Written Testimony of Dr. Catherine F. Cahill
Director, Alaska Center for Unmanned Aircraft Systems Integration (ACUASI) at the University of Alaska Fairbanks (UAF)

U.S. House of Representatives Committee on Transportation and Infrastructure, Subcommittee on Aviation

FAA Reauthorization: Harnessing the Evolution of Flight to Deliver for the American People

March 30, 2023

Chairman Graves, Ranking Member Cohen, and Members of the Subcommittee, my name is Cathy Cahill and I am the Director of the Alaska Center for Unmanned Aircraft Systems Integration (ACUASI) at the University of Alaska Fairbanks (UAF). ACUASI is the University of Alaska's Center of Excellence for UAS and one of the top UAS research programs in the country. ACUASI is unique in that it has multifaceted roles as lead of one of the seven FAA designated UAS Test Sites and one of the eight BEYOND sites, and a core university in the FAA's UAS Center of Excellence (a.k.a. the Alliance for System Safety of UAS through Research Excellence – ASSURE). As a result, our team is engaged with the best and brightest commercial and governmental entities on cutting-edge UAS technologies, helping FAA collect and analyze the data needed to support the safe integration of UAS into the National Airspace System (NAS), and developing the workforce pipeline that will produce the engineers, scientists, pilots, cargo handlers, drone mechanics, and other jobs needed by UAS end users, operators, and providers to support the developing drone economy. Being in Alaska allows us to safely test new technologies, policies, and procedures in a state that is dependent upon aviation to conduct missions of import such as long-distance cargo delivery to remote communities, medical supply delivery, long linear infrastructure surveillance, mapping and surveying, and mammal monitoring. Our diverse portfolio and academic standing allows us to demonstrate, observe, and evaluate the risks associated with UAS use in both military and civil environments. Our community and professional relationships enable us to safely advance UAS and aviation technologies. Combined, these facts uniquely position me to raise some critical factors for consideration in the 2023 FAA Reauthorization. This written testimony is provided to you through my personal capacity as a private citizen and based on my professional experience; it does not necessarily represent the views of the University of Alaska.

Alaska is an aviation state (https://dot.alaska.gov/stwdav/). We have the highest number of pilots, traditional aircraft, and drones per capita in the country and 82 percent of all Alaskan communities can only be reached year-round via aircraft. Please let me restate this fact for emphasis: more than four out of five communities in Alaska are dependent on year-round aviation. Any improvements we make to the routine servicing of these communities has a direct impact on the quality of life of the residents in those communities. Routinely transporting cargo, such as diapers and milk, to the communities might not be an exciting operation, but it greatly improves the quality of life in that community by reducing cost and increasing access to fresh foods and other necessities. We also have a large number of aviation accidents and fatalities (https://www.adn.com/alaska-news/aviation/2019/11/04/rate-of-alaska-fatal-plane-crashes-tops-national-average/), so aviation safety is of serious concern in the state. Many missions, including pipeline surveillance, mapping,

animal counting, and cargo delivery, are currently being done using traditional aircraft which can be dangerous. These could be more safely and efficiently conducted using drones flying Beyond the Visual Line of Sight (BVLOS) of their pilots, if a reasonable set of technologies and policies and procedures can be developed and implemented by: the drone community, the larger aviation community, and Federal regulators. Improving aviation safety while improving the quality of life in Alaska's remote communities is why ACUASI has been working for years with partners, especially the State of Alaska Department of Transportation and Public Facilities and those remote communities. Collectively we work to develop concepts of operations for conducting these missions, work with aircraft manufacturers and technology providers to identify and implement new technology based solutions to meet the challenges of safely flying BVLOS. We also work directly with regulators such as the FAA and the Federal Communications Commission to develop the policies, procedures, and permissions required to conduct these operational missions. Our ceaseless efforts in advancing and enhancing aviation safety in Alaska have led to the following realizations and are the foundation to my recommendations for the 2023 FAA Reauthorization legislation.

