FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)
Statement of Concurrence / Non-Concurrence

Voting Member Name	Niv Russo
Voting Member Organization	Airobotics

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

1. Concur with the Final Document as written

Voting Member Signature: _____ Date: ___03/04/2022_____

2. Concur with the Final Document as written with the following exception(s): **(Fully explain the areas of exception below, providing specific page and line number. Submission of separate paper is acceptable).**

Voting Member Signature: _____ Date: _____

3. Non-Concur with the Final Document as written. Letter of Dissent must be provided.

Voting Member Signature: _____ Date: _____

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)
Statement of Concurrence / Non-Concurrence

Voting Member Name	Albert Glenn
Voting Member Organization	Organization of Black Aerospace Professionals

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

1. Concur with the Final Document as written

Voting Member Signature: _____ Date: _____

2. Concur with the Final Document as written with the following exception(s): **(Fully explain the areas of exception below, providing specific page and line number. Submission of separate paper is acceptable).**

- Target levels of safety and comparison with Light Sport Aircraft (LSA) including the reference to the safety continuum (AG 2.1);

- Operating requirements proposed to govern Remote Air Carrier and Remote Operating certificate holders (OQ 2.10-2.13);

Voting Member Signature: _____Albert Glenn _____ Date: _March 1, 2022_____

3. Non-Concur with the Final Document as written. Letter of Dissent must be provided.

Voting Member Signature: _____ Date: _____

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)

Statement of Concurrence / Non-Concurrence

Voting Member Name	Allison McKay
Voting Member Organization	WAI - Women in Aviation International

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

1. Concur with the Final Document as written

Voting Member Signature: Allison McKay Date: 3/4/2022

2. Concur with the Final Document as written with the following exception(s): **(Fully explain the areas of exception below, providing specific page and line number. Submission of separate paper is acceptable).**

Voting Member Signature: _____ Date: _____

3. Non-Concur with the Final Document as written. Letter of Dissent must be provided.

Voting Member Signature: _____ Date: _____

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)

Statement of Concurrence / Non-Concurrence

Voting Member Name	Amit Ganjoo
Voting Member Organization	ANRA Technologies

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

1. Concur with the Final Document as written

Voting Member Signature: _____ Date: March 3, 2022

2. Concur with the Final Document as written with the following exception(s): (Fully explain the areas of exception below, providing specific page and line number. Submission of separate paper is acceptable).

Voting Member Signature: _____ Date: _____

3. Non-Concur with the Final Document as written. Letter of Dissent must be provided.

Voting Member Signature: _____ Date: _____

ELECTRONIC FRONTIER FOUNDATION

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)
Statement of Concurrence / Non-Concurrence

Voting Member Name	Andrés Arrieta
Voting Member Organization	Electronic Frontier Foundation

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

Non-Concur with the Final Document as written. Letter of Dissent must be provided.

Voting Member Signature: _____ Date: 3rd March 2020

Best regards,

Andrés Arrieta
Director of Consumer Privacy Engineering
Electronic Frontier Foundation

March 3, 2022

Letter of dissent to BVLOS UAS ARC Report of February 25 2022

The Electronic Frontier Foundation cannot sign on to this report, as it did not incorporate the policy recommendations for which we advocated during the Beyond Visual Line of Sight (BVLOS) Aviation Rulemaking Committee (ARC). We summarized those recommendations along with ACLU and EPIC in a memo that we circulated to the ARC leadership and FAA staff (appended to this letter). Some of our most significant concerns can be summarized as follows:

- Privacy practices should not be voluntary. Non-binding principles offer no protection for the public nor any real incentive for operators to comply, leaving the field wide open for abuse.
- The transparency of operators' practices must be mandatory. This ARC was adamant about performance-based and data-driven proposals, so it seems counter to the FAA's mission not to require that basic information that would be necessary to understand the privacy risks be made public.
- Community engagement and control are critical. The "community response to drones" conversation was focused on noise and environmental impact, but not community concerns about privacy and intrusion. It seemed to us important to evaluate whether and to what extent there is a risk of negative community reaction to normalized and scaled BVLOS operations stemming from such concerns, and what the path will be for addressing such reactions. Insofar as the ARC considered negative community responses to drones, the solution that was endorsed was communicating with and educating the public. But that was envisioned as a one-way street; there was a studious refusal to consider whether and how communities should have control over the drones that fly above them.

