various detection technologies. However, before installing the proposed equipment, they must consult their attorneys and the FAA to see what they can do legally. The FAA currently does not support the idea of airports acquiring such detection capabilities. The equipment might interfere with services at arrival and departure areas. It is in everyone's interest if airport authorities consult the FAA before deciding to install any detection systems.

Doing Business in the Drone Age

Diana Cooper, Senior Vice President of Policy & Strategy, PrecisionHawk
Brendan Schulman, Vice President of Policy & Legal Affairs, DJI
Jennifer Richter, Aiken Group
Lisa Ellman, Partner, Hogan Lovells
Eric Schwartz, Lead for UAS Program, Florida Power and Light

The drone business has been booming rapidly, revolutionizing business operations by reducing time and costs. It is enhancing data analytics, and enabling new business models and opportunities. In recent years, drones have been used for various purposes, from saving lives and restoring power to assessing destroyed infrastructure during natural disasters. Industry experts in this session discussed how to tackle the challenges associated with the drone market and shared tips on how to unleash the economic potential for business.

An active and engaged UAS community is one that creates a positive impact by providing comments to the FAA on proposed rulemaking.

To make sure that policy outcomes do not impede the UAS business, it is critical to address the issue of safety and security. Despite their enormous benefits to society and the economy, drones still have an image problem and are seen as scary and intrusive. The public perception of drones is still negative. Some people falsely believe that drones are going to invade and suppress their privacy and freedoms. We should redress such misperceptions through educational materials, fact books, and white papers.

Drone manufacturing companies, on their part, should offer geofencing as a protection against the careless and clueless operators who want to cause concern and panic among the public. Those who intentionally cause harm and engage in illegal or dangerous operations must face enforcement action. It is everyone's responsibility to keep the national airspace system (NAS) safe. This should not be viewed solely as the FAA's problem.

Retaining the safety and security of the NAS requires developing new technologies and infrastructure, including more advanced cloud storage and wireless systems that interact with Unmanned Traffic Management systems for the security of these operations. This offers a great opportunity to work with local governments and opens new windows of investment.

News organizations, such as CNN, see great business value from drones. It encourages its journalists to use drones because they capture stunning images and prove to be extremely helpful for newsgathering and production.

Hurricanes Maria and Harvey served as watershed moments for the use of UAS in journalism and rescue operations as they were used to tell powerful stories on natural disasters in several states. At one point, CNN used 50 drone operations to cover these stories.

Even teams that are using drones for the benefit of the public are often stopped and asked if they are operating legally. On some occasions, people have called law enforcement on these UAS operators. Sometimes, these interactions with law enforcement could be a teachable moment for officers who do not know much about drones or are encountering such a situation for the first time.

It is important for companies to keep track of their pilots when they are in the field because in some instances, people have threatened or even pulled guns on UAS operators. Florida Power and Light uses an internal global positioning system to locate its crews so that it knows where work is complete or ongoing. Moreover, while big news organizations such as CNN can post their brand logo on their trucks, it is more challenging for smaller businesses to convince the public about the legality and benefits of their operations.

Unraveling Risk
Theme: *Evaluating UAS operational risk, Understanding the FAA's Safety Management System*

Joe Morra, Director, Safety & Integration Division, FAA UAS Integration Office
James Foltz, Manager, Programs & Procedures, FAA Aircraft Certification Service
Jarrett Larrow, Aerospace Engineer, FAA Flight Operations Branch
Maggie Geraghty, FAA ATO Safety Manager

With more drones entering the national airspace system, the FAA is expected more than ever to take a holistic approach to safety risk management. Speakers in this session discussed the Agency's streamlined process for assessing risk and what it means for UAS operators. The also spoke about the development of a streamlined type certification process for UAS and how new operations will challenge the risk control framework of existing regulations.

Risk evaluation within the FAA uses tables that consider the likelihood and the severity of risks. There are five stages of risk severity: Minimal, minor, major, hazardous, and catastrophic.