The FAA UAS Test Sites

The FAA and Congress have not funded, granted permissions, or utilized the current seven FAA UAS Test Sites to their fullest potential. The intent of Congress behind the seven FAA-approved UAS Test Sites appears to have been for the Test Sites to assist companies with the research, development, test, and evaluation of new drone technologies and the safe integration of that technology into the National Airspace System (NAS); however, when the Test Sites were stood up, their scope was constrained to conducting public aircraft operatons as identified in 49 U.S. Code § 40125:

49 U.S. Code § 40125 - Qualifications for public aircraft status

> *(2) Governmental function.—*
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> *The term "governmental function" means an activity undertaken by a government, such as national defense, intelligence missions, firefighting, search and rescue, law enforcement (including transport of prisoners, detainees, and illegal aliens), aeronautical research, or biological or geological resource management.*

This requirement greatly limited the ability of the Test Sites to assist commercial operators with the testing and evaluation required to certify their aircraft. As soon as an aircraft was no longer a prototype being used for aeronautical research, the Test Sites could not help the company fly the aircraft and develop the hours needed for the manufacturer to demonstrate the safety of the aircraft in the NAS. The seven Test Sites are safety-focused and are uniquely skilled and positioned to facilitate this safe transition. Additionally, the FAA interpreted this requirement as a definitive list of public aircraft operations, instead of as a 'such as' list that could be added to, so the Test Sites and other public aircraft users were not allowed to conduct infrastructure (e.g., roads, bridges, etc.) monitoring by state Departments of Transportation, training of drone users, demonstrations of the technology for potential public use cases, and other operations.

The public aircraft restriction also meant that the Test Sites could not charge companies for flights; the Test Sites could only charge for providing assistance in accessing operational airspace, such

as applying for the permissions required for the company to fly in a specified airspace, and the use of their facilities. Because the Test Sites did not receive any direct funding from Congress or the FAA to develop those facilities, it was a struggle for all of the Test Sites to develop the facilities required for their customers to do their required testing. Congress has since directed limited funding for research at the Test Sites, but they are required to go to a Qualified Commercial Entity through a Broad Agency Announcement competition process that results in the Test Sites receiving a small portion of the funding allocated to the project for very specific and limited support. I recommend providing the Test Sites with baseline funding to support their facilities and facilitate safer, easier access and support for drone manufacturers and technology providers.

In spite of the public aircraft and funding limitations, the Test Sites have collected important aviation safety data on new aircraft and technologies, including Detect and Avoid (DAA) technologies that will allow a drone to spot other aircraft in the air and autonomously avoid them. Additionally, after many years of requesting relief from the public aircraft limitation and Congressional and State pressure on the FAA, on February 6, 2023, the FAA's University of Alaska UAS Test Site finally received the first 49 U.S. Code § 44803(c) waiver that allows the Alaska Test Site to conduct civil operations for the test and evaluation of drones under 300 pounds and charge for their efforts. Between February 6 and March 24, 2023, three of the other six Test Sites also received U.S. Code § 44803(c) waivers and the other Test Sites are expected to get their waivers in the near future. These waivers allow the Test Sites to finally do what they should have been allowed to do for vehicles of this size when they were stood up ten years ago. The industry is now expanding into aircraft that are heavier than 300 pounds and the Test Sites are the logical, safe place for this testing as well. We currently are working with aircraft manufactures developing aircraft of this size or converting traditional cargo aircraft to autonomous systems. The Test Sites are currently only authorized through September 30, 2023, and should be extended by at least five years to continue their important work and fully implement the capabilities available using the 44803(c) waiver to help companies get their drones and drone technologies certified for use in the NAS.

I have heard rumors that organizations are requesting the expansion of the FAA UAS Test Site program. I strongly disagree with that premise. The current Test Sites have established and proven procedures, repeatable operations, and proven safety records that are unmatched in the industry and will be difficult to match for any new Test Site. Additionally, the current Test Sites have not been supported financially by the FAA in spite of our good partnership with the FAA Test Site Program Managers and our provision of quality data sets to the FAA and adding additional sites will make that problem more acute, especially since new Test Sites could potentially be immediately provided with the waivers that the current Test Sites just received after years of hard work. Further, there is a risk that this would dilute the already limited funding coming through the Qualified Commercial Entity program. In addition, if Congress wants to expand the integration of drones into the NAS, including operating flights at the height of the Chinese surveillance balloon or above, altitudes that could be used to expand cellular communications capabilities, support disaster response, collect weather data sets and more; the current Test Sites have experience in these flight regimes and could increase their capacity to support customers and partners interesting in operating at these altitudes. We can also expand our operations to support those regions and entities that desire to be test sites through the processes and procedures we use to operate our ranges in Oregon and Hawai'i. These were set up after the Test Site authorizations were granted to the University of Alaska for the entire Pan-Pacific UAS Test Range Complex instead of for Alaska,

