Contents

Third Annual FAA UAS Symposium
Baltimore, MD
March 6 – 8, 2018

EXECUTIVE SUMMARY

The Federal Aviation Administration (FAA) hosted the third annual Unmanned Aircraft Systems (UAS) Symposium in conjunction with the Association for Unmanned Vehicle Systems International (AUVSI) from March 6 to 8, 2018. This event enabled the FAA and the UAS industry to directly connect and discuss how to craft practical regulations and to share feedback on the implementation of existing rules, policies, and procedures.

Held at the Baltimore Convention Center in Maryland, the 2018 FAA UAS Symposium had over 940 pilots, manufacturers, and representatives of the UAS community attend — a 25.6 percent increase over 2017 attendance. Millions more followed the event and engaged with the FAA through its social media channels. The agenda was built from stakeholder feedback and focused on industry partnerships as well as how to overcome technical challenges to safe UAS operations. Speakers and panelists were selected from both government and industry based on their expertise on in-demand topics: expanded operations, security, automation, public aircraft operations, and flying for emergency response.

Building off previous years' momentum, the Symposium has become one of the nation's biggest and most prestigious UAS events, and attendee knowledge about FAA regulations was noticeably more evolved. The discussion with stakeholders centered on collaboration, moving away from segregation and more toward integration — with a shared vision and building on each other's successes.

As Transportation Secretary Elaine L. Chao said during her closing remarks, the future of the unmanned aircraft industry in America is going to be shaped by the stakeholders that gathered in Baltimore. "The spirit of innovation is one of our country's greatest strengths and by working together we can help shape a future in which the safe development, testing, and deployment of drones will continue in this country," she said.

This year the FAA was able to use the Symposium as a high profile platform to announce recent accomplishments, including the National Beta Test for Low-Altitude Authorization and Notification Capability (LAANC). The first phase rolled out on April 30 to select facilities. The LAANC update generated media coverage, as did the announcement that Lead Participants would soon be named for the UAS Integration Pilot Program (IPP). The UAS IPP will usher in a new wave of collaboration among

the FAA; UAS operators; and state, local, and tribal governments to safely expand cutting-edge operations. Secretary Chao announced the 10 Lead Participants on May 9.

In the years since the first Symposium in 2016 in Daytona Beach, Fla., there are more ways operators can safely and legally access the National Airspace System (NAS). The FAA made it clear that in 2018 it will continue to facilitate that access, whether through exemptions or rulemaking. This was the point driven home by many FAA representatives throughout the Symposium — that the agency is "open for business."

This report captures the highlights of this year's event and stakeholder feedback about what they did and did not find helpful. This report also includes a survey of UAS stakeholders about their communication preferences when receiving UAS news from the FAA. Presentations of plenary sessions, workshops, and policy dialogues can be found [here](#).

OVERVIEW OF DAY ONE PLENARY SESSIONS

Welcome and Conference Keynotes

- **Catherine Pugh**, Mayor of Baltimore
- **Brian Wynne**, President & CEO, Association for AUVSI
- **Michael Kratsios,** Deputy Assistant to the President and Deputy U.S. Technology Officer, Executive Office of the President
- **Dan Elwell,** Acting Administrator, Federal Aviation Administration

Brian Wynne, President and CEO of AUVSI, welcomed the nearly 1,000-member audience, representing industry; operators; communities; and local, state, and federal government bodies to the third annual FAA UAS Symposium.

Baltimore Mayor Catherine Pugh expressed excitement over UAS and the potential positive impact the technology could have for her community. Citing AUVSI's economic impact forecast of 100,000 new jobs and more than $82 billion in economic impact upon full integration, Pugh said the city is looking to tap into the potential benefits. "I want you to know that Baltimore is poised to be part of this rapidly growing area," Pugh said. To get young people interested in science and technology, the city is setting up drone camps for kids 10 years and older, who will compete in a drone race, for a "mayor's cup."

In opening remarks Michael Kratsios, Deputy Assistant to the President and Deputy U.S. Technology Officer, Executive Office of the President, explained that UAS integration is a priority for the White House. Kratsios said the harmonious integration of the NAS is "a no brainer… Supporting technology is a critical piece of what we do every day."

"We've never seen such a massive adoption of new vehicles taking to the sky at such a rapid pace... We need a regulatory framework that is flexible enough to keep pace," Kratsios said, adding that the UAS IPP will spur innovation in the next three years.

FAA Acting Administrator Dan Elwell said the next two years will be crucial to expanded integration, and took the opportunity to announce that LAANC would soon roll out as a nationwide beta test. LAANC is being deployed throughout 2018 and will be available at nearly 300 air traffic facilities[1] by the end of September to provide near real-time airspace authorizations.

 "History and innovation are about to meet at the intersection we call unmanned aircraft," Elwell said.

In the plenary sessions that followed, panelists explored in detail topics like security, granting access to the airspace and everything flying in it, as well as automation, setting safety standards, rulemaking, aircraft certification activities, and much more.

FAA Leadership Panel – Setting the Stage

Moderator: Carl Burleson, FAA Acting Deputy Administrator

- **Tim Arel**, Deputy Chief Operating Officer, FAA Air Traffic Organization
- **Ali Bahrami**, Associate Administrator, FAA Aviation Safety Organization

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[1] At this time, the National Beta test for LAANC is being rolled out only at FAA Air Traffic Control (ATC) facilities.

FAA UAS Symposium 2018 Report

- **Angela Stubblefield**, Deputy Associate Administrator, FAA Security and Hazardous Materials Safety Organization
- **Sean Torpey**, Acting Chief Information Officer, FAA Finance and Management Organization
- **Bailey Edwards**, FAA Assistant Administrator for Policy, International Affairs, and Environment

Themes: Challenges with competing priorities; working as a community to move forward on UAS integration.

In this opening panel, key FAA officials provided an overview of their policy responsibilities, and how their organizations approach UAS integration. FAA Acting Deputy Administrator Carl Burleson said the UAS industry pace of innovation is remarkable and opening a new era of aviation history. The FAA's responsibility is to maintain safety but not impede innovation. The focus is integration, not segregation, which is more difficult, but more sustainable in the long term. Panelists discussed how issues such as remote identification (remote ID), security challenges, and new stakeholders all require the FAA to shift its approach to regulation.

Ali Bahrami, the FAA's Associate Administrator for Aviation Safety, explained that while operations will inform rules to be made, the FAA is still committed to performance-based rulemaking. There is definitely a way forward for many operations under current regulations, and the FAA works to accommodate and inform better rules. However, the FAA doesn't have all the answers, and there is no silver bullet rule that's going to magically open the skies. The UAS IPP can help face unique policy challenges, by partnering new, non-traditional aviation stakeholder groups with state and local governments in a whole new way to inform rulemaking.

Security was another hot topic — and what the FAA is doing to adjust these new circumstances. Angela Stubblefield, Deputy Associate Administrator, FAA Security and Hazardous Materials Safety Organization, explained how drones bring both new safety and security challenges, and integration depends on finding common solutions. Threat discrimination is critical for allowing more advanced operations. Being able to track and identify a drone is a key factor for not only getting closer to a UAS traffic management system (UTM), but also in dealing with "the clueless, the careless and the criminals."

Lunch Panel: UAS in Today's NAS — What Are You Waiting For?
Moderator: **Earl Lawrence**, Executive Director, FAA UAS Integration Office

- **John Duncan**, Executive Director, FAA Flight Standards Service
- **Jay Merkle**, Deputy Vice President, Program Management Organization, FAA Air Traffic Organization
- **Mel Johnson**, Deputy Director, Policy & Innovation, FAA Aircraft Certification Service

Themes: Open for business: FAA's UAS integration philosophy and safety mission.

Earl Lawrence, Executive Director of the FAA UAS Integration Office, kicked off this panel by outlining the Agency's UAS integration philosophy, the framework for operations today, and the vision for a future regulatory structure. Lawrence said he wanted to "set the record straight" regarding a lot of misunderstanding in the public about what's "allowed" and what's "not allowed."

 "If you're asking yourself if the FAA 'allows' something, the answer is almost certainly yes. There is a way to do pretty much everything today — the structure or process for doing so may change in the future. There's not a very clear path for a lot of the operations that you want to do today – but that

doesn't mean they're prohibited. It means we need you to come in and apply, walk an uncharted path. That's what the panelists on this stage today are going to tell you – bring us your applications, your ConOps (concepts of operations), your aircraft designs. We're ready; we're open for business," Lawrence said.

Mel Johnson, the Deputy Director of Innovation and Policy in the Aircraft Certification Service, which oversees all the aircraft certification activities and policies for the FAA, added that safety standards will always stay the same, but be prepared to show the FAA a solid safety case. Jay Merkle, the Deputy Vice President of the Air Traffic Organization's Program Management Office, has oversight for the Agency's air traffic programs, which includes LAANC. He explained how LAANC and other programs will help get more people flying — and help air traffic controllers feel confident that UAS operators stay where they're supposed to.

DAY ONE BREAKOUT SESSION TAKEAWAYS

Workshop: UAS Rulemaking – From Idea to Implementation

- **Finch Fulton**, Deputy Assistant Secretary for Transportation Policy, Department of Transportation
- **Lirio Liu**, Executive Director, FAA Office of Rulemaking
- **Nan Shellabarger**, Executive Director, FAA Office of Policy and Plans

Themes: The FAA's rulemaking process and external factors that affect rulemaking timelines and outcomes.

In traditional aviation, technology can take years to mature. UAS have a considerably shorter timeline, and it's no secret that it can be a challenge for government to keep up. The rulemaking process may seem like a long time when industry moves so fast — but one must consider all the activities that go into making policy. The FAA takes the approach of strategic prioritization, which addresses top-down, bottom-up and emergent rulemaking needs, and supports workload balancing. Processes that stretch out the (at least) 36-month rulemaking timeline include FAA and industry coordination, regulatory evaluation, and an open public comment period, which is required and key for any rulemaking. And the reason rulemaking is slow is to ensure the process is deliberative and thorough.

Certain activities can help shorten the overall timeline, such as full industry collaboration and consensus. There is no "one-size-fits-all" approach, and the FAA takes a phased methodology to rulemaking — but there are other tools in the agency's kit to help in the meantime. For example, the FAA's Aviation Rulemaking Committees (ARC) provide detailed, data-driven recommendations for crafting a proposed rule for public comment. To facilitate access to the NAS as rules are evaluated and until an Interim final rule and ANPRM are rolled out, operators can request exemptions or waivers if they can demonstrate that they can mitigate risks for more complex operations, such as through detect and avoid capabilities.