The FAA has a responsibility to regulate with safety risk in mind. It uses regulations and standards to control these risks in the system. Waivers are the removal of safety risk controls and therefore require a safety assessment. The FAA needs confidence that granting regulatory relief would not adversely affect safety, would provide a level of safety at least equal to that provided by the rule being relieved, or would control safety risk to an acceptable level as determined by FAA Management. The operator still has the ultimate responsibility for the safety of their operation and compliance with applicable regulations. While making the case for safety, the operator produces a safety assessment used as an input to the FAA safety review and approval/denial decision. The FAA may perform a safety assessment of its own during the approval/denial decision-making process.

For the FAA to reach a decision, it requires a clearly defined operation (i.e., risk picture) that includes specific details of the operation (i.e., what, when, where, who, and how). It also assesses how the operator is controlling the severity and likelihood of risks for the proposed operation. The FAA also determines the predicted severity and likelihood of risks with those controls in place.

To reach a decision, the FAA also requires solid rationale and supporting data on manned aircraft within operating area, population below the operating area, failure modes and rates, reliability levels, and test results (i.e., occurrences rates).

Five common UAS hazards involve technical issues with the UAS, deterioration of external systems supporting the UAS operation, human error, adverse operating conditions, and inability to see and avoid.

Type certification is a tool to manage risk for UAS. The FAA has a risk-based approach for the certification of aircraft. FAA's Aircraft Certification function is working with Flight Standards and Air Traffic Organization to develop and streamline the type certification process. They [Aircraft Certification] are looking at having a risk framework for the MOSAIC (Modernized Special Airworthiness Certification) effort (still in development).

An acceptable level of risk is determined using the FAA's severity and likelihood charts and performance-based evaluation. Safety is not a one-size fits all approach for all aviation. The Agency assigns different levels of safety for different aircraft, including UAS. Specific Operation Risk Assessment is a method of conducting risk assessment and it is a good starting point. The Agency, however, still assesses the severity and likelihood of risks.

For operations still in their infancy, operators should talk to the FAA's Aircraft Certification function to avoid issues with their vehicle and to discuss operations within their concepts of operation. They can also call 844-FLYMYUA for assistance.

A type certification is just a certification of an aircraft and should not be taken as an approval for operations. Safety assurance is very important to the FAA, so waiver applicants must make their applications very clear. The review time is reduced if the application is clear and well understood.

Public Agencies: What You Need to Know to Start Your Drone Program

Mike O'Shea, Program Manager, Safety & Integration Division, FAA UAS Integration Office
Christopher W. Sadler, Deputy Chief, York County Department of Fire and Life Safety
Darshan Divakaran, North Carolina Department of Transportation
Brook Rollins, Lieutenant and UAS Program Manager,   Arlington (TX) Police Department

For public entities, getting a "yes" from their town, city, or state to fly a drone is just the first step. The real questions are how they can get permission from the FAA, and what the legal and privacy considerations are for their operations. Speakers in this session concurred that the mission, not the technology, should drive the operations. Applicants should reach out to other operators to learn about best practices.

Public safety officers should hold themselves to higher standards because they are operating their drones for the safety of the public. They should continue training and looking for new technologies. Just like other operators, public entities should also abide by the rules and regulations that enable UAS operations. They have to brief their own departments, and explain the purpose and benefits of their drone programs.

At the outset, public entities should identify the best use cases of a UAS program. They should develop the procedures, policies, and safety standards that will govern the use of UAS. They will then present the summary of the intended uses along with the proposed procedures, policies, and safety standards to the governing body for approval. The next question is what type of UAS to use. They should choose a UAS that has the capabilities needed to accomplish the mission approved by the governing body. They also need to decide whether to purchase or lease a UAS. Other important steps include securing funding for the program and determining whether to obtain training through the vendor or with a third party.

A checklist is helpful for public entities as they plan to start a UAS program. They should have a statement of procedures and agency standards for the flight team. They should obtain an FAA part 107 and a UAS Permit. They are required to register their UAS with the FAA and get insurance in place for the UAS. Data management, data transfer, and a data security plan are other important things to have in place while preparing to launch a UAS program.