Hawai'i, and Oregon separately. We have been using these policies and procedures to bring additional operational areas across the country into the University of Alaska UAS Test Site. All seven current Test Sites have the ability to do this. This additional scope and support would require additional funding and/or through our ability to charge for 44803(c) test and evaluation support.

We also recommend that the term 'governmental function' in 49 U.S. Code, Section 40125 be redefined to: 1) allow the FAA's Test Sites collect data on and oversee the research, development, test, and evaluation (i.e., aeronautical research) of all drones, not just those for Federal government use without requiring a 44803(c) waiver to be able to conduct civil operations, and 2) allow infrastructure inspections, public demonstrations, training and education, and all other activities that are in the public interest that are not currently considered 'public operations' but are in the public's interest. Suggested wording changes are highlighted in red:

49 U.S. Code § 40125 - Qualifications for public aircraft status

> *(2)Governmental function.—*
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> *The term "governmental function" means an activity undertaken by a government, such as national defense, intelligence missions, firefighting, search and rescue, law enforcement (including transport of prisoners, detainees, and illegal aliens), aeronautical research (including data collection on civil systems undergoing research, development, test, or evaluation at a FAA UAS Test Site), or biological or geological resource management, infrastructure inspections, public demonstrations, training and education, and all others that are in the public interest.*

BEYOND

The FAA's BEYOND program provides eight state, local, or tribal-led teams with assistance in navigating the regulatory and technical challenges associated with conducting BVLOS operations. In Alaska, the BEYOND program supports our long, linear infrastructure monitoring (e.g., the Trans-Alaska Pipeline), medical supply delivery, and large drone cargo delivery between remote communities efforts. In addition to providing technical and regulatory support to allow us to fly safe, pioneering missions in these three mission areas, the BEYOND program is quantifying who our stakeholders are and how we are engaging with them to best determine how to move the public and other stakeholder, such as the General Aviation community, acceptance of drones forward as drones increasingly enter the NAS. This program is a benefit to the all elements of the aviation community as it addresses the safe integration of drones flying BVLOS in the NAS using real-world operations as the use cases and quantifies the economic benefits of routine drone operations. BEYOND should be continued beyond its current expiration date of October 25, 2024.

FAA's UAS Center of Excellence (a.k.a. the Alliance for System Safety of UAS through Research Excellence – ASSURE)

The ASSURE program has been conducting quality aviation safety research that leverages the expertise of the universities and identified partners. ASSURE research efforts support a broad cross section of technical research areas for the FAA by bringing teams of subject matter experts, technologists, and researchers together to focus on key FAA-identified knowledge gaps. For example, important ASSURE research includes studies on the effects of drones impacting people

and other aircraft, the effectiveness of different detect and avoid technologies in spotting traditional aircraft and drones in the NAS, how to effectively integrate large drone cargo and urban air mobility platforms into airport infrastructure and the potential economic impacts of those technologies as they are adopted. The research products resulting from these studies are centered on improving safety and providing inputs for new guidance and regulations.

The ASSURE universities receive funding through the program, which has been a major advantage to our participation in ASSURE, but the program requires a 1:1 cost match that is difficult for many schools to meet. The ASSURE program is requesting relief from the cost match requirement to allow greater participation in the program. The program also is seeking a ten-year, no-compete extension to be able to leverage the infrastructure, national and international partnerships, and expertise developed by the ASSURE team during the current research efforts into long-term research support and success for the FAA.