Workshop: Understanding Remote Pilot Responsibilities

- **Jim Malecha**, UAS Liaison, Commercial and General Aviation Division, FAA Flight Standards Service
- **Joe Morra**, Director, Safety Operations Branch, FAA UAS Integration Office

- **Tracy Lamb**, Vice President of Regulatory and Safety Affairs, Association for Unmanned Vehicles Systems International
- **Taylor Mitcham**, Chief Drone Ninja, SkyNinja

Themes: The growing remote pilot community and its obligation to address risks to nonparticipants on the ground and to other aircraft sharing the NAS.

The FAA has already issued over 75,000 remote pilot certificates — and that number continues to grow rapidly. This new group of aviators may not have gone through the hundreds of hours of training that traditional pilots typically undergo. The FAA wants hobbyists, recreational users, and business and commercial operators to understand what it means to fly safely while welcoming them into the safety culture that has been embedded in traditional aviation for more than a century. Responsibilities as a pilot start way before the flight. Professionalism within the UAS community is key to acceptance and integration with the culture of aviators.

Stakeholders must try to transfer some of the lessons and values from manned aviation to unmanned flight. The operating environment for unmanned aircraft can be challenging — UAS often fly below 400 feet, and must interact with a variety of obstacles like telephone poles, electrical lines, buildings and other infrastructure. Risk mitigation and safety management systems must be at the forefront of any operational plan. Airmanship (the consistent use of good judgement and well-developed skills to accomplish flight objectives) should be approached the same way between the manned and unmanned communities. Sharing experiences, including accidents/incidents, is important to promote safe flight. Discussing these should not be off limits, they should be out in open for public and communal benefit.

Workshop: Flying in the National Airspace System Today

- **Scott Gardner**, Acting Manager for UAS Tactical Operations, Emerging Technologies, FAA Air Traffic Organization
- **Randy Willis**, Manager, Emerging Technologies, FAA Air Traffic Organization

Themes: Future rulemaking will help streamline access; current regulatory structure provides tools we need to access the NAS.

The potential benefits of operating UAS are completely lost if an operator can't fly where and when they need to. This panel opened a dialogue on the various methods that operators can use to gain access to the NAS and the specifics related to each type of operation including processing criteria, application requirements, and operator requirements. Panelists began with an overview of various methods that operators can use to gain access to NAS as well as application requirements, operator requirements and other criteria. Before the small UAS rule (part 107) there were limited ways for operators to legally fly in the NAS outside of hobbyist uses.

In the 2012 FAA Modernization and Reform Act, Congress included a provision that would allow the FAA to authorize UAS operations without airworthiness certifications — the very first step in allowing for routine UAS operations. Section 333, as it was called, was a pretty limited authority, and with the release of part 107 the FAA was able to authorize significantly more UAS operations. Prior to Section 333, though, the only ones able to operate UAS were public entities. Most people are now familiar with part 107. Current UAS options now run from part 107 and the Special Rule for Model Aircraft, Public

Aircraft Operations and those under Section 333, as well as advanced operations involving Experimental Aircraft and Type Certificated Aircraft. Part 107 airspace waivers and authorizations have been challenging for the FAA because of the overwhelming desire to fly UAS commercially. The FAA has received more than 32,000 requests for access to controlled airspace. LAANC will help automate the current manual process, which is not practical for the growing interest. Audience members were interested in 107 authorizations, Public Aircraft Operations (PAO) designation requirements, getting authorizations more quickly, and a few people were excited to hear about the LAANC roll out more broadly.

Policy Discussion: Unblocking the Potential for Flying Beyond Visual Line-of-Sight

- **Ali Bahrami**, FAA Associate Administrator for Aviation Safety
- **John Duncan**, Executive Director, FAA Flight Standards Service
- **Bill Davis**, Executive Director, Emerging Technology Integration, FAA Air Traffic Organization
- **Paul McDuffee**, Vice President of Government Relations, Insitu

Themes: Expanded operations dependent upon beyond visual line-of-sight (BVLOS); how can the FAA ensure that safely?

Everybody's next steps rely on how they can operate BVLOS, which offers limitless potential. Panelists outlined several scenarios where BVLOS operations can support a variety of missions, from bridge, infrastructure, and agricultural inspection and surveying, to emergency and disaster response. The misconception is that people believe the FAA does not "allow" these types of operations. The regulatory framework exists, but it is a complicated process, and few applicants have demonstrated they understand what is necessary to be able to do so. Those who are approved have shown mitigations that maintain safety. Other Symposium workshops covered flying BVLOS through the existing framework (i.e., waivers and COAs). This discussion was about policy, as well as how industry collaboration can help the FAA move the needle forward. On a basic level, remote ID and tracking is going to be critical. Operators need to be able to tell where the aircraft is at all times, and they need to be able to communicate their position to other aircraft. To accommodate small UAS, air traffic systems need to be agile, scalable, and affordable — and automated. The existing infrastructure isn't built to support small UAS, and data and spectrum issues need to be considered. In the long run it is a two way discussion. The onus is on industry to bring solutions to the table.

Policy Discussion: Legislation and Regulation — Who's in Charge of What?

- **Finch Fulton**, Deputy Assistant Secretary for Policy, Department of Transportation
- **Lorelei Peter**, Assistant Chief Counsel for Regulations, FAA Office of the Chief Counsel
- **Jackie Keshian**, Senate Commerce Committee
- **Mark Aitken**, Senior Policy Advisor, Akin Gump Strauss Hauer & Feld LLP
- **Doug Johnson**, Vice President for Technology Policy, Consumer Technology Association

Themes: Legislation, regulation the FAA's upcoming reauthorization, funding levels, and policy priorities.

This session outlined the relationship between legislators and regulators. The panelists, including Congressional staff, offered insight into areas of focus for upcoming legislation. The discussion concentrated on how key concepts and issues related to the FAA's reauthorization become enacted legislation, and sought to walk through the process in language easy to understand for those unfamiliar with policymaking. In a room full of community stakeholders, the well-rounded panel was able to provide their experiences for interaction with policy makers and stakeholders on how to advocate their interests. For example, Doug Johnson, Vice President for Technology Policy, Consumer Technology Association (CTA), shared his high level approach for the benefit of other stakeholders. This included to educate community and policy makers, advocate for priorities, and serve as a contributor to the policy discussion. Other topics included perspectives on UTM and participants' collaborative role with NASA and other entities. CTA viewed its role as a standard setting organization as an opportunity to help establish a performance standards for the broader UAS community.

Policy Discussion: Forecasting and Emerging Markets — Looking in the Crystal Ball

- **Nan Shellabarger**, Executive Director, FAA Office of Policy and Plans
- **Virginia Stouffer**, Program Manager for Aviation and Operations Research, LMI
- **Jack Cutts**, Director of Business Intelligence and Research, Consumer Technology Association
- **Ed Waggoner**, Integrated Aviation Systems Program (IASP) Director, NASA

Themes: The warp-speed pace of innovation and technology and expected market outlooks.

When it comes to predicting the future UAS economic outlook, the expectation is: business is good. Better tech like first-person view, single purpose drones, better cameras, and stabilization are more affordable than ever, and it has never been so easy to fly a drone. This panel looked at forecasts from a policy and economic standpoint and of course, the overarching theme is that the possibilities are endless. The commercial UAS industry is taking on a life of its own. The future will see the industry going beyond package delivery in rural areas to urban transport — but questions remain as to what urban vehicles are going to look like and what's going to be required of them. Forecasts largely have to do with considering where the economic benefit over cost estimates will be, and what emerging new markets will look like. Then there are the technical barriers and regulatory challenges based on operational situations (BVLOS and operations over people). Package delivery remained a hot topic but the reality at the moment is that it would be more feasible (from a cost-based/economic benefit and regulatory standpoint) in rural, sparsely populated areas. Consumer demand will continue to grow through 2022, and UAS have the potential to create up to 300,000 jobs in that time. What needs to match these increases is public awareness on the rules and how to fly safe.

Workshop: A Beginner's Guide to Preemption

- **Charles Trippe**, Chief Counsel, Federal Aviation Administration
- **Steven G. Bradbury**, General Counsel, Department of Transportation
- **Gregory S. Walden**, McGuire Woods
- **Bailey Edwards**, FAA Assistant Administrator for Policy, International Affairs, and Environment

Themes: State and local jurisdiction regarding UAS operations, safety, privacy, rules of the road and who polices UAS operators.

To ensure safety of flight and people and property on the ground, the FAA maintains federal oversight of aviation and airspace, even when federal and state laws conflict. However, local authorities — state, county, municipal, and tribal entities — have jurisdiction over where aircraft take off and land. Until recently, that has meant an airport, heliport, or seaport, which are generally under a state or local government's responsibility. Suddenly, drones can take off and land practically anywhere. So is there a new grant of authority needed? Do we rely on existing authorities? The answer is still not so clear. However, what is certain is that a patchwork system of rules at the local, county, and state level is not workable and will create more risk. Panelists explained how the precise issues of how preemption principles can be applied are yet to be worked out as the FAA begins to embark on the task of regulating UAS.

There needs to be a proper balance between federal and state authorities in answering many of these questions, like: will cities be able to say where drones can take off and land? What does the FAA determine is necessary for the safe and efficient use? How will privacy concerns and rights of sovereign tribal entities be respected? What type of authority should the cities be able to exercise there? Panelists agreed that a good start will be seeing how the UAS IPP eases coordination among federal and local authorities — and whether it creates the perfect environment to address many of these questions and to facilitate UAS integration.

Workshop: LAANC — Lessons Learned and Leaning Forward

- **Jay Merkle**, Deputy Vice President, Program Management Organization, FAA Air Traffic Organization
- **Bill Stanton**, LAANC Liaison, FAA Air Traffic Organization
- **Bill Goodwin**, Head of Legal Affairs, AirMap
- **Matt Fanelli**, Director of Strategy, Skyward

Themes: Access to controlled airspace near airports; real-time processing of airspace authorizations below approved altitudes in controlled airspace.

LAANC, the Low Altitude Authorization and Notification Capability, gives drone operators fast approved access to controlled airspace, supplementing the manual process and reducing wait time from months to seconds. The Symposium kicked off with an announcement that the LAANC National Beta Test would begin at the end of April, rolling out in waves across the country. This announcement naturally led to numerous questions from the audience, both on how operators can use it and how additional industry partners can get involved. Audience members for this session addressed panelists directly on several areas that includes user experience, overall policy, and broader UTM interest. Some highlights included:
- What happens when a LAANC request is not approved? Panelists explained that it would revert to a manual process for further review. Audience members were appreciative that this process was handled by local facilities rather than being kicked back into the national review process.
- How does a new vendor/partner become part of the program? A discussion highlighted periodic openings for new companies. This would come with performance-based requirements for new companies.

- Some mentioned a concern that the LAANC program was ceding airspace responsibility and control to private companies. Panelists clarified that this is not the case and that the FAA still retains approval authority.

Workshop: Unsafe/Unauthorized UAS – What Can You Do?