815 Eddy Street, San Francisco, CA 94109 USA **phone** +1.415.436.9333 **fax** +1.415.436.9993 **email** info@eff.org **eff.org**

- There was no consideration given to negative uses of drones, and how to constrain them, other than government security agency concerns over security threats. We think that the section on "societal benefits" of drones contains many legitimate points about the possible advantages this technology might bring. But the omission of a full, balancing discussion of the technology's potential downsides (other than security threats) does not reflect our agnostic views on the extent to which drones are likely to provide benefits to the American people. We cannot join what is, essentially, a brief arguing mainly for the advantages of drones without addressing substantial issues they create for the public.

We greatly appreciate that the FAA recognized the need to include privacy advocates as well as various other community and non-aviation stakeholders in this Advisory Rulemaking Committee process. This initial effort at expanding that stakeholder representation was not entirely successful, however.

Industry representatives led the ARC, set its agenda, and dominated in numbers. Reflecting past practice, ARC leaders and participants and FAA staff consistently spoke of the ARC as a process by which "industry" provided feedback to the FAA. Some industry representatives had little interest in discussing challenging questions. Consideration of the privacy risks of drones inherently means thinking about their potential downsides, yet the ARC was dominated by and structured for drone boosters, with much conversation over how to sell the technology to the public. That was inherently in conflict with the desire of privacy advocates to consider the potential downsides of drones and their possible negative uses, and how those might be addressed.

Our participation was also hampered at times by the highly technical nature of some of the discussions. To be sure, we understood that much of the discussion would involve technical safety and other aviation questions about which our organizations hold no opinion. However, it was not always clear when a technical question had policy implications. Even where those implications seemed clear, it was often difficult to have a nuanced discussion on the issues presented and the implications of various decisions. Despite laudable efforts by FAA staff to encourage the industry and aviation community participants to "level-set" and "explain terms," such participants couldn't help but slip back into lingo, and the gap in knowledge was significant enough that it effectively excluded non-aviation participants from important discussions.

As the FAA continues to work on incorporating broad multi-stakeholder feedback on drones, which will interact with American life and communities in far more intimate ways than crewed aviation, we recommend that the agency consider convening a separate ARC or other proceeding through which to gather community, privacy, and other non-industry, non-aviation stakeholder input and perspectives, or structuring future ARCs related to the integration of drones to allow such participants to have separate conversations on questions that they themselves define. The model of creating an ARC

for “industry” input may not make sense as a mechanism for input from this more diverse set of stakeholders in the same way it may have in other ARCs.

We found the ARC a valuable way to learn more about the aviation and drone industry, and we applaud the FAA for inviting privacy groups and other stakeholders to this process. We also found that FAA staff were uniformly helpful, encouraging, and open to hearing our points of view, and we feel it gave us the opportunity to communicate our point of view to the agency even though they are not reflected in the report.

Best regards,

Andrés Arrieta
Director of Consumer Privacy Engineering
Electronic Frontier Foundation

Privacy Considerations for BVLOS Drones:

Privacy Considerations for FAA Aviation Rulemaking Committee on Beyond Visual Line of Sight Drone Flights

Arrieta Andrés, Scott Jeramie, Stanley Jay

Authors: Arrieta Andrés, Scott Jeramie, Stanley Jay

A publication of the American Civil Liberties Union, Electronic Frontier Foundation, and Electronic Privacy Information Center, 2021.

December 2021

Introduction

Our organizations recognize the many potential positive uses to which Beyond Visual Line Of Sight ("BVLOS") drone flights could be put. But it is also our job to consider some of the implications that a regime of routine and scaled BVLOS flights could have for privacy and surveillance, how such a regime could harm Americans' privacy, and what the pathway is for ensuring that we can maximize the benefits of this technology while minimizing the harms.

Why addressing privacy is important

Drones are very powerful surveillance platforms that greatly increase the ease and possibility of aerial surveillance. As drone technologies advance, drones will be able to fly longer and farther, carry heavier and more diverse payloads of surveillance equipment, and become even more capable of autonomous operation—all at an increasingly cheaper price point. The operational flexibility of duration, distance, and altitude makes it harder for people on the ground to detect and understand what is happening with a particular surveillance drone.

Drones can carry numerous surveillance technologies

Most drones by default are equipped with cameras that can record images or take pictures. These cameras can be quite powerful. Even consumer drones can come equipped with cameras with the ability to shoot in 4K, and military drones carry gigapixel cameras that can photograph city-sized areas.