Remote Identification

Remote Identification (a.k.a., Remote ID or RID) is the ability of a drone to provide identification information to other parties during flight. The Remote Identification of Unmanned Aircraft Final Rule is a new regulation (Part 89 in Title 14 of the Code of Federal Regulations) requiring all drone operators to buy a drone with standard RID equipment on it, equip their drone with a module that will broadcast an RID signal, fly at a FAA-Recognized Identification Area, or seek special authorization to operate the drone without an RID starting on September 16, 2023. Remote ID provides law enforcement and other agencies with information on the location of a drone's ground control station, and hence the location of the operator, of a drone that appears to be flying in a reckless or illegal manner. ACUASI team members are concerned about the safety of our drone operators in cases where we are flying legally, but an anti-drone person receives our Remote ID signal and intercepts our users in a hostile manner.

Counter-UAS

Unmanned aircraft systems have a tremendous potential to increase aviation safety by doing the dirty, dull, and dangerous flights that currently put pilots at risk, improve cargo delivery to remote areas, deliver packages quickly, effectively and economically, provide broadband communications to remote areas, improve maritime domain awareness, facilitate Search and Rescue, assist law enforcement, monitor infrastructure, and a host of other positive use cases. However, it has been demonstrated that drones also can be used to conduct war, disrupt airports, commerce and transportation, support terrorism, and conduct other nefarious acts. Therefore, the U.S. needs to develop, test, and implement safe counter-UAS (C-UAS) technologies that will allow the discrimination between authorized drones, unauthorized drones, and traditional aviation and allow the safe removal of rogue drones from the NAS by authorized individuals.

Counter-UAS technologies have the potential to adversely impact authorized drones, traditional aircraft, people or property on the ground, and/or safety systems in the NAS. As a result, the authority for conducting C-UAS activities has been limited to five agencies (i.e., DOD, DOE, DHS, DOJ, and the FAA) to ensure the highest levels of safety and security while protecting the public, drone operators, and others from potential collection and misuse of personally-identifiable information. The testing of C-UAS technologies, including some of the detection and tracking

systems, has been limited due to their potential violation of sections in Title 18 U.S.C. including the Pen/Trap Statute, the Wiretap Act, the Aircraft Sabotage Act, the Computer Fraud and Abuse Act, and others, and in 49 U.S.C., under Aircraft Piracy. Additionally, countermeasure technologies themselves are frequently classified due to their value to national security. Therefore, the number of companies able to test C-UAS technologies is limited and requires the participation of one of the entities listed above to access restricted airspace and deploy the countermeasures. Remote ID will increase C-UAS technology's effectiveness by providing information on the locations of all authorized drones in an area, thereby allowing security officials to separate authorized drones from unauthorized drone, but rogue drones most likely will not be broadcasting RID signals or broadcasting false signatures, so other forms of C-UAS detection, tracking, and identification are needed.

The FAA's authority has been limited to the testing of potential C-UAS systems at five airports. This is not sufficient for the FAA to understand the effects of the C-UAS systems on the range of safety systems, such as First Responder communications systems and navigational aids, deployed across the NAS, or in non-airport locations including critical infrastructure. The FAA needs to be given a wider authorization to allow it to test these systems away from airports without the need to partner with another agency, which may have a different agenda for the testing, and a duplicative approval process that slows down testing approvals. Additionally, the agencies that have full C-UAS authorities should have their authorities renewed for a longer period of time.

C-UAS researchers need be able to purchase a wide, representative variety of the types and configurations of the drones most commonly used in the NAS to effectively test the ability of C-UAS systems to detect, track, identify, and/or mitigate those drones. The tested drones need to include aircraft made by foreign manufactures on the list of banned organizations because those aircraft make up a large portion of all drones registered and flown in the U.S. The FAA and the FAA UAS Test Sites involved in current and upcoming C-UAS testing need an exemption from the ban on the purchase of those aircraft so they can support the C-UAS system testing and evaluation by providing the systems with challenges from the most common types of drones found in the NAS.

ACUASI, as a UAS Test Site, BEYOND site, ASSURE member, etc., has yet to test mitigation systems due to our not having the authority to do so. However, we have conducted DAA testing, which is very similar to the detection and tracking piece of C-UAS, and we are partnering with organizations possessing the authorities to support the research necessary to determine the safety of the systems in the NAS. We need to test these technologies in Alaska due to our extreme environmental conditions, large number of General Aviation and commercial aircraft that could be affected by a C-UAS system, and our proximity to Russia.