- **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
- Lt. **Eric Hamm**, Deputy Commander, DSP Aviation-South
- Detective **Ralph Gonzalez**, New York Police Department

Themes: UAS impact on law enforcement; FAA's Law Enforcement Assistance Program (LEAP) and other resources to ensure public safety and security.

When it comes to who has the authority and responsibility to respond to complaints about UAS, there is still a lot of confusion in the air. The FAA receives calls on a daily basis from people complaining about drones. The FAA response is, did you call law enforcement? A typical response: "they said to call you." Local law enforcement authorities are becoming quite familiar with UAS. The officers on the panel provided examples of incidents involving UAS across the country: a drone crash at a parade in Seattle that injured a woman; a California man arrested for flying a drone close to a helicopter during a rescue mission; two men arrested attempting to fly narcotics and other contraband into a state prison in Maryland. The list goes on.

New York City police detective Ralph Gonzalez explained how coordination between the FAA and local law enforcement is important in not only investigating incidents, but also in determining enforcement when it comes to it. Gonzalez and other panelists explained that local police will not be enforcing flight restrictions (that's the FAA's jurisdiction), but should look at the underlying activity in cases of rogue flights and operators. That is, if you take the UAS out of the incident you can apply already existing laws to infractions committed. Panelists discussed how local law enforcement officers will need to continue to be vigilant in identifying potential misuses of drones — especially at events that garner national media coverage. The FAA's Charles Raley, Senior Attorney for UAS, also detailed the FAA's compliance philosophy when it comes to enforcement. This entails educating users on flying safely and legally, and consequences for careless or reckless operations, for example civil or administrative penalties.
The panel concluded with how to participate in the FAA's LEAP, the main FAA point of contact for Federal, State, local, tribal and international law enforcement agencies. LEAP can help organizations on:
- Outreach/education for law enforcement and other public safety organizations
- Registration information
- Information gathering for initial FAA investigations
- Forensic investigation (facilitating collection of flight information; photo/video; social media preservation and certification)

OVERVIEW OF DAY 2 PLENARY SESSIONS

Morning Roundtable – Moving Forward Together

- **Moderator: Brian Wynne,** President & CEO, Association for Unmanned Vehicles Systems International
- **Derek Kan,** Under Secretary for Policy, Department of Transportation
- **Mike Reynolds,** Senate Commerce Committee
- **Bailey Edwards,** FAA Assistant Administrator for Policy, International Affairs, and Environment

Themes: Collaboration in moving UAS integration forward; good policymaking requires broad perspectives; and technology will continue to challenge this process.

Symposium day two kicked off with the theme of how collaboration in moving forward UAS integration relies on several intertwining issues, including security and remote ID, UTM and rulemaking. FAA representatives talked of an "Operations First" approach to expanded operations, and industry was supportive of operational testing necessary for good regulations. The economic stakes are high when it comes to expanded UAS operations, and the FAA wants to help facilitate that, but needs rulemaking to follow the pace of industry. There is opportunity to create good public policy — but you can't do that in a vacuum; it requires collaboration among regulators, policymakers and industry.

Industry is aware that security concerns are delaying rulemaking, and its representatives' perspective is that rules will help, not hurt. FAA panelists described how the current policy discussions on security concerns are balancing those across different government interests and existing statutes, for example a need for Title 18 Reform as part of any plan for remote ID. One of the "hot topics" for integration at the moment, remote ID, is one of the tools necessary for telling good guys from bad guys, as well as keeping track of everything in the NAS. The Remote Tracking and ID ARC in the summer of 2017 was very enlightening, and industry worked hard to provide recommendations, and identify differing perspectives.

Panelists also discussed another hot topic, automation, and how that would be regulated. The world is seeing possibilities that were only dreamed of decades ago in science fiction movies. Even now, from drones to cars — when you order pizza in the future it could come from an automated system. Automation element is a big deal — and a big change for regulatory approach. The FAA and the Department of Transportation will need to balance regulation with the need to foster innovation, enhance safety, and help develop a 21st century infrastructure — and all the while engage with communities to integrate these technological advances into society.

Lunch Panel: Dreaming of Electric Sheep

- **Moderator: Derek Kan**, Under Secretary for Policy, Department of Transportation

- **Michael Thacker**, Executive Vice President of Technology and Innovation, Bell
- **Jesse Kallman**, President, Airbus Aerial
- **Anil Nanduri**, Vice President, New Technology Group, Intel Corporation

Themes: new possibilities, innovative technologies, and operational developments for the next (but definitely not final) frontier.

This panel was very appropriately named after Philip K. Dick's 1968 novel — *Do Androids Dream of Electric Sheep* — which served as the basis for the 1980s Ridley Scott movie "Blade Runner." Unmanned aircraft are changing the look and feel of the aviation industry, and every year we encounter new possibilities and new technologies. As industry keeps going higher, farther, and faster, the next step is clearly automation. Going back to the panel's title, it refers here to what it means to be a human/pilot in this age of automation. Panelists hypothesized on their future vision for unmanned aircraft: including the meshing of traditional versus non-traditional aviation to put the "drone taxi" concept into practice, and other ways this new technology will completely alter human and cargo transportation— and even entertainment, for example through light shows at entertainment and sports parks.

While one cannot tell the future, panelists discussed how all sectors engaged with UAS are diligently working on answers for questions that can be anticipated. These included:
- The future role of a human, or pilot, in automated air travel (human removed completely or human in the loop?).
- Anticipating the economic evolution of these services (will one be able to order a pilotless taxi — or better, would they?).
- Interacting with the cities and communities these aircraft will be operating (will UAS IPP help solve problems seen and unforeseen?).

DAY TWO BREAKOUT SESSION TAKEAWAYS

Policy Discussion: The Future of UAS Remote Identification

- **Earl Lawrence**, Executive Director, FAA UAS Integration Office
- **Steve Bradford**, FAA Chief Scientist for NextGen
- **Jay Merkle**, Deputy Vice President, Program Management Office, FAA Air Traffic Organization
- **Josh Holtzman**, Director, Office of National Security and Incident Response, FAA Office of Security and Hazardous Materials Safety

Themes: The ability to remotely identify an aircraft in flight as a crucial component of UAS traffic management and UAS integration.

Throughout the UAS Symposium participants heard how a crucial component for achieving expanded UAS integration in the NAS depends on knowing who is flying drones, and where. From the FAA's perspective, remote ID is vital to both expansion of safe operations and security risk reduction, as well as making UTM a reality.

Panelists discussed how the ability to identify the operator or owner in order to contact him to cease operations might be the difference between life and death when emergency services, firefighting, and disaster relief are in the same airspace. Panelists echoed Administrator Elwell's earlier comments that the intent is to establish the ID requirement "very quickly." Key points of the discussion centered on needs for achieving that, which included collaborating with other agencies and local governments to assure safety and security concerns are addressed. They also discussed how to best:

- Facilitate public safety officials' ability to locate and communicate with a UAS operator
- Enable efficient management of low-level operations in all types of airspace and to provide situational awareness to air traffic management
- Get the word out to communities on FAA regulations, so the public conforms to the rules and local governments know how to discriminate between compliant and non-compliant operations

Panelists also discussed how the recent UAS Identification and Tracking ARC reached consensus on several issues, a point of contention was over to which drones the ID and tracking requirements should apply. A simple start is to align the process with UAS registration requirements, although current law limits the FAA's authority to require remote identification of certain UAS — even if they are required to register. Really, the point of system would be for UAS operating below 400 feet above ground level — operating larger drones or at higher altitudes have to meet a higher bar and fall under existing requirements. Industry collaboration for whatever system rolls out for remote ID will be necessary, as a government-owned system is unlikely to be scalable.

Policy Discussion: Conducting High Altitude Operations

- **Gary Norek**, Acting Director, Operational Concepts Validation and Requirements, FAA Air Traffic Organization
- **Craig Hoover**, Director, Advanced Technology Marketing, GE Aviation & UAS in Controlled Airspace ARC Co-Chair
- **Leonard Bouygues**, Program Manager, Project Loon, X (Formerly Google X)
- **Martin Gomez**, Director of Aeronautical Platforms, Facebook
- **Brad Mandala**, Director of Flight Operations, Airbus Aerial
- **Johnnie Walker**, Padina Group

Themes: Taking things to a higher level; high altitude UAS operations for surveillance, communications, and internet service.

Lately, the focus of UAS integration has been on smaller UAS at low altitudes — but there are many companies that are looking much higher than that. This discussion explored how the FAA is working with industry to develop standards for high altitude UAS operations for surveillance, communications, and internet service in response to the spike in demand for access to Class A and Upper E airspace. The industry has plans to use airspace in very different ways. How the aircraft reaches that altitude and the flight profiles will be important to consider as we look at the development of standards. In 1995 when the FAA classified the airspace, the agency didn't anticipate the evolution of aircraft and operation. The FAA must collaborate with industry to be responsive to industry needs and changes. These "crafts" may be similar to existing platforms but with differing technology. The agency needs to be sure our philosophy and principles align when we develop policy that is transferable to other countries.

Manufacturers need one standard that will enable cross boundary operations without special requirements.

Policy Discussion: We're Talking Drone Safety – Who's Listening?

- **Jeannie Shiffer**, FAA Deputy Associate Administrator for Corporate Communications
- **Erik Amend**, Executive Office Manager, FAA UAS Integration Office
- **Lindsey Voss**, Director of Education, AUVSI
- **Andrea Brands**, Director of Citizenship and Sustainability, AT&T
- **Taylor Mitcham**, Chief Drone Ninja, SkyNinja
- **Eno Umoh**, Founder and CEO, Global Air Media

Theme: Getting the FAA's message of flying responsibly out to a wide audience; using technology to connect with millions of new pilots.

Drones are revolutionizing the economy, but they have also opened up the airspace to millions of pilots, many with no previous aviation experience. Everyone is a pilot now or can become a pilot.
In 2012, Congress enacted legislation requiring the FAA to integrate UAS into the NAS, and the FAA has had to respond quickly. The trouble is, sometimes government can move slowly. Traditional aviators had to come to the FAA — we didn't have to go to them. Now that's not the case. The FAA has to reach out to the community and constantly challenge ourselves to be non-governmental and be forward leaning in the way we engage.

Panelists shared their experience with reaching a target audience. For example, Eno Umoh, Global Air Media, spoke about an innovative approach his organization took in bringing the message of drone safety and getting kids involved with UAS from an early age. While working with young people in Baltimore in community workshops, Umoh saw how using drones could grab attention. He then worked with the mayor's office to design a drone safety program and curriculum to take into schools.

