STATEMENT OF EARL LAWRENCE, DIRECTOR OF THE FEDERAL AVIATION ADMINISTRATION'S UNMANNED AIRCRAFT SYSTEMS INTEGRATION OFFICE, BEFORE THE SENATE COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION: UNMANNED AIRCRAFT SYSTEMS: INNOVATION, INTEGRATION, SUCCESSES, AND CHALLENGES, MARCH 15, 2017.

Chairman Thune, Senator Nelson, Members of the Committee:

Thank you for the opportunity to appear before you today. My name is Earl Lawrence, Director of the Federal Aviation Administration's (FAA) Unmanned Aircraft Systems (UAS) Integration Office. In this role, I am responsible for the facilitation of all regulations, policies, and procedures required to support the FAA's UAS integration efforts. I also represent the FAA on the Senior Steering Group of the UAS Executive Committee focusing on coordination and alignment of efforts among key federal government agencies, and I oversee the Subcommittee of the Drone Advisory Committee.

The Department of Transportation's (USDOT) and FAA's vision for fully integrating UAS into the National Airspace System (NAS) entails UAS operating harmoniously, side-by-side with manned aircraft in a safe and secure manner. This vision goes beyond the accommodation practices in use today, which largely rely on operational segregation to maintain systemic safety. As we work to realize this vision, the FAA intends to work incrementally to introduce UAS into the NAS after careful consideration of the safety of people and property both in the air and on the ground.

Two years ago, the FAA appeared before this committee to discuss the status of the safe, incremental integration of UAS—more commonly referred to as drones—into the NAS, and also into the FAA. In that time, we have made significant progress toward our goal of fully integrating this new class of aircraft and their operators. This progress is the result of significant

coordination efforts across the FAA. While my office serves as the focal point for external stakeholders, almost every policy and support office within the Agency has dedicated staff and resources to supporting these integration activities. Today, the United States is clearly a global leader in UAS integration, and I would like to highlight for you some examples of our accomplishments, our challenges, and our ongoing work to build upon our successes as we move forward with the next phase of UAS integration.

Small UAS Registration

Aircraft registration is a foundational statutory requirement that applies to all civil aircraft and promotes a culture of accountability. At the time of our last discussion, we were experiencing a huge influx of new, casual UAS users—people who fly UAS for personal entertainment or recreation. Many of these operators do not have the basic aviation knowledge, training, or experience required for pilots of traditional manned aircraft. Growing concern about reports of UAS flying near airports and manned aircraft highlighted the need to educate these users about how to operate UAS safely as soon as possible, preferably before they began operating small UAS in the NAS.

We knew at the outset that we would need to work with industry stakeholders in order to develop a registration process for small UAS. The Secretary of Transportation and the FAA Administrator announced the creation of a UAS Registration Task Force on October 19, 2015. This Task Force was comprised of industry representatives with a range of stakeholder viewpoints, interests, and knowledge. The group met for three days in November 2015 to develop recommendations for a small UAS registration process.

After evaluating the Task Force's recommendations and public comments, the FAA published an Interim Final Rule on Registration and Marking Requirements for Small Unmanned

Aircraft on December 14, 2015. This rule established a new web-based process for small UAS registration, relieving operators of the need to use the legacy paper-based process, and took effect on December 21, 2015. The requirements stipulate that owners must register their UAS online if the combined weight of the vehicle and anything it carries is more than 0.55 lbs. and less than 55 lbs., and is flown outdoors for either recreational or non-recreational purposes, consistent with the statutory requirement for aircraft registration. Within the first two weeks of online registration opening, over 160,000 UAS owners had registered their UAS.

The registration process serves two critical functions that will help foster a culture of safety, security, and accountability in the emerging UAS community. First, it provides a means to associate an unmanned aircraft with its owner. This helps law enforcement and regulators identify an operator more quickly in the event of an incident and ensures operators are aware that they are responsible for the safe operation of their vehicle. Secondly, and equally important, the registration process provides an opportunity to educate users about how to safely operate UAS in the NAS, including instructions to not fly near manned aircraft and always fly within visual line-of-sight, as well as an acknowledgement that flying in the nation's airspace comes with certain responsibilities and expectations. To date, over 750,000 small UAS owners have registered, including more than 40,000 in the last two weeks of December 2016. The FAA has used the registration database on three occasions to provide registrants with important, time-sensitive safety information about flying their UAS – during Hurricane Matthew, wildfire season, and the Iditarod Great Sled Race.