Cameras are not the only technology that can be added to drones, of course. Drones are a platform, and the only limits on what they can carry are size and weight. Among the sensors that can be attached to drones are microphones, heat and movement sensors, mobile phone interception devices (aka IMSI catchers), GPS, radar, Lidar, sonar, range-finders, magnetic-field change sensing, radio frequency sensors, and chemical and biochemical sensors. Data from drone surveillance can be combined with other surveillance technologies such as facial recognition and license plate readers or correlated with data from surveillance technology on the ground or online to identify people and vehicles, track their movements across time and space, or analyze their associations or habits. The lack of rules concerning drones and the technology they can carry means there will be vast opportunities for surreptitious data collection from the public.

Drones increase the risk of aerial surveillance

The lack of legal protections against aerial surveillance combined with the lowered bar for entry that drones create for aerial surveillance, raises the risk of privacy invasions. The law of aerial surveillance of public spaces is murky at best and is not well enough developed to protect the public in the face of the broad availability of drones.

Drones make it cheaper and easier to conduct aerial surveillance. Drones are generally orders of magnitude cheaper than other aircraft capable of conducting aerial surveillance (i.e. airplanes and helicopters). Drones are much cheaper to maintain and don't require the same level of training to operate as do crewed aircraft making the cost of the "pilot" much cheaper. Drones are increasingly equipped with technology to steady their flight, hover in one place, and avoid crashing into objects. Many consumer drones can track specific objects on the ground or can be programmed to fly a specific flight path.

Additionally, advancing drone technology will allow for semi-autonomous or even completely autonomous drone operations, removing the need for a pilot at all. This allows a single person to oversee multiple drone flights at once—making it even easier and cheaper to operate a drone. Autonomous BVLOS drone operations, in particular, will enable widespread drone surveillance in ways that manual line of sight drone operations could not.

Protecting the public's expectation of privacy

Members of the public are not in a position to know if their privacy is being compromised by drone surveillance, and even if they were they would have no recourse. How is someone currently supposed to know if they or their community is subject to drone surveillance? Drones can be hard to detect, flying high enough to make spotting them visually or hearing them above ground noise next to impossible.

Even if someone does become aware that a drone is nearby, there is currently no practical way to know what surveillance capabilities it possesses or if it is actively collecting information. There is no consistent and clear way to know if the drone is a government, commercial, or private drone or what its purpose is. When it comes to protecting privacy from drone surveillance, the public is largely at the mercy of drone operators.

Protecting the public's expectation of privacy from drone surveillance and preventing privacy violations will facilitate acceptance of drones in the National Airspace. The public is wary of drones[1] and will only become more so when BVLOS drone operations

1 DACUS, Drones and Drone Operations – Citizen's Perspective: Representative population survey on the acceptance of drones and the social impact of drone operations in urban areas (2021), https://dacus-research.eu/wp-content/uploads/2021/08/D5.1-Social-Acceptance-Survey-Results.pdf; Terance D. Miethe, Ph.D. et al., UNLV Center for Crime and Justice Policy, Public Attitudes about Aerial Drone Activities: Results of a National

start occurring in populated areas. And too often, a disproportionate amount of the negative impact of new technologies falls on the most vulnerable and marginalized communities[2]. Without privacy protections in place, drone incidents violating people's privacy will taint the whole industry. A few bad actors could seriously hamper integration of drones into the airspace, especially for BVLOS flights. Protecting everyone's privacy, but particularly that of vulnerable and marginalized communities, will speed up acceptance and integration of drones.

Categories of privacy invasion

Given the vast range of creative uses to which a generative technology such as BVLOS drones could be put, it is impossible to anticipate all the ways that the technology might be used to violate privacy. Some potential concerns, however, fit into the following categories:

Individual privacy-invading operators

BVLOS operations may eventually become relatively common, widespread, and democratized, as the barriers to entry continue to fall. If the FAA achieves its goal of allowing by-rule BVLOS flights[3], and such a general rule doesn't include privacy protections, we are likely to see BVLOS drones used for aerial reconnaissance in privacy-offensive ways. For example, drones might be used to follow other people for extended periods of time and/or across extended distances. People might follow the car of a celebrity, their ex-wife's new boyfriend, a driver that one is angry at, or an attractive person as they complete their jog.