The speakers also agreed upon several points on how the FAA could improve outreach, including:
- ✓ The agency needs to move at the speed of industry and not government — starting with a more user-friendly website.
- ✓ Drone safety education should start with targeting a very young audience, and include targeted messaging in public campaigns that influencers that they can relate with and on platforms that they use (YouTube, SnapChat, Facebook, etc.).
- ✓ Safety in drone use starts with users too — especially for those flying beyond recreational use.
- ✓ All users need to educate themselves first using available resources (online) to know where they can fly and when — and at the very least to know at least where NOT to fly (e.g. in emergency situations, wildfires, restricted areas, etc.).

Workshop: Flying Beyond Visual Line-of-Sight Today

- **Brad Palmer**, Manager, General Aviation and Commercial Division, FAA Flight Standards Service
- **Randy Willis**, Manager, Emerging Technologies, FAA Air Traffic Organization
- **Catherine Bramlett**, UAS Operations Manager, BNSF Railway

- **Randall Warnas**, Global Sales Manager for UAS Technology, FLIR Systems

Themes: Achieving full benefits of UAS operations can't be done without BVLOS capacity; what the FAA needs from you to get to yes when it comes to BVLOS operations.

We know the potential applications for operations beyond visual line-of-sight are unlimited, but where do you start? FAA representatives explained how there is a public misunderstanding that the FAA isn't approving BVLOS operations. Actually, the FAA is willing to work with people who are willing to bring projects forward. However, applicants need to dive deeper and show how they will mitigate risks. This also includes showing how they will know where the aircraft is at all times and how it will be able to identify and avoid obstacles. There are two key areas that the FAA and the various stakeholders need to overcome as a group — operations over people and detect and avoid strategies. Panelists described several scenarios involving BVLOS missions and their challenges, including:
- Bridge inspection — how will the applicant manage the aircraft when sight of it is blocked by the structure?
- Long distance railway/pipeline inspection — risk mitigation comes into play because of the possibility of operating over people; what is the backup plan in case of a momentary loss of control of the aircraft; and how will the remote pilot in command maintain safe separation from other aircraft (manned or unmanned).
- Small cargo delivery — same as above come into play (especially operations over people and separation). If automation comes into play then how will applicant demonstrate a sufficient recovery plan, and ensure the ability to stay well clear or detect and avoid.

People who are approved have shown mitigations that maintain safety. The work being done to grant waivers today is informing the bigger picture for rulemaking.

Workshop: International Operators in the United States

- **Tricia Stacey**, Director, International Division, FAA UAS Integration Office
- **John Swigart**, Aviation Safety Inspector, Flight Technologies and Procedures Division, FAA Flight Standards Service
- **Bob Finamore,** Foreign Air Carrier Licensing Division Chief, Department of Transportation

Themes: Options for certain foreign-registered UAS to operate in the United States.

Part 107 provides clear guidance to operators using aircraft registered in the United States. However, there is a process for foreign operators to fly their UAS in in the United States. FAA and Department representatives provided information on options and considerations for registration, piloting, and operation of small UAS by foreign operators wanting to do business in the United States under Part 107.

Scenarios for operation that the panel outlined were for:
- Operate your own foreign-registered small UAS, and obtain an FAA remote pilot's certificate.
- Operate your own foreign-registered small UAS, but under the direct supervision of a U.S. Certificated Remote Pilot in Command.
- Use your own foreign-registered small UAS, but subcontract the operation to a U.S. Certificated Remote Pilot.

- Fly under a North American Free Trade Agreement permit for authorized specialty air services (for Operators from Canada and Mexico).

Case by case scenario discussion was important to the audience members, and panelists engaged with participants individually after the session. As the FAA learns of more scenarios, it can highlight more guidance and generate reference materials.

Workshop: UAS Standards – What Exists and What's Coming

- **James Foltz**, UAS Program Manager, FAA Aircraft Certification Office
- **Art Hinaman**, Technical Operations Branch Manager, FAA UAS Integration Office
- **Jim McCabe**, Senior Director, Standards Facilitation, American National Standards Institute
- **Margaret Jenny**, President, RTCA

Themes: From the standpoint of the FAA and industry, standards: support and link research to rulemaking; ensure safety, reliability and quality; facilitate free and fair global trade.

There is a flurry of activity regarding standards development for UAS — which are instrumental in the future of UAS operations. Numerous organizations are developing standards for operations, certification, and risk mitigation. This workshop presented the standards work that is ongoing through FAA and industry collaboration and the use cases where these standards can be applied to help enable future operations with UAS.

When we talk about standards in FAA lingo — risk based/performance based — the key take away is that regardless of means the goal has to be to accommodate innovation and technology. Under the FAA regulatory landscape, there is a move toward performance-based (rather than prescriptive) regulations. The challenge for the FAA has been keeping up.

As a "new entrant" into the NAS, UAS present certain challenges to developing standards. Between FAA and the UAS industry, there's a "culture clash." For example, the FAA is methodical, deliberative, and emphasizes risk mitigation in order to maintain its long and enviable safety record, whereas the commercial sector is quick, innovative and generally rewards risk-taking. Developing UAS standards involves partnerships among all involved stakeholders (public and private) to ensure consistency and to come together to overcome or address challenges. Accommodation goes back to performance based regulations. That's the key to success. That means we can work with industry to develop consensus standards quickly to adapt to new technology

Common themes in audience member discussions suggested that the culture clash cited in the session is significant. As one of the FAA-member panelists said after the session, "The people here have a real Silicon Valley mindset, where manned aviation is real conservative. We need to deal with how to combine this clash of cultures to get the best of both." Both FAA and industry representatives said that collaboration continues to be key.

Policy Discussion: Understanding and Enabling Air Traffic Management for UAS

- **Steve Bradford**, Chief Scientist for NextGen, Federal Aviation Administration

- **Jay Merkle**, Deputy Vice President, Program Management Organization, FAA Air Traffic Organization
- **Parimal Kopardekar** (PK), Senior Technologist for Air Transportation System, NASA
- **Susan Roberts**, General Electric
- **Matt Fanelli**, Director of Strategy, Skyward

Themes: UTM and how it will it translate into operational scalability in real world airspace.

This session focused on the FAA's perspective on the concept for a UTM ecosystem, including identifying known gaps and common misconceptions. Participants began with an explanation of the current ecosystem when it comes to UTM. UTM is a "traffic management" network for uncontrolled operations that is separate but complementary to the FAA's Air Traffic Management system. UTM development will ultimately identify services, roles/responsibilities, information architecture, data exchange protocols, software functions, infrastructure, and performance requirements for enabling the management of low-altitude UAS operations. Much of this is still being ironed out, and a RTT has been established between the FAA, NASA and industry to coordinate the UTM initiative.

LAANC, or the Low Altitude Authorization and Notification Capability, provides drone pilots access to controlled airspace near airports through near real-time processing of airspace authorizations below approved altitudes in controlled airspace. Drone pilots can use applications developed by approved UAS Service Suppliers (USS) to access the LAANC capability. However, LAANC is narrowly focused and is not going to solve other issues. Stakeholders need to cooperate and move forward on UAS Service Suppliers information exchange, and as mentioned throughout the Symposium, remote ID will be a fundamental factor for UTM to be realized.

Policy Discussion: Drones at Airports – Who Can Do What?

- **Winsome Lenfert**, Acting Associate Administrator for Airports, Federal Aviation Administration
- **Dean Schultz**, Executive Vice President and Chief Operating Officer, Reno-Tahoe International Airport
- **Chaim Van Prooyen**, Project Manager, Planning & Development, Atlanta International Airport
- **Justin Towles**, Vice President, Regulatory and Legislative Affairs, American Association of Airport Executives (AAAE)

Themes: Risks and benefits of using drones at or near airports, and finding a safe balance.

UAS operating on or near airports can provide great benefits, but also pose unique risks. Panelists shared best practices for airport operators and local authorities, including what authority an airport or local official has to ensure safe and efficient airport operations.

According to panelists representing the FAA and major airports, drone/UAS use at airports (near airports) is here to stay. Not only do all stakeholders need to get used to it, but they also need to streamline coordination across multiple entities (operators, air traffic, city and federal government bodies) to make sure legitimate operations are facilitated, and risks for potential wrong-doers are mitigated. Challenges in mitigating illegitimate flyers discussed in this panel were similar to those

brought up in the security discussions throughout the Symposium — for example regarding counter UAS measures. Even geo-fencing becomes difficult because airports are using drones for legitimate reasons.

There is more interest for UAS operations at airports from a variety of sources and for a variety of uses: from structure and facilities inspection, to perimeter security and wildlife mitigation, among a myriad of other uses. Other organizations and agencies (like the Transportation Security Administration) are very eager about the potential uses. Airports like Reno-Tahoe International Airport — which conducts UAS testing at its facilities and over public lands — have found that raising public awareness is also extremely important. Public campaigns have been useful in not only letting people know what the airport is doing with drones, as well as to remind new aviators to fly responsibly.

As technology continues to advance, the possibilities for different types of uses will grow, and airports need to continue to find ways to blend UAS with manned aircraft operations — or they may one day find themselves obsolete. As one panelist said, "We are going to be solving a lot of transportation problems in getting people together. Urban air mobility platforms moving people from A to B are going to revolutionize transportation. Airports need to consider now how we can accommodate a technology that's going to be very prevalent. Revenue structures for airports are going to be turned upside down."

Policy Discussion: Drones and Public Safety – Useful Tool or Public Nuisance?

- **Joe Morra**, Director, Safety and Integration Division, FAA UAS Integration Office
- **Rob Sweet**, Manager, Strategic Operations Security, FAA Air Traffic Organization
- **Robin Murphy**, Professor of Computer Science and Engineering, Texas A&M University
- **Chris Sadler**, Vice Chair, National Council on Public Safety UAS

Themes: Using drones during emergency response, disaster recovery, or major public safety events can have two outcomes: they can be extremely helpful or they can get in the way.

This discussion began with an overview of UAS use during Hurricanes Harvey and Irma in 2017. The storms saw the largest known deployment of small UAS by public officials for uses, ranging from support response and for emergency command situation awareness, to life saving and damage assessment. The former (Harvey) saw untrained out of state teams called in (not under a MOA or contract) by the American Red Cross and local and out of state self-deployed teams seeking missions (and funding) from agencies. Although the self-deployed teams likely went with good intentions, they also:
- Posted data to social media, violating the Texas Privacy Act
- Duplicated effort for existing damage inspection and debris removal contracts
- Appeared to be unprepared for austere conditions or being self-sufficient, and unaware of challenges of flying in disasters

As the impact of natural disasters and extreme incidents increases, UAS have proven to be a valuable tool for emergency response efforts. Panelists continued to explore possible applications and challenges for using drones in public safety work, and consider policy and best practice improvements for government and industry.

Just like any other tool employed in an emergency situation, safe UAS operation begins way before the actual emergency through establishing procedures, training and planning. Panel members provided other real-life scenarios where drones made a significant addition to natural disaster and extreme incident responses.