Small UAS Rule (Part 107)

Building on the successful launch of the online registration system, the FAA adopted a similar approach of engagement and collaboration with industry stakeholders in the development

of the first set of operating rules for small UAS, which forms the bedrock of the regulatory framework for full UAS integration. Because UAS technology is evolving at a rapid pace, a flexible regulatory framework is imperative. Our goal is to provide the basic rules for operators, not identify specific technological safety solutions that could quickly become outdated. We've achieved this goal with the final small UAS rule (14 CFR part 107), which was issued on June 21, 2016 and went into effect on August 29, 2016.

Part 107 introduces a brand new pilot certificate that is specific for UAS operations—the Remote Pilot Certificate. Unlike a part 61 airman certificate (certification for manned aircraft), which necessarily has more stringent requirements, an individual can obtain a Remote Pilot Certificate by passing an aeronautical knowledge test at an FAA-approved testing center. Alternatively, if the individual holds a current non-student part 61 airman certificate, the individual may complete an online UAS training course in lieu of the knowledge test. Approximately 24,000 applicants have taken the Remote Pilot Knowledge Exam, and over 91% have passed.

The small UAS rule has also greatly reduced the number of, and the need for, Section 333 exemptions, which the FAA used to grant case-by-case approval for certain unmanned aircraft to conduct commercial operations. Before part 107, the primary way to operate a drone for non-hobby purposes was to obtain a Section 333 exemption and an accompanying Certificate of Waiver or Authorization (COA). The FAA issued 5,551 exemptions under Section 333.

The provisions of part 107 are designed to minimize risks to other aircraft and people and property on the ground, as well as provide the UAS industry and operator community with the flexibility to innovate. Among other operational limits such as speed and altitude, the regulations require pilots to keep an unmanned aircraft within visual line-of-sight, fly during

daylight hours, and prohibit flights over unprotected people on the ground who are not directly involved in the UAS operation.

In keeping with our goal of a flexible framework, part 107 also allows operators to apply online for waivers and airspace authorizations to fly outside the rule's requirements, provided that they demonstrate their proposed operation may be conducted safely. This process has been used successfully to issue over 400 waivers and 2,200 airspace authorizations for UAS operations in controlled airspace, including the drone show featured during halftime at this year's Super Bowl. Part 107 allows for operations in Class G airspace without prior air traffic control authorization; operations in Class B, C, D, and E airspace (i.e. controlled airspace) may be permitted with authorization from the FAA Air Traffic Organization (ATO).

The small UAS rule provides UAS operators with unprecedented access to the NAS while also ensuring the safety of the skies, and was largely well received by the UAS industry. However, it is only the first step in the FAA's plan to integrate UAS into the NAS. Consistent with our incremental integration strategy, we intend to use a risk-based approach to facilitate expanded UAS operations, including operations over people, operations beyond visual line-of-sight, and transportation of persons and property.

Next Steps and Challenges Ahead

The FAA's commitment to further expanding permissible UAS operations and enabling this emerging technology to safely achieve its full potential requires resolving several key challenges. Congress recognized a number of these challenges in the FAA Extension, Safety, and Security Act of 2016. Before operations beyond visual line-of-sight can become routine, FAA must address risks posed by drones to other manned aircraft, as well as risks posed by

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drones during a loss-of-operator-control event. Additionally, preemption, privacy, enforcement, and security – both physical and cyber – remain key issues as UAS integration progresses.

Technical Challenges

One way the FAA is working to address the technical challenges presented by increasingly complex UAS operations is to support its UAS test sites in conducting critical research. One of the primary goals of the test site program is to help the FAA determine technical and operational trends that could support safety-related decision making for UAS-NAS integration. In 2016, the test sites continued to conduct research to validate key operational requirements for UAS integration, including research and testing into technology that enables UAS to detect and avoid other aircraft and obstacles, investigation of lost link causes and resolutions, and evaluation of the adequacy of ATC and communications procedures with UAS. Test site activities have also explored industry applications of UAS, such as emergency response, utility company infrastructure inspection, wildlife census, and precision agriculture.