Corporate privacy invasions

If BVLOS flights are permitted by any operator complying with a rule, numerous uses of such flights will emerge that have significant privacy implications. In today's world, data is worth money, so there will be constant market incentives to maximize privacy-invasive aerial data collection practices.

Possible privacy-invasive uses of BVLOS drones include:

- Collecting data on traffic or pedestrian patterns across a town or city, both aggregated and individually targeted.
- Measuring home occupancy rates by surveying which houses are lit up or heated in the visual or infrared spectrum, and when and to what degree, or by

Survey (July 2014), https://www.unlv.edu/sites/default/files/page_files/27/PublicAttitudesAboutAerialDroneActivities.pdf;Paul Hitlin, 8% of Americans Say They Own a Drone, While More Than Half Have Seen One in Operation, Pew Research Center (December 19, 2017), https://www.pewresearch.org/fact-tank/2017/12/19/8-of-americans-say-they-own-a-drone-while-more-than-half-have-seen-one-in-operation/.

2 Nathan Sheard & Adam Schwartz, Community Control of Police Spy Tech, Electronic Frontier Foundation (May 19, 2021), https://www.eff.org/deeplinks/2021/05/community-control-police-spy-tech.

3 Currently, anyone wanting to fly BVLOS has to apply for special, individualized FAA permission. By-rule flights would allow any party to carry out a BVLOS flight as long as they comply with the rules.

measuring the amount and type of vehicles parked outside at different times and days.
- Following randomly selected customers home from a store or restaurant to get a sense of where their customer base is coming from.
- Collecting information about homes and their owners for marketing purposes, such as who owns a backyard grill, who has a neat garden and who doesn't, or who could use some roof repairs.
- Intercepting cell phone signals using IMSI catchers (aka "Stingrays") to collect location data or other information that can be associated with specific people through the unique identifiers of cellphones.
- Collecting WiFi identifiers to correlate online profiles to individuals' physical locations.

There could also emerge many other privacy-invasive uses yet to be conceived of. The companies that are operating the most flights with the most time in the air might be in an especially good position to collect data that, because of its greater comprehensiveness, would be all the more valuable.

While effective transparency measures could create reputational and market pressures against such data collection, much surveillance is silent and invisible. If a company engaged in delivery operations, for example, decided to use those delivery flights to collect information on people along flight paths, those people might never know.

Mass surveillance

These kinds of privacy-sensitive commercial uses could be pushed to extremes if companies or services emerge that use rotating parallel flights to create 24/7 wide-area surveillance of cities and towns. Such a wide-area surveillance service is already being pitched to police departments (none of which have adopted it, partially due to community opposition as well as a successful ACLU constitutional challenge[4]). But similar services could establish private markets for such surveillance, for example by selling to insurance companies, real estate firms, and others.

Law enforcement

Law enforcement uses of drones raise many issues, including routine surveillance and tracking; the retention and sharing of imagery, including incidentally collected imagery; discriminatory deployments; the potential for abuse; and use in automated

4 Saira Hussain & Hannah Zhao, Victory! Fourth Circuit Rules Baltimore's Warrantless Aerial Surveillance Program Unconstitutional, EFF (July 2, 2021), https://www.eff.org/deeplinks/2021/07/victory-fourth-circuit-rules-baltimores-warrantless-aerial-surveillance-program.

enforcement. The ACLU[5], EFF[6], and EPIC[7] have all made recommendations for checks and balances on law enforcement's use of drones.

Unwanted intrusions

Even in the absence of unwanted collection of personal information or the like, many people will resent the presence of video cameras hovering in the air over their heads, especially around their homes. Whether a drone has a camera or other potentially intrusive sensors on board may not matter; it is a well-established principle of privacy that people are just as affected by the possibility[8] that they are being watched as they are by actually being watched. This kind of privacy invasion involves a diffuse set of feelings that combines the dislike of being watched, intrusion upon seclusion, spoliation of environment, intimidation, nuisance, and noise. We strongly suspect that the frequent incidences of "drone rage" that have been experienced in the drone community reflect this cluster of feelings.

To the extent the kinds of invasions take place, that will only intensify this set of negative feelings towards drones.

There is a strong possibility that routine and scaled BVLOS operations, especially package delivery, will increase the public's exposure to drone operations over time. Today's relatively rare line-of-sight operations will become tomorrow's daily or even hourly BVLOS operations over or near people's homes, especially if they find themselves situated in a flight pattern or chokepoint. It's possible that drones will initially be welcomed as a novelty but will quickly wear out their welcome.