When developing training plans, public entities should review valuable information available from manned aviation sources. If they already have a good training standard,

they should show it to other agencies. Most agencies with successful programs are happy to share their program or standards so that others can decide how to proceed.

When deciding which model to use, several factors need to be considered, including image quality, swappable plug-and-play technology, and GPS-based navigation and flight management systems for precise flight planning. Other considerations include capacity for autonomous or semi-autonomous flights, the battery life needed for missions, and the ability to operate in various weather conditions.

Lunch Plenary: Delivery by Drone – On the Route to Routine
Bailey Edwards, Assistant Administrator for Policy, International Affairs and Environment
Mark Blanks, Director, Virginia Tech Mid-Atlantic Aviation Partnership (MAAP)
Basil Yap, UAS Program Manager, NC Department of Transportation
Lawrence Williams, Global Business Development Executive, Zipline International
Wes Shover, Head of U.S. Operations, Flytrex

Recent years have witnessed real progress in the realm of drone delivery. Several companies have forged a path for initial operations through the framework of the UAS Integration Pilot Program (IPP). Panelists in this session discussed what it would take to transform these early operations into normal, everyday occurrences. They talked about the progress they have made and the lessons they have learned in this journey. They discussed what is needed to make drone deliveries as common as your neighborhood mail carrier.

Drones are a priority for the White House and the administration is interested in the safe integration of UAS into the national airspace system. Through the IPP, the FAA is working in collaboration with various partners. It has received impressive results from conducting routine operations, but there is still much ground to cover.

In Virginia, state authorities have been working with Wing's drone delivery project under the IPP. Now, they are seeking feedback from the public, which will be the pathway to an upcoming door-to-door community outreach program to address the public's questions and concerns.

The North Carolina IPP is focused on medical and food package delivery, and transportation infrastructure inspection. North Carolina Department of Transportation (NCDOT) has 30 drones that it currently uses for various purposes. As a next step, NCDOT plans to focus on beyond visual line of sight operations and flights over people. In partnership with AirMap, T-Mobile, PrecisionHawk, and others, NCDOT had completed 765 flight operations since March.

Zipline uses UAS to deliver blood in Rwanda, where drones account for 60% of blood delivery, and it is now planning to launch a similar program in North Carolina.

Panelists applauded the FAA for granting the IPP awardees tremendous access and support.

Startups interested in setting up drone delivery services must familiarize themselves with parts 91, 107 and 135. Basic education of drone regulations will help their businesses thrive and understand the system in a better way. Having the right knowledge is a key to address the public's concerns. The public is not opposed to new technologies but want to know if they will benefit from them.

The FAA is trying to balance risk with benefits. If people in the United States see benefits from drones, they will eventually buy into the technology. Drones deliveries offer a promising future, which is why companies like Amazon and Google are spending resources on getting that capability. While the IPP has opened new doors of understanding on what drones are capable of accomplishing, DOT and the FAA are now allocating more resources to UAS to make sure that the United States does not lag behind other nations in this field.

Introducing Your Operation on Main Street: The State and Local Perspective

Laura Brown, FAA Deputy Assistant Administrator for Public Affairs
Trevor Woods, Director of Safety, Northern Plains Test Site
Basil Yap, UAS Program Manager, NC Department of Transportation
Greg Agvent, Senior Director, CNN Aerial Imagery & Reporting
Ben Miller, Director, Colorado Center of Excellence for Advanced Fire Technology

Drone technology is still new in our society, but UAS operations can win the support of communities if operators follow the rules. Speakers in this session shared their perspectives on best practices for state and local coordination with a focus on how to address community concerns and what to consider regarding environmental and noise impacts.

A lot of recent learning for drone operators has happened either accidently or in the wake of unanticipated events, such as floods and hurricanes. These natural disasters, however, have provided UAS operators a great opportunity to see what can be done with their drones. These events have helped raise the importance and profile of drones and had a positive influence on public opinion.