To complement the work being done at and by the UAS test sites, in May 2015 the FAA selected a UAS Center of Excellence (COE), led by Mississippi State University and the Alliance for System Safety of UAS through Research Excellence (ASSURE). The goal of the UAS COE is to create a cost-sharing relationship between academia, industry, and government that will focus on research areas of primary interest to the FAA and the UAS community. The FAA has received initial research results for several research topics, including airborne and ground-based collision testing, which are currently being peer reviewed by both internal and external research teams. This work fits into the FAA's overall UAS research and development portfolio, which is primarily focused on applied research to support the development of rules, policies, and procedures.

To keep pace with the rapid increase in the number of UAS operations, and to pave the way for the full implementation of beyond visual line-of-sight operations, FAA is working with the National Aeronautics and Space Administration (NASA) and industry to develop and eventually deploy a UAS Traffic Management (UTM) System. NASA's research concept specifically considers small UAS operations below 400 feet, in airspace that contains low-density manned aircraft operations. NASA has developed a phased approach for their UTM concept, building from rural to urban and from low to high-density airspace. In April 2016, NASA coordinated with the six FAA-selected test sites to perform phase one testing of the UTM research platform. A Research Transition Team (RTT) has been established between the FAA and NASA to coordinate the UTM initiative, as the concept introduces policy, regulatory, and infrastructure implications that must be fully understood and addressed before moving forward with technology deployment. Additionally, the UTM work with NASA will inform our efforts with respect to UAS operating in proximity to airports. A second RTT has also been established with NASA, which is focused on UAS operating in higher altitude and controlled airspace, as opposed to the UTM initiative, which focuses on operations in low altitude managed airspace.

Security and Enforcement

As Congress recognized in the 2016 FAA Extension, the security challenges presented by UAS technology require a whole-of-government response. The FAA is working with several departments and agencies – including the Department of Justice, Department of Homeland Security, Department of Defense, and others – to identify and evaluate technologies that detect and track unmanned aircraft movement through the NAS. However, technologies to detect and track unmanned aircraft movement through the NAS are only one part of the equation to address the security challenges presented by evolving UAS technologies. To adequately secure and

protect the airspace we must continue to educate the public on the safe operation of UAS and work with our law enforcement partners at every level of government in responding to incidents involving threats from UAS.

We also continue to work closely with our industry partners to evaluate these promising drone-detection technologies. As directed in Section 2206 of the 2016 FAA Extension, the FAA has established a pilot program to evaluate some of these technologies, which have been tested in airport environments at New York's JFK Airport, Atlantic City International Airport, and Denver International Airport. Further testing will take place at Dallas-Fort Worth later this year. In addition, the FAA is working with interagency partners to develop policies and procedures for restricting UAS operations over fixed site facilities, as directed by Section 2209 of the 2016 FAA Extension.

The potential for conflicts between manned and unmanned aircraft has become a very real challenge in integrating these new technologies into the NAS. We are seeing an increased number of drone-sighting reports from pilots of manned aircraft, with approximately 1,800 reports of sightings in 2016, compared to 1,200 reports the year before. As the Federal agency responsible for the safety of the flying community, the FAA remains concerned about the increasing number of these reports. To begin addressing this issue, we are actively engaging in public education and outreach efforts, such as "Know Before You Fly" and the small UAS registration process.

Sometimes, however, education is not enough. If an unauthorized UAS operation is intentional, creates an unacceptable risk to safety, or is intended to cause harm, strong and swift enforcement action will be taken. Recently, we announced a comprehensive settlement agreement with a UAS operator that violated airspace regulations and aircraft operating rules by

flying drones in congested airspace over New York City and Chicago. However, one of the

enforcement challenges we often face is identifying the operator of a UAS flying where it

shouldn't. This Committee has recognized that challenge with Section 2202 of the 2016 FAA

Extension, which directs the FAA to convene industry stakeholders to develop consensus

standards for remotely identifying UAS operators. We plan to begin convening stakeholders this

spring.

Continued engagement with the law enforcement community is paramount to ensuring

public safety. In January 2015, the FAA published guidance for the law enforcement community

on its UAS Web site, and has been actively engaging with law enforcement agencies at local,

State, and Federal levels to reduce confusion about how to respond to UAS events. The FAA

encourages citizens to call local law enforcement if they feel someone is endangering people or

property on the ground or in the sky. Local law enforcement should then work with local FAA

field offices to ensure these safety issues are addressed.