FAA panel members fielded many questions from the audience, with several having comments that the special governmental interest emergency authorization process for accessing certain airspace such as temporary flight restrictions (TFR) during emergencies is effective and is working at the speed needed by those responders with UAS programs.

Workshop: Autonomous Vehicles – Lessons Learned for and from UAS

- **Mel Johnson**, Deputy Director of Policy and Innovation, FAA Aircraft Certification Service
- **Adi Singh**, Principal Scientist, UAV Systems, Ford Motor Company
- **Mark Moore**, Director of Engineering for Vehicle Systems, Uber
- **Dr. Dean Bushey**, Assistant Professor of Computer Science & Information Technology, Florida Polytechnic University

Themes: Mixing different technologies; real world testing and incremental integration; applications for automation in aviation; and building acceptance.

From selfie drones to flying cars, autonomous operations present the archetypical image of the future of aircraft. This industry-led workshop compared the lessons learned from unmanned vehicle technology and regulation and applies them to the UAS industry.

Panelists highlighted that there are many lessons from the automotive industry that can be applied to aviation. One of the key lessons is that mixed technology occupying the same space causes conflict. Conflict is reduced through appropriate regulatory structure. A regulatory structure is needed to help move the technology forward. Full government and industry cooperation is needed to accomplish that.

Just like the self-driving car trials gradually being introduced and tested on the nation's roadways, automated UAS applications and testing should also be incremental. In other words, start testing into the NAS on a small scale and in a segregated environment at first, and then gradually increase interaction.

In the long run, one of the more difficult obstacles to overcome for UAS integration in general is public perception, as well as a little distrust when it comes to technology. Automation could complicate achieving acceptance in society. Real world testing allows the public to gain confidence as well as manufacturers. Highly publicized testing and highlighting results (e.g. automation properly deployed) is necessary to help socialize these new technologies and concepts.

Workshop: Conducting Public Aircraft Operations

- **Scott Gardner**, Acting Manager for UAS Tactical Operations, Emerging Technologies, FAA Air Traffic Organization
- **Karen Petronis**, Senior Attorney for Regulations, FAA Chief Counsel's Office

Themes: Public aircraft requirements; public vs. civil operations under part 107; and airspace authorizations required.

Local, state, and federal governments have more than one way to operate UAS, depending on the type of mission they are conducting. This workshop saw high attendance and hosted one of the larger

question and answer sessions with audience members. Questions were very specific and varied among different specific situations.

Panelists fielded an array of topics, walking through the approval process for public aircraft operations, explaining what constitutes a PAO, and outlining the steps for getting a Certificate of Waiver or Authorization (COA). They also discussed considerations for public operators who may be choosing between flying under a public COA versus Part 107.

For conducting Public Aircraft Operations (PAO), there is still an opportunity for the FAA to better clarify what to fly under (PAO or 107 civil operation), who is eligible, and how to fly (public COA or 107 civil operator). If public entities have a clear understanding how, when, why and where they plan to fly — the more specific, the better — it will help them get through the process (i.e. getting COA authorization approval).

Several audience members also asked about flying as contractors for PAOs with a public COA, suggesting that more outreach would be useful geared toward public entities contracting out public UAS operations to small businesses/operators.

OVERVIEW OF DAY THREE PLENARY SESSIONS

Morning Keynotes: UAS Traffic Management – From Research to Reality

- **Gur Kimchi**, Vice President, Amazon Prime Air

A common framework for UAS traffic management (UTM) that is efficient, scalable and leverages current technologies is critical to industry efforts to safely enable a multitude of business applications and use cases. Deployable and economic solutions that draw upon research, infrastructure capabilities and industry experience are an achievable reality. In this keynote Gur Kimchi shared a vision for the practical, constructive steps operators and service providers can take to achieve this federated model for unmanned traffic management.

Keynote Remarks

- **James Burgess**, Project Wing Co-Lead, X

Lunch Panel: Moving from Paper to Pixels – Confessions of a Government Bureaucrat

- **Moderator: Earl Lawrence**, Executive Director, FAA UAS Integration Office
- **John Allen**, Vice President & Chief Safety Officer, JetBlue & Drone Advisory Committee Subcommittee Co-Chair
- **Sean Cassidy**, Director of Safety and Regulatory Affairs, Amazon Prime Air and & Drone Advisory Committee Subcommittee Co-Chair
- **Brian Wynne**, President and CEO, Association for Unmanned Vehicles Systems International
- **Matt Zuccaro**, President, Helicopter Association International

Earl Lawrence, Executive Director of the FAA UAS Integration Office, kicked off the last plenary session of the 2018 Symposium, recalling a career that has spanned between government and industry — and the challenge of being a government bureaucrat. Lawrence said he remembered how getting printed materials like the Federal Register or navigation charts until fairly recently are the perfect example of how government can be more than a little slow to adopt new ideas, technology, and ways of doing business.

But then he explained his participation in UAS registration as "a sign of hope" for facilitating expanded UAS operations. "We managed to hold an ARC, write a rule, and build a registration system in about two months," Lawrence said.

Taking a cue from unmanned technologies, the FAA will need that kind of involvement and dedication to move from paper to pixels. Advancing UAS operations will depend on collaborations like the ARC example, will depend on working across public and private sectors, and can ultimately create a better environment for innovation and safety.

Symposium Closing Keynote

- **Dan Elwell**, Acting Administrator, Federal Aviation Administration
- **Elaine L. Chao**, Secretary of Transportation

Acting Administrator Elwell introduced a recording from Transportation Secretary Elaine L. Chao, who thanked participants for their attendance and expressed optimism about the future of UAS integration into the NAS. Her remarks are summarized below:

Over the last few days you have heard the steps the Department has taken to fully and safely integrate drones into the nation's airspace. It won't surprise you to learn that some of the options being considered include allowing UAS operations over people, at night, and beyond the line of sight. The Department is consulting closely with our partner agencies in national security and law enforcement to address their concerns about UAS operations.

This administration is actively working through these issues. We very much hope to be able to announce new steps forward in the near future. In the meantime stakeholder response to the UAS Integration Pilot Program has been especially gratifying. After putting out a call for participants on November 2, 2017 the Department received 149,000 applications from a diverse group of state, local, and tribal governments, as well as first responders, airport operators, and academic institutions.

We're on track to announce the selection of the first 10 participants for the UAS Integration Pilot Program in May 2018. We hope to continue to gain valuable insight from this work. The future of the unmanned aircraft industry in America is going to be shaped in no small part by the stakeholders gathered here today.

It's no secret however that the public has legitimate concerns about the safety, security, and privacy of this new technology. So, I challenge all of you to step up and help educate the public about the benefits of this new technology and to address legitimate public concerns. The spirit of innovation is one of our country's greatest strengths and by working together we can help shape a future in which the safe development, testing, and deployment of drones will continue in this country. Thank you so much.

OVERVIEW OF DAY THREE BREAKOUT SESSION TAKEAWAYS

Policy Discussion: Drone Delivery – How Close Are We?

- **Earl Lawrence**, Executive Director, FAA UAS Integration Office
- **John Duncan**, Executive Director, FAA Flight Standards Service
- **Mel Johnson**, Deputy Director, Policy & Innovation, FAA Aircraft Certification Service

Themes: Fundamentals of air carrier transport; part 135 certification process; aircraft certification services; and knowing risks and safety needs.

According to FAA representatives on this panel, believe the hype: drone delivery is closer than you think. Package delivery is not prohibited, but it's also not easy and not for everyone. The latter point was to dispel notions of delivering a one-off burrito to the occasional college student, or single package deliveries door-to-door. It's not to say they can't be done, just that there will be standards that must be followed.

Panelists explored the evolving regulatory framework around for-hire, aircraft cargo delivery operations that require serious investment, engineers, and a plan, as well as known risks and common challenges facing both regulators and potential operators.

On a basic level, air carrier transport are composed of three components and their subsequent requirements:

- Aircraft
  - o Design and Production Certificate (Part 21), Tailored to the type of operation and size of aircraft.
- Operator
  - o Pilot in Command/Crew – onboard or remote
  - o Part 135 Certificate – common carriage
- Airspace Authorization
  - o Performance/Equipage Requirements (e.g. Detect and Avoid, Communications, UTM, etc.)

While the FAA representatives told audience members that the agency is there to help them through the process, they stressed that there are several things essential to a successful. They urged those interested in the certification process to educate themselves, for example, know what it means and takes to certify an aircraft, understand hazards and how to mitigate risk, and to gain some familiarity and competence with the aviation system.

The key takeaway here is, safety assurance for these kinds of operations is key – don't bring a business case to your FAA certification discussion, bring a safety risk management plan.

Policy Discussion: Improving the User Experience

- **Jim Stroiney**, Acting Deputy Chief Information Officer, FAA Office of Information and Technology
- **Jeannie Shiffer**, FAA Deputy Assistant Administrator for Corporate Communications
- **Tim Shaver**, Deputy Director, Office of Safety Standards, FAA Flight Standards Service

Themes: The FAA DroneZone; future enhancements; feedback loops for continued improvements.

UAS present issues of volume and pace that the FAA, and much of the aviation industry, have never experienced before — and this is particularly true of the FAA IT system. This discussion highlighted the Agency's newly streamlined public interface, the FAA DroneZone, and outlined future system deployments and enhancements designed to make doing business with the FAA faster and easier.

The FAA DroneZone houses all of a part 107 operator's FAA critical information in one convenient online portal. The web-based application is designed to speed up review and approval of UAS operator's requests, including registration, airspace authorizations and waivers, operational waivers and accident reporting.

The FAA DroneZone's cloud-based design provides an intuitive and user-friendly experience. In the near future, improvements could include adding attachments like safety plans, a "waiver wizard" to guide users through that process, in-application communication, and visual operation maps, as well as other user interface enhancements. That said, the FAA representatives explained that the agency is always open for feedback on further improvements, and audience members had a chance to provide feedback. Although most expressed appreciation for the DroneZone and the tools the FAA is offering, there were some recurring themes from the audience interaction regarding confusion over:

- Some attendees asked about flying within the programming of a nationwide community-based organization. They were interested in better understanding what they are and why an individual would have to join one. This refers to FAA guidance for those who want to fly under what was formally the Special Rule for Model Aircraft.
- Attendee questions also demonstrated confusion over what waivers, authorizations, and various certificates actually do.

Policy Discussion: Global Integration – Getting on the Same Page

- **Tricia Stacey**, Director, International Division, FAA UAS Integration Office
- **Brendan Schulman**, Vice President of Policy and Legal Affairs, DJI
- **Lorenzo Murzilli**, Manager, Innovation and Advanced Technologies, Federal Office of Civil Aviation of Switzerland
- **Matt Fanelli**, Director of Strategy, Skyward

Themes: Harmonization for standards and regulations to facilitate UAS operations across borders.