Right of Way Rules

ACUASI has been participating in efforts, such as the BVLOS Aviation Rulemaking Committee (ARC), to establish the right of way rules for drones, especially those operating under 400 feet above ground level (AGL), the focus of the BVLOS ARC, Integration Pilot Program, and other efforts. We believe that most of the long-distance drone flights that will be conducted in Alaska will occur at altitudes above 400 feet AGL due to improved satellite, radar, ADS-B, and other navigational and communications availability and safety of flight (e.g., terrain avoidance) if the

communications link is lost. However, our team believes that we must participate in the low-altitude operations discussion to ensure that Alaska's aviation interests are protected. As an example, many drone operators are pushing for the airspace below 400 feet AGL to be set aside for BVLOS drone operations without a DAA requirement by stating that no one flies under 400 feet AGL. Anyone who has spent any time flying around Alaska knows that many Alaskans, especially General Aviation pilots, fly under 400 feet AGL. They also know that pipelines, railroad tracks, and other infrastructure serve as navigational aids during deteriorating weather, which conflicts with some potential infrastructure shielding proposals. In the rest of the country, agriculatural aircraft (a.k.a. crop dusters) and helicopters routinely fly at these altitudes and some visual routes at high density airports are at these altitudes. Additionally, on approach to Sacramento Metropolitan Airport, I observed a crop duster fly below high-tension power lines, which would not be allowed under potential shielding proposals.

The ACUASI team believes that the current rules and regulations are a good starting point for discussing what a fully-integrated NAS should look like. There are some rules and regulations that need to be updated to allow for drone technology to enter the airspace with traditional aircraft, but in our opinion, we should keep what currently works and make minor modifications to fix what does not, not create new regulations from scratch.

As an example of a regulation that needs to be fixed is the 'see and avoid' clause of 14 C.F.R. § 91.113(b). Currently, no drone can meet the regulations for avoiding other aircraft in the airspace as written in this clause. According to the FAA, the word 'see' in 14 C.F.R. § 91.113(b) cannot be met using any method other than a human eye onboard an aircraft. The FAA's concern is that if an aircraft loses link with the ground control station, then streaming video would cease and the pilot would not be able to see any aircraft near the drone. Additionally, there can be significant time lags in streaming video that could result in an aircraft not being spotted until a collision cannot be avoided. Therefore, we recommend the following wording change to allow for the deployment of an on-aircraft system that can autonomously spot other aircraft in the air and avoid them.

> *General.* When weather conditions permit, regardless of whether an operation is conducted under instrument flight rules or visual flight rules, vigilance shall be maintained by each person operating an aircraft so as to see and avoid other aircraft. When a rule of this section gives another aircraft the right-of-way, the pilot shall give way to that aircraft and may not pass over, under, or ahead of it unless well clear.

to:

> *General.* When weather conditions permit, regardless of whether an operation is conducted under instrument flight rules or visual flight rules, vigilance shall be maintained by each person operating an aircraft so as to detect and avoid other aircraft. When a rule of this section gives another aircraft the right-of-way, the pilot shall give way to that aircraft and may not pass over, under, or ahead of it unless well clear.

This paves the way for using DAA technology onboard the drone to help the drone give way to the traditional aircraft and maintain well clear. Onboard DAA technology also could be added to traditional aircraft with designs that limit the pilot's sight to keep them from colliding with aircraft they cannot see or to all aircraft to prevent distracted pilots from flying into other aircraft as has

happened across the U.S., including several accidents in Alaska. Additionally, onboard DAA technology prevents the aircraft from violating well clear even if the link between the ground control station and the aircraft is lost, a distinct possibility in the challenging communications link conditions found in Alaska. Onboard DAA is a major stepping stone to safe, fully-integrated drone operations in Alaska. The FAA should fund significant DAA test and evaluation efforts to ensure the development of a small, light-weight DAA systems that operate in all conditions and are able to fit on a small drone without significantly decreasing the ability of that drone to carry a payload.