Continued Engagement with Industry

As the FAA moves forward with UAS integration, we will continue to involve all

stakeholders in framing challenges, prioritizing activities, and developing consensus solutions.

By leveraging this expertise, we ensure that the FAA maintains its position as the global leader

in aviation safety. Last summer, we formed the Drone Advisory Committee (DAC). Its

members include representatives from industry, government, labor, and academia. The DAC

will allow us to look at drone use from every angle, while considering the different viewpoints

and needs of the diverse UAS community.

The first DAC meeting was held in September 2016 and its members have already started

to work on assisting us in two key areas: identifying the roles and responsibilities of drone

operators, manufacturers, and Federal, state, and local officials related to drone use in populated areas; and determining what the highest-priority UAS operations are and how we can enable access to the airspace needed to conduct these operations. The FAA recently created a new tasking concerning a third key area: how to fund the full complement of services required to safely integrate UAS operations into the NAS in the long-term. We look forward to receiving and reviewing the DAC's recommendations.

In October 2016, we also began working with industry to form an Unmanned Aircraft Safety Team (UAST), modeled after the very successful Commercial Aviation Safety Team (CAST). This group's mission is to collect and use UAS operational data to identify safety risks, and then develop and voluntarily implement mitigation strategies to address those risks. The group is currently working on several projects, including helping the FAA develop a survey to the UAS operator community.

Apart from our work with the DAC and the UAST, the FAA held its first UAS symposium in Daytona Beach, Florida in April last year. The symposium provided a forum for UAS stakeholders to provide feedback directly to FAA decision-makers on topics related to UAS integration. Nearly 500 attendees heard keynote remarks from the FAA Administrator and Deputy Administrator, and participated in discussions on topics ranging from aircraft and pilot certification to legal and policy issues related to UAS operations and integration.

Our second UAS symposium will be held in the Washington D.C. area on March 27-29, 2017. Conversations will touch on the more significant challenges that integration presents, including the intersection of privacy and preemption, the importance of harmonizing international regulations, and the array of new safety and security risks associated with increased UAS operations. The symposium will also have a Resource Center to provide attendees with

one-on-one technical support on authorizations, waivers, Part 107 requirements, and other policies and regulations.

Building on Our Success

Moving forward, we intend to build on the progress that we have made this past year with two notable initiatives currently underway. We are developing a Low Altitude Authorization and Notification Capability (LAANC) to automate the process for UAS operators to notify Air Traffic Control of flights within five miles of an airport center or to get authorization to fly in certain classes of airspace. This initiative will be the first step toward implementing UTM. As part of LAANC, the FAA will publish UAS facility maps that indicate likely safe altitudes for UAS flight and distances around airports. Industry applications will facilitate interaction with the maps and may provide automatic notification to the FAA and operational authorization to UAS operators through data exchange. Data received by the FAA may be used by Air Traffic Control to contact the operator in the event of an emergency. On February 1, 2017, the FAA held the first in a series of industry workshops to discuss this initiative in greater detail, and recently released a sample of 10 facility maps to the industry partners involved in LAANC.

The second initiative is to develop an integrated gateway—a common web portal and associated API—that will serve as a one-stop-shop for all UAS interactions with the FAA. It will allow UAS owners and operators to register their aircraft, apply for an airspace authorization or waiver, file an accident report, and keep abreast of the latest FAA news and announcements concerning UAS. This gateway will be designed for desktops, laptops, tablets, and phones, and will serve as the platform for future communications with the FAA as UAS rules and regulations evolve.

Conclusion

The progress that we have made, in particular during the past year, might have seemed unimaginable not long ago. From the beginning, we knew that we had to engage our stakeholders, and it paid off with the creation of a UAS registry and the successful implementation of a flexible regulatory framework to enable routine small UAS operations. Our collaborative working relationships with the DAC and UAST will help inform and prioritize integration activities, ensure we remain engaged with industry trends, and maintain clear channels of communication to convey expectations and solicit feedback. We know, however, that these accomplishments are only the first step. As reinforced in the 2016 FAA Extension, there are many important issues yet to be addressed and we will continue to work with our stakeholders as we move forward.

This concludes my statement. I will be happy to answer your questions at this time.