Aviation has always relied on international collaboration, forging connections, and engaging in harmonization efforts across governments, industry, and international organizations, like the International Civil Aviation Organization and Joint Authorities for Rulemaking on Unmanned Systems. In this session, representatives from around the world shared insights on the opportunities and challenges of harmonization for standards and regulations to facilitate UAS operations across borders.

26

The panelists and audience members discussed how they look to the FAA as a global leader because it manages the most complex airspace in the world. It was with that logic that many suggested the agency needs to spearhead the prioritization for international standards, and get a basic framework out for basic operations as a start; other international stakeholders can then add onto those depending on local uses and realities.

Panel members and audience comments identified remote ID requirements — including whether and how to classify UAS according to weight — as fundamental to enable the progression to more complex and larger numbers of UAS operations and continued development of UTM systems/services. Other priorities included development of a risk assessment framework for operational approvals, standards for night operations and operations over people, collection and use of data to support regulators in decision-making, focusing on continuing to approve operations to gather data, bringing the public on board through education and outreach, and consideration of whether changes are needed to manned aviation requirements.

There was also a robust discussion on the need for building public acceptance of UAS and their beneficial uses in all countries. From flying urgent blood delivery to rural areas in Rwanda, to delivering a floatation device to a struggling swimmer in waters off Australia's coast, drones can save lives. Emphasizing those stories are what will achieve buy-in from the public to use as an advantage in rules, regulations and policymaking. However, consistent standards and rules need to come into place to allow those operations.

Workshop: UAS Detection Technology

- **Angela Stubblefield**, Deputy Associate Administrator for Security and Hazardous Materials Safety, FAA
- **Anh Duong**, Executive Officer, Science & Technology Directorate, Department of Homeland Security
- **Brendan Groves**, Counsel to the Deputy Attorney General, U.S. Department of Justice
- **Elizabeth Soltys**, UAS Security Program Manager, FAA Office of Security and Hazardous Materials Safety

Themes: Current technologies, limitations on applying them, lessons learned, and the path forward.

Over the past several years the federal government and industry partners have engaged in testing numerous UAS detection technologies throughout the country, to be able to protect against errant or malicious operators. Remote ID is critical to help with threat discrimination regardless of counter UAS detection or mitigation. It can help identify who is not participating and highlights them as greatest risk.

Title 18 legal constraints limit this ability and present challenges to almost everyone in private sector, and federal, state and local governments as well. Congressional action to provide legislative relief is required to change that current situation. Industry has developed technology to support UAS detection and counter UAS, but domestic legal limitations prevent their deployment in a civil setting. While federal agencies are working together, educational institutions and private sector partners need to collaborate as well to find solutions that do not negatively affect the NAS and can keep pace with UAS technology.

There are no standards for performance of UAS detection, tracking, and mitigation technologies. The environment in which they must operate factors into their performance, and federal partners are collaborating and coordinating on these evaluations.

Airspace restrictions are viewed by critical infrastructure owners as a first step to being able to detect and mitigate threats from errant or malicious UAS. There is a lot of energy in the sector about implementation of Section 2209 process for requesting airspace restrictions for critical infrastructure. The FAA described ongoing 99.7 process with federal partners and what is being learned that will form the basis for better processes for non-federal partners under 2209, which may require rulemaking.

Workshop: Flying UAS in Emergencies and Disaster Response

- **Joe Morra**, Director, Safety and Integration Division, FAA UAS Integration Office
- **Gary Miller**, Manager, Tactical Operations, FAA Systems Operations Security
- **Taylor Mitcham**, Chief Drone Ninja, SkyNinja
- **Chris Courtney**, Chief Pilot and Senior Vice President of Operations, Measure

Themes: Be prepared; know before you go; and don't get in the way of authorized responders.

Past storms showed how UAS can be flown before, during, and after disasters for a multitude of support operations. Last hurricane season, different types and sizes of drones (from small quadcopters to ScanEagles) flew diverse types of missions (search and rescue, infrastructure inspection, and news/media), under varying operational circumstances (operations over people, ops below 2,500 feet — and the first ever TFR for BVLOS for a commercial operator for Hurricane Harvey response). Many of these examples showcased FAA efforts to help facilitate these types of flights, further giving responders another tool in the recovery process.

A reoccurring theme for people operating or planning to operate in disaster and emergency response missions — especially for civilian operators — was to plan and coordinate BEFORE you go. In other words, don't just show up with your drone and ask, "how can I help?" Not coordinating with local, state, or federal authorities beforehand can cause headaches and delay first responders from their priority at hand; the actual incident. At the very worst, you could put yourself in a dangerous situation where you need to be rescued. Being that many in the audience appeared to be involved in these operations, with many of their questions to panelists involved the COA process and how to apply.

Workshop: Submitting Airspace Waiver/Authorization Requests

- **Scott Gardner**, Acting Manager for UAS Tactical Operations, Emerging Technologies, FAA Air Traffic Organization
- **Randy Willis**, Manager, Emerging Technologies, FAA Air Traffic Organization

Themes: Authorization versus waiver and how to apply — FAA DroneZone, LAANC, or Certificate of Authorization or Waiver (COA) Application Processing System (CAPS)

This session offered participants the chance to learn best practices for requesting airspace authorizations and waivers for part 107 operations. Panelists shared tips and tricks for applying for and complying with waivers and authorizations, and gave examples of successful ones. General information on the two are available on the FAA's UAS web portal.

The FAA has been processing requests manually, but LAANC will automate the process and help speed up the timeline. The National Beta Test began to roll out in April 2018, and it will continue to be

evaluated to improve upon user experiences. In the meantime, the other online processes are through the FAA DroneZone or for the CAPS system for COAs for public entities.

Workshop: UAS Type Certification – Worth the Effort?

- **Kevin Hull**, Manager, Los Angeles Aircraft Certification Office, Federal Aviation Administration
- **James Foltz**, UAS Program Manager, FAA Aircraft Certification Office
- **Andy Thurling**, Chief Technology Officer, NUAIR

Themes: Type certification process; manages risk through safety assurance; and collaboration on certification process is the key to success.

Type certification is not just for manned aircraft, and is an important consideration for manufacturers seeking certification of their UAS. Representatives from the FAA and industry explained the role of the operator, industry, and the civil authority in all four segments of UAS operations (non-commercial, part 107, airworthiness based on industry standards, and airworthiness based on full design/production certification by the civil authority) and provide insights into how to start the type certification process.

Type Certification includes the process and procedures for evaluating and approving aircraft, engine, and propeller type design data. To obtain approval, an applicant must show compliance to the applicable airworthiness standards, including noise and emissions. For UAS, it includes the entire system: the aircraft, control station, and any engines and propellers to be certified as part of the UAS as a whole.

Panelists walked the audience through the safety continuum and managed risk (the level of certification compared to rigor and oversight), classification for UAS and manned aircraft, and applicable regulations per new type design. The process is organized into five phases: conceptual design, requirements definition, compliance planning, implementation, and post certification activities. It helps to understand the requirements up front. For example, applicants need to detail the conceptual design — the FAA wants to understand your vehicle — as well as the concept of operations.

Panelists emphasized that having a type certificate does not grant operational approval. However, the good news is that as the FAA continues to certify UAS, cases begin to emerge that can be used as an acceptable certification basis. The FAA representatives emphasized that the certification process is a team effort, that the agency strives to work as partners, and urged participants to engage directly with the FAA.

Workshop: A Beginner's Guide to Spectrum Policy

- **Ian Atkins**, Group Manager, Spectrum Engineering and Policy Office, FAA Air Traffic Organization
- **Art Hinaman**, Technical Operations Branch Manager, FAA UAS Integration Office
- **Jennifer Richter**, Partner, Akin Gump Strauss Hauer & Feld LLP

Themes: Drone safety depends on reliable communications links; basic types of spectrum; and spectrum for UAS operations that interact with the NAS.

Regulators (federal, state, local) and the public will accept UAS integration when they are convinced of the safety, security, and reliability of drones. The safety, security, and reliability of drones depends, in large part, on the safety, security, and reliability of the communications links that command the UAS, help to avoid collisions, and enable low altitude traffic management.

Communications functions that require spectrum access include: remote ID, command and control links, collision avoidance, and payload communications (sensor information, videos, pictures, diagnostics) — but a "one size fits all" approach won't work. There are three basic categories of spectrum that can be leveraged for UAS functions: i) unlicensed bands; ii) commercially-available licensed bands; and iii) aviation protected spectrum. The appropriate spectrum solutions depend on the size of the aircraft, the altitude at which it intends to operate, whether UAS will fly BVLOS or over people, and other factors.

UAS at different altitudes need different spectrum solutions. For example, sUAS at low altitudes do not require aviation protected spectrum, but large UAS (cargo and military) at higher altitudes would.

Similarly, Task Group 2 of the Drone Advisory Committee (the "access to airspace" group) recommended networked cellular and LTE for low altitude UAS communications. The Federal Communications Commission — the primary authority to authorize spectrum for airborne purposes — is interfacing with the FAA, NTIA, NASA, and DHS to ensure that spectrum solutions for UAS satisfy safety and security issues.

Workshop: UAS Research – Who's Doing What to Support Integration

- **Sabrina Saunders-Hodge**, Director, UAS Research Division, FAA UAS Integration Office
- **Nick Lento, Manager**, New Entrants, FAA NextGen Office
- **Mark Blanks, Director**, Virginia Tech Mid-Atlantic Aviation Partnership (MAAP)
- **Steve Luxion**, Deputy Director, ASSURE FAA UAS Center of Excellence
- **Davis Hackenberg**, Deputy Project Manager, UAS Integration in the NAS, NASA

Themes: Testing UAS collision and impact helps to improve safety for people on the ground and manned aircraft.

What happens if a UAS hits a person? What are the newest advances in detect and avoid technology? How do we maintain and repair UAS safely? This session outlined the FAA's research priorities in support of UAS integration, including the main actors and opportunities to get involved.

Many if not all of the success stories participants heard during the three-day symposium would not have been possible without extensive research efforts – which in turn would not happen if it weren't for partnerships. When it comes to full UAS integration, the FAA can't do it alone. The FAA collaborates with many organizations to facilitate research, development, and testing. The FAA works across federal agencies, industry, and several test sites (e.g., with NASA, Department of Defense, Center of Excellence, and international partners).

Continued research and testing not only supports innovation and opens new operational possibilities for UAS. More importantly, it supports safety. For example, testing UAS collision/impact on the ground or in the air will guide industry in improving safety for manned aircraft and people on the ground, and saving lives.

Of interest was NASA's overview on research on detect-and-avoid systems and technology that include Commercial UAS Operating Environments (e.g. from low altitude urban, to rural and VLOS flying, flying

under VFR-like and IFR-like conditions, and on up to high-altitude long endurance flights).