Some other major stepping stones to safe, fully-integrated drone operations are improved weather information, enhanced communications (e.g., satellite communications, cellular communications, etc.), and fused airspace information displays. These technologies could provide the backbone for the integration of large drone cargo and passenger transport, a.k.a. Advanced Air Mobility (AAM), with traditional aviation between remote communities in Alaska and for locations across the country. The FAA, FCC, National Weather Service, and other Federal agencies need to provide the State of Alaska and other organizations funding to allow for the build-out of the infrastructure required to implement such a system and build Alaska's future transportation system.

Workforce development

Last, but by no means least, ACUASI is working to develop the workforce needed to support the incoming drone economy. As the University of Alaska, and in conjunction with Science, Technology, Engineering, and Mathematics (STEM) providers across Alaska, ACUASI is encouraging young minds, as well as the minds of military personnel transitioning to civil life, traditional pilots looking to retire from a life in the cockpit, and all others, to consider a career in a drone-related endeavor. We are developing curricula for people to get certified in drone operations or to achieve a degree in aerospace engineering. More importantly, we also are identifying what new jobs are going to be required to support the field in the future. For example, currently the pilots who fly cargo into our remote communities unload the aircraft. In the future, we will need personnel to assist in the loading and loading of the cargo drone. We also will need drone mechanics, business owners, insurers, programmers, safety inspectors, and a host of other professionals. We will need to train scientists, real estate agents, cinemaphotographers, and teachers how to use the technology. We need payload developers and data analysts to analyze the data from novel payloads. There is an entire workforce associated with drone technology and its uses.

The potential for the drone economy to be transformative in the State of Alaska is tremendous. I am excited that this cutting-edge technology may allow residents of Alaska's remote communities, often Alaska Natives who have lived in their communities for generations, to remain in the place they love and still have a high-tech career. The kids that our team engages during outreach events in these communities may no longer have to chose between their community and fast-paced, technological jobs. They see that no matter what their interests are, they will be able to participate in the drone economy. This will help alleviate the Alaska brain drain to the continental U.S. Additionally, students from across Alaska understand the value of aviation in their lives and bring that to the drone economy. They understand aviation safety and how drones can further that endeavor. We need to make sure that students, whether traditional or non-traditional, from across the U.S. see how they can participate in this up and coming field. Funding for outreach and training is essential for developing this workforce. The impact of the STEM efforts funded by ASSURE

are a great example of how a single entity, ASSURE, can positively impact a wide variety of students including under-represented populations and show them the potential for a future in drones. This same impact can be felt in similar communities across the country. This is an inspiration model for our next generation and efforts of this type need to be funded throughout the FAA.

In summary, Alaska is the logical place for the safe testing and implementation of drones for uses of import to Alaskans and the rest of the U.S. population. We have a need for drones. We have minimal ground hazards. We have a population that understands aviation and aviation safety. And we have a program, ACUASI, that is leading the way to safe drone integration in the NAS. Thank you for your help in making our efforts come to fruition across our great country.

This ends my prepared statement and I would be happy to answer any questions you might have.

About Dr. Cahill:

Dr. Catherine (Cathy) F. Cahill is the Director of the Alaska Center for Unmanned Aircraft Systems Integration (ACUASI) and a Full Professor of Atmospheric Chemistry at the University of Alaska Fairbanks (UAF). Her educational background includes earning degrees in Applied Physics (B.S.) and Atmospheric Sciences (M.S. and Ph.D.) and researching trans-Atlantic aerosol transport during a Fulbright Fellowship to Ireland that served as her Postdoctoral experience. For many years, her research focused on the sources, transport, transformation, and impacts of atmospheric aerosols, including the effects of atmospheric aerosols on the Warfighter in Iraq and Afghanistan and the long-range transport of pollution from China into the Arctic. To understand the altitudes at which pollution crosses the Pacific Ocean, Cathy needed to make vertical measurements of aerosols in the atmosphere. In 2006, this need led her to start designing aerosol samplers for unmanned aircraft. After a 2014-2015 sabbatical to Washington D.C. in which she served as a Congressional Fellow to the U.S. Senate Committee on Energy and Natural Resources, Cathy returned to UAF and became the Director of ACUASI.