The North Carolina Department of Transportation used drones to monitor sites and provide supplies to first responders during Hurricane Florence when the state received 53 inches of rain. Drone images persuaded local policymakers to allocate the resources they needed to respond more urgently to the hurricane. The public and policymakers did not fully understand the magnitude of the damage caused by the hurricane until they saw the powerful drone images. These images changed the public's perception about the extent of the damage caused by the hurricane and illustrated the power of storytelling.

The state also used drones to inform various stakeholders, including senior public officials and engineering groups, about the ground situation in the damaged areas.

Drones are also helping the news media to tell stories from unique and diverse perspectives. CNN, for instance, discovered that drone images and videos get much higher public engagement because they are so distinctive. Drone footage is raw, true, and powerful and it gives the audience a nearly complete view of an area.

Amid the abundance of information and resources, it is also important to know how much information is too much. Overwhelming the public with too much information may have a negative impact. It is important to clearly state one's goals for an operation

and identify the key areas that need more attention. Trust is foundational to a successful community engagement strategy. The public will be supportive of drone operations if UAS operators also listen to community perspectives.

Today, people are more knowledgeable about drones than ever before. The more exposure they get to drones, the more welcoming they will become toward this technology.

When Seattle wanted to use drones, there was a frenzy in the community because the public did not know much about civil drones and confused them with the military drones used in the war zones in Afghanistan or Iraq.

A great way to win the community's trust is by telling them success stories. Their perceptions change when you tell them about the economic benefits of drones and how they can help in saving lives and improving our communities.

Public and private organizations find social media an extremely helpful tool in reaching out to communities. They have upgraded their programs to reach out to people instantly. Short videos tend to generate great interest among drone operators of all ages. In addition to social media, face-to-face meetings also hold tremendous significance. Workshops, flight demos, public speeches, and direct discussions are other effective ways to engage with the community. New drone courses are being introduced at various colleges and universities. All of this is helping elevate the level of public awareness on safe UAS operations. The conversation on drones is constantly evolving, leading to more advanced and safer operations.

What Is Economic Authority and When Do I Need It?
Theme: *Explaining what economic authority is, Discussing when Economic Authority is needed and how it can be obtained*

Lauralyn Remo Temprosa, Chief, Air Carrier Fitness Division, Office of the Secretary
Damon Walker, Air Carrier Fitness Division, Office of the Secretary
Bob Finamore, Chief, Foreign Air Carrier Licensing Division, Office of the Secretary

In addition to any authorities required by the FAA, U.S. operators that wish to transport goods or people by aircraft may need to obtain economic authority from the Office of the Secretary of Transportation (OST). Economic authority may also be required for foreign operators, especially for agricultural or specialty air services. The process and the standards are simple and streamlined. This session provided attendees with a unique opportunity to interact with the OST staff team that deals with economic authority issues. OST officials explained the process and answered questions on launching a business.

The session helped attendees understand that any UAS operator who wants to provide air transportation service as an air carrier (i.e. transportation of people, property, or mail between two states) must first obtain Safety Authority (FAA) and Economic Authority from the Department of Transportation (DOT).

UAS operators may obtain economic authority by registering as an air taxi operator and demonstrating that they meet the citizenship requirement. Operators who are not U.S. citizens can operate as a special air service.

Air Taxi Authority is a type of economic authority one would likely need for UAS operations. Applicants complete these forms toward the end of the FAA part 135 certification process. They can read more about these in 14 CFR 298.

Air Taxi registration has a citizenship requirement. DOT applies the statutory definition of a U.S. citizen to each layer of an air carrier's ownership so that each successive "parent" entity must be found to be a U.S. citizen.

Operators with foreign ownership would not meet the citizenship requirement. To conduct interstate package delivery operations, applicants must meet the citizenship requirement. However, part 375.70 also allows operators to make the case (narrative application) requesting special conditions/exceptions from the citizenship requirement.

If an entity does not have the economic authority, states can tax them, limit where and when they can fly, and impose other controls.