Workshop: Experimental Special Airworthiness Certification

- **Brian Cable**, Manager, Airworthiness, FAA Aircraft Certification Service
- **Tom Rampulla**, Aviation Safety Inspector, FAA Aircraft Certification Service
- **Frank Paskiewicz**, Regulatory Support, BNSF Railway

Themes: Design requirements; FAA Order 8130.34 and latest changes; and how to get through the process.

What options do UAS manufacturers and operators have beyond part 107? Obtaining special airworthiness certificates is one option. An experimental certificate may be issued for the purposes of research and development (including test flights), showing compliance with regulations, crew training, exhibition, and market survey.

What's the process for obtaining experimental certification and how it may be used? The answer is, it's not easy, but it is possible. Being the first is always the hardest, and that's why the FAA calls past pioneers "pathfinders." As panelists explained, from the first UAS experimental certificate in 2005, to the successful UAS Focus Area Pathfinder Program from 2015 through 2017, these types of certifications pave the way for future standards development and will help facilitate the expansion of commercial UAS operational approvals.

Experimental special airworthiness certification is for experimental aircraft that satisfy design, airworthiness, operating, and other requirements. It's generally for Optionally Piloted Aircraft (OPA), which can be flown or controlled by an onboard PIC or by another individual from a location not onboard the aircraft, and OPA/UAS aircraft designed to operate with or without a pilot. Throughout the process the specifics of the testing parameters will have to be spelled out – from the proposed flight area, to the tasks to be performed, and safety and other inspections. Panelists urged that new applicants should make sure the vehicle is first registered and engage with the FAA early to fully understand and comply with FAA policies.

Workshop: Getting an Agricultural Operator Certification (Part 137)

- **Jim Malecha**, UAS Liaison, Commercial and General Aviation Division, FAA Flight Standards Service
- **Grant Canary**, CEO, DroneSeed

Themes: Certification requirements, including exemptions from certain sections of parts 107 and 137, for dispensing activities directly affecting agriculture, horticulture, or forest preservation..

Of all the ways to talk about commercial applications for UAS, the discussion would not be complete without agriculture. UAS are increasingly being used in agricultural aircraft operations, including spraying pesticides, nutrients for soil health, and for mosquito eradication programs. But the path to pesticide application is a complex one, requiring close interaction with the FAA.

A representative from the FAA and industry discussed certain regulatory reliefs (exemptions from parts 107 and 137) and operating rules for agricultural aircraft operations. Generally, the FAA can waive some of the rules (or approve exemptions), but only in a way that doesn't introduce any risk to the NAS.

Panelists first defined what constitutes agricultural application for purposes of part 137: operations using UAS to dispense activities directly affecting agriculture, horticulture or forest preservation.

The DroneSeed representative gave valuable advice on what is needed to petition the FAA for exemptions. Basically, it can be a long process to even start: an early step in the process is getting the petition published in the Federal Register for public comment. Later, demonstration and inspection phases can take up to 220 days. As precedents are set that petitioners can reference in their own applications, the process can ideally move quicker.

Workshop: Risk Mitigation in UAS Operations

- **Wes Ryan**, Unmanned Aircraft Certification Lead, FAA Aircraft Certification Service
- **Maggie Geraghty**, Manager, Safety Management Group, FAA Air Traffic Organization
- **Tracy Lamb**, Vice President of Regulatory and Safety Affairs, Association for Unmanned Vehicles Systems International
- **Lorenzo Murzilli**, Manager, Innovation and Advanced Technologies, Federal Office of Civil Aviation of Switzerland

Themes: Risk mitigation processes and how they apply to UAS; managing risk while providing a path forward for more complex (i.e. riskier) operations.

The core mission of the FAA is safety and the agency has maintained the safest airspace system in the world by developing procedures and processes to minimize risk. Safe integration of UAS will be achieved into that shared airspace in part by identifying all risks to the operation and implementing solutions to ease the risk.

Panelists detailed how the FAA conducts safety analysis of UAS and their operations, and explored risk and mitigations to focus on the role of the pilot, airworthiness, operating limitations, and the use of segregated airspace to mitigate risk. The FAA has established safety assurance processes for aircraft certification and operations, and safety expectations are applied using risk-based decision-making. The key is to actively manage risk and constantly be looking out for changing factors.

New transportation concepts involving UAS will challenge all stakeholders, but the same doctrine applies. Generally, new tech companies are risk takers and innovation does require some risk tolerance — in fact, risk is often rewarded.

However, the importance of proactively evaluating risk cannot be understated. Safety Management Systems and risk-based decision-making are key tenets to safe operations. The public depends on competent risk assessment and risk mitigation, and if risks are overlooked, public skepticism will be an obstacle to full UAS integration into the NAS.

CONCLUSION

The third annual UAS Symposium continued to prove that industry, operators, and other stakeholders greatly benefit from these face-to-face interactions with the FAA. High level agency decision-makers hosted panels and mingled with attendees in between to discuss topics ranging from airspace authorizations to cybersecurity and facilitating expanded UAS operations in the NAS. Experienced FAA employees who are experts in the day-to-day, nuts-and-bolts work of all things UAS staffed a resource center to help Symposium participants with their specific questions.

Respondents to the 2018 Symposium satisfaction survey said that that, in general, the event and its activities met their expectations. More than 50 percent of respondents ranked the event at the highest level of satisfaction[2] on aspects such as the ease of registration, quality and location of the venue, and the length of the event and mix of attendees. Details of the survey are in the following section of this report.

Overall, the feedback suggested that this conference will continue to grow each year. More people, businesses, public entities, and communities see the event as extremely useful in interfacing with the agency for to meet their varying needs.

As one Symposium 2018 guest put it: "Having direct access to the highest levels of FAA UAS leadership was beyond impressive, it was invaluable and helpful as well. It is incredibly refreshing to come away from the Symposium feeling as though there IS a government agency who is actively concerned and willing to be of authentic assistance to the industry, not just playing political lip service. This will not be my last Symposium and I've already raved and recommended to others in my circle of influence that they too attend next year."

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[2] Questions asked the respondents to rate their satisfaction on a scale of 1 (dissatisfied) to 5 (satisfied); 118 people responded to the survey, but not all answered all questions.

POST EVENT SURVEY RESULTS

All Symposium attendees received a survey shortly after the event. About 13 percent of attendees[3] responded to the survey. The survey contained 10 questions (below) and response data was calculated from the 118 out of 144 total responses who answered enough questions to support a valid assessment.

Q1: Did you attend any of the previous UAS Symposium?
Q2: Why did you decide to attend the 2018 Symposium?
Q3: How likely is it that you would recommend the FAA UAS Symposium to a friend or colleague?
Q4: One of the objectives of the UAS Symposium was to improve stakeholder engagement with the FAA. Do you feel the Symposium advanced this connection?
Q5: Rate your satisfaction with the following aspects of the Symposium (1 = dissatisfied, 5 = satisfied).
Q6: Rate your satisfaction with the following aspects of the Symposium (1 = dissatisfied, 5 = satisfied).
Q7: Rate your satisfaction with the Tuesday sessions (1 = dissatisfied, 5 = satisfied).
Q8: Rate your satisfaction with the Wednesday sessions (1 = dissatisfied, 5 = satisfied).
Q9: Rate your satisfaction with the Thursday sessions (1 = dissatisfied, 5 = satisfied).
Q10: Did you visit the FAA Resource Center?

Survey highlights

In general, more people said they attended the symposium for "business or professional development" (about 68 percent) than any other reason, but the responses for this question varied. Some offered other personal reasons, like for: "Hearing information first hand from the FAA leadership;" "Gathering information to bring back to my high school;" "Team building;" or that they were "Interested in planned FAA regulation changes."

Why Did You Attend the Symposium?

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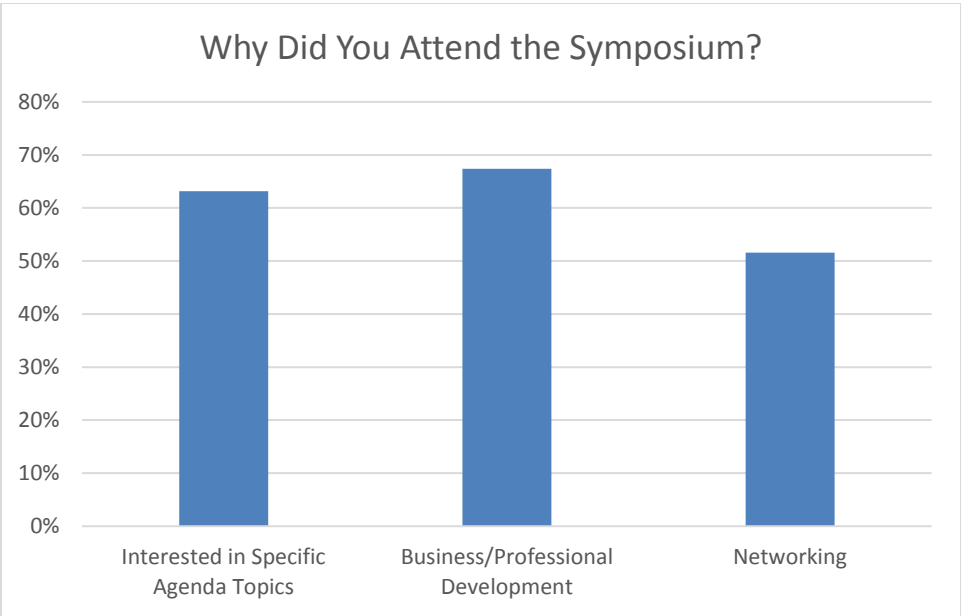
[3] Some respondents did not enter a value on some of the questions.

Figure 1: An overwhelming percentage of respondents said the Symposium advanced stakeholder engagement with the FAA.

Did the Symposium Meet Stakeholder Engagement Objective?

13%
87%

■ Yes ■ No

Figure 2: On average, 73 percent answered favorably in support of the event location, with 43 percent and 30 percent saying they were satisfied or somewhat satisfied on a scale of one to five.
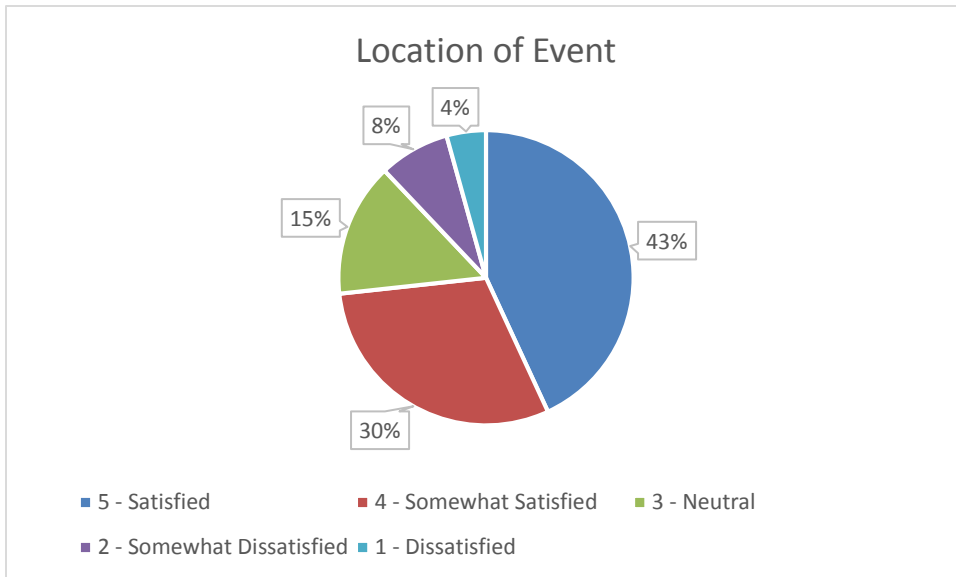

Location of Event

4%
8%
15%
43%
30%

■ 5 - Satisfied   ■ 4 - Somewhat Satisfied   ■ 3 - Neutral
■ 2 - Somewhat Dissatisfied   ■ 1 - Dissatisfied

Figure 3: The average rating in support of the quality of the event venue was about 4.17 on a scale of one (dissatisfied) to five (satisfied).

Quality of the Venue

Scale	Number of respondents
1 - Dissatisfied	2%
2 - Somewhat Dissatisfied	7%
3 - Neutral	11%
4 - Somewhat Satisfied	34%
5 - Satisfied	46%

Scale from 1 to 5 (y-axis)
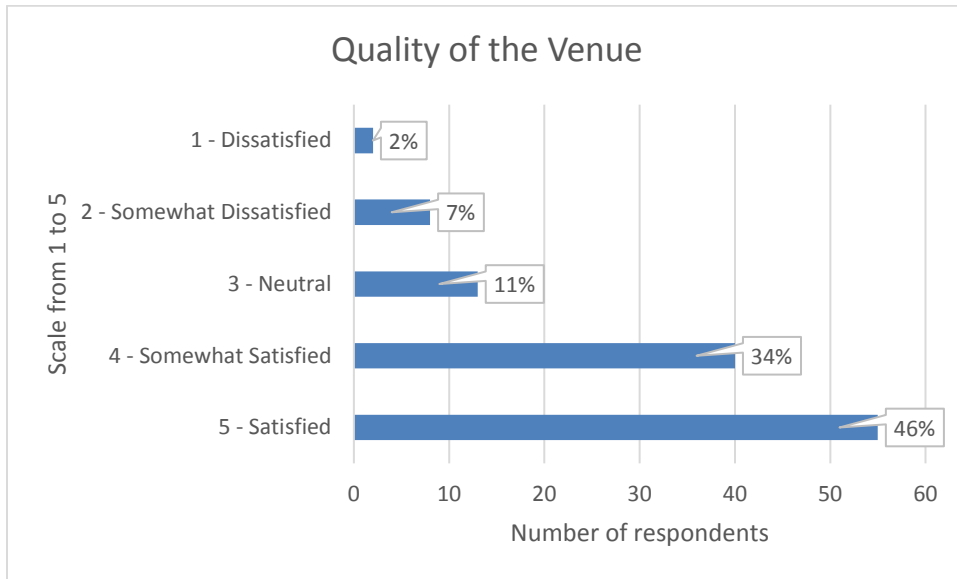Number of respondents (x-axis: 0, 10, 20, 30, 40, 50, 60)

Figure 4: About 33 percent of respondents were in the neutral range for the registration fee, with an overall average rating of 3.32 on a scale of one (dissatisfied) to five (satisfied). About 45 percent said they were either "satisfied" or "somewhat satisfied."

Registration Fee

Scale	Percentage
5 - Satisfied	21%
4 - Somewhat Satisfied	24%
3 - Neutral	33%
2 - Somewhat Dissatisfied	13%
1 - Dissatisfied	9%

Number of respondents (y-axis: 0, 5, 10, 15, 20, 25, 30, 35, 40)
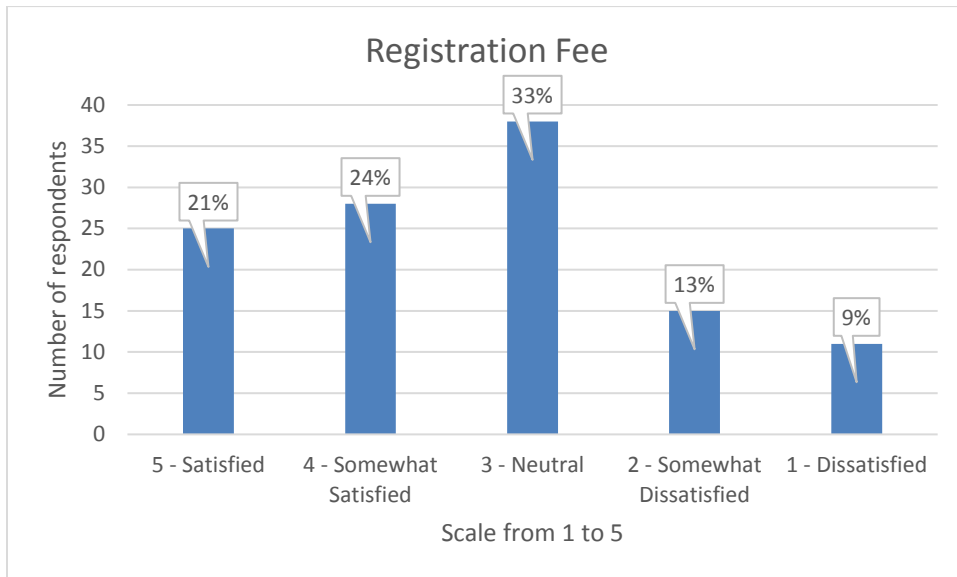Scale from 1 to 5 (x-axis)

FAA UAS Symposium 2018 Report

Figure 5: A majority of respondents (about 89 percent) was favorable on the ease of registration, with an overall average rating of average 4.35 on a scale of one (dissatisfied) to five (satisfied).
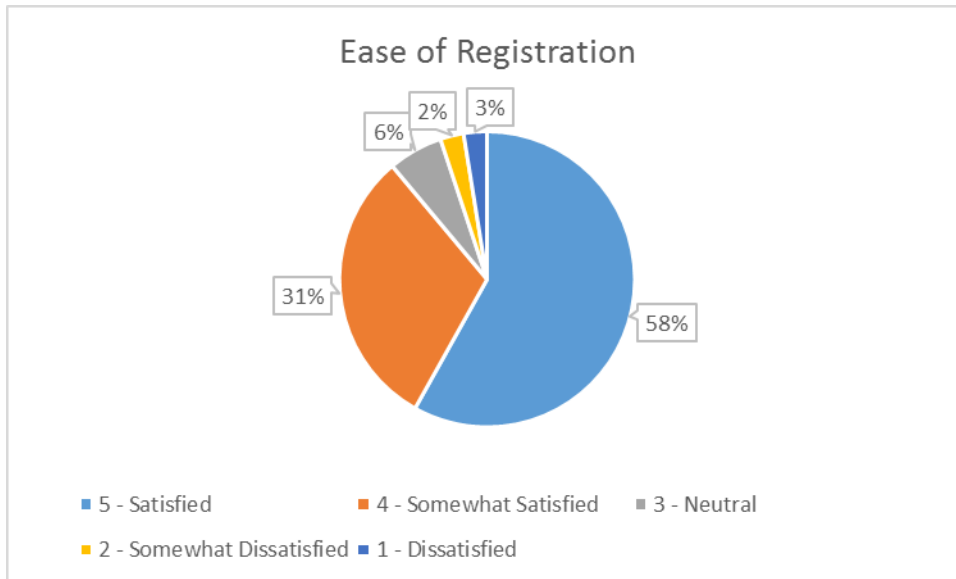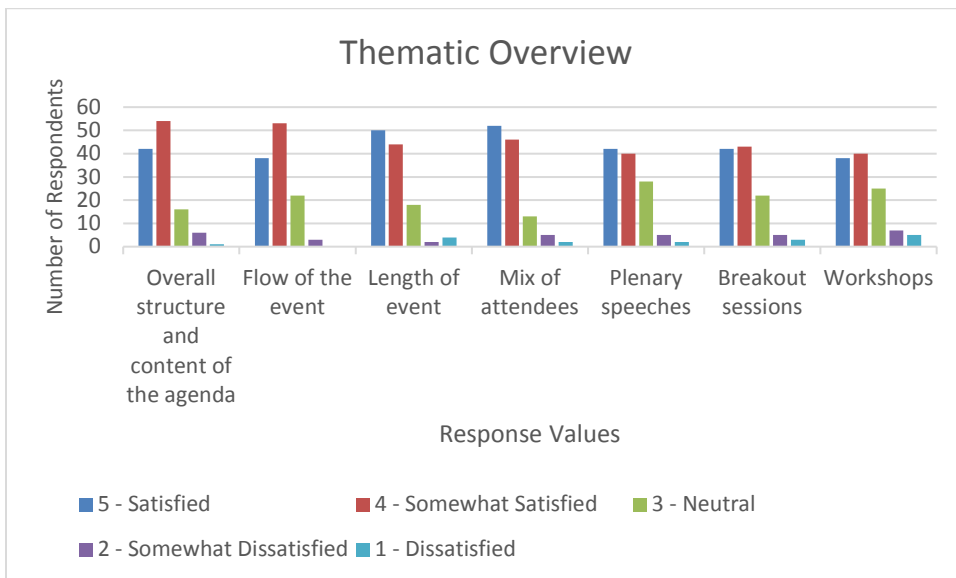

Figure 6: More people said they were satisfied with several aspects of the Symposium than were not satisfied.

Open-Ended Response

All survey participants were asked the question, "Do you have any additional comments/suggestions/feedback?" Some respondents answered with valuable points for the FAA to consider in its efforts to make future events more meaningful and useful for participants. Some mentioned the event's registration fee directly and mentioned their discontent with some of the meeting spaces for workshops. Other feedback in the open-ended responses included:

37

FAA UAS Symposium 2018 Report

- ✓ While the subject areas of the workshop, plenaries, and breakouts were diverse, the speakers and content of the messaging were very repetitive.
- ✓ I missed a lot of things I wanted to see due to the parallel tracks. I know that it's necessary, but it is frustrating!
- ✓ It would be good for the FAA to include more international speakers to show that the U.S. is a global player and is 'listening' and/or 'leading' the charge, not just acting in isolation.
- ✓ The content seemed to be geared primarily toward people with vast experience in the field(s). It would be valuable to develop content for novice folks particularly those of us who are new to the industry as part 107 pilots.

FAA UAS Symposium 2018 Report