The FAA's role in addressing privacy risks

From the beginning, FAA recognized the importance of addressing privacy to facilitate the integration of drones into the National Airspace. Soon after the FAA Modernization Act of 2012 was passed, then Representatives Ed Markey and Joe Barton, the Co-Chairmen of the Bi-Partisan Privacy Caucus, sent a letter to the Acting FAA Administrator, Michael Huerta, to "express our concerns about the [FAA Modernization Act's] potential privacy implications and to request information about how the FAA is addressing these important matters."[9] Markey and Barton stated:

5 Jay Stanley & Catherine Crump, Protecting Privacy from Aerial Surveillance: Recommendations for Government Use of Drone Aircraft, ACLU (Dec. 2011), https://www.aclu.org/sites/default/files/field_document/protectingprivacyfromaerialsurveillance.pdf.

6 Letter from Jennifer Lynch, EFF Staff Attorney, to Lieutenant Governor Mead Treadwell & Mr. Robert Davis (May 31, 2013), https://www.eff.org/files/eff_asa_model_drone_legislation_letter.pdf.

7 Use of Unmanned Aerial Vehicles (Drones): Hearing Before the Majority Policy Comm. of the Penn. State Senate (Mar. 15, 2016), (statement of Jeramie D. Scott, EPIC Director of Domestic Surveillance Project), https://epic.org/privacy/drones/EPIC-Drone-Testimony-20160315.pdf.

8 Karen Gullo, Surveillance Chills Speech—As New Studies Show—And Free Association Suffers (May 19, 2016), https://www.eff.org/deeplinks/2016/05/when-surveillance-chills-speech-new-studies-show-our-rights-free-association.

9 Letter from S. Markey & Rep. Barton, to Michael P. Huerta, Fed. Aviation Acting Admin. (Apr. 19, 2012), https://irp.fas.org/congress/2012_cr/drones041912.pdf.

> "Now that the FAA has initiated the rulemaking process for implementing the FAA Modernization and Reform Act, the agency has the opportunity and responsibility to ensure that the privacy of individuals is protected and that the public is fully informed about who is using drones in public airspace and why.[10]"

The FAA responded by stating that "[t]he FAA recognizes that there are privacy concerns related to UAS operations, and the agency will review these concerns in the context of the ongoing UAS rulemaking activities and integration plans."[11]

The FAA's Comprehensive Plan and Roadmaps for drone integration have repeatedly recognized privacy as a key issue. In the Comprehensive Plan to guide the integration of drones required by the 2012 act, the FAA stated that "[m]embers of the NextGen SPC [Senior Policy Committee] agree on the need to address privacy concerns of the public at large while safely integrating UAS in the NAS."[12] All subsequent versions of the Roadmap also speak to the importance of addressing privacy with the most recent one stating:

> "The public has real concerns regarding UAS operations with respect to safety and privacy. If people don't feel safe when drones are operating around them, or they have persistent fears of drones intruding in their private lives, then UAS commercial opportunities will be very limited."[13]

As the FAA has made clear, the public acceptance of drones is required for the integration of drones into the national airspace, and the public will not accept drones if privacy is not addressed. As the agency overseeing the integration of drones, the FAA must make sure that there is a pathway for addressing ongoing privacy risks and new ones as they emerge.

Considerations in addressing privacy risks

Community response to drones

One of our biggest concerns is that an FAA BVLOS regulation will leave no room for addressing privacy problems that emerge with the technology. The FAA must not preempt localities from restricting BVLOS flights to address privacy invasions, whether or not the FAA decides to protect privacy in a rulemaking opening the skies to by-rule operations.

The truth is that we don't know to what extent communities will want or accept regular or frequent drone flights, or where, or under what conditions. That will depend on a

10 *Id.*

11 Letter from Fed. Aviation Acting Admin., Michael P. Huerta, to S. Markey (Sept. 21, 2012).

12 JOINT PLAN. & DEV. OFF., UNMANNED AIRCRAFT SYSTEMS (UAS) COMPREHENSIVE PLAN (Sept. 2013), 7, https://www.faa.gov/about/office_org/headquarters_offices/agi/reports/media/UAS_Comprehensive_Plan.

13 Fed. Aviation Admin., Integration of Civil Unmanned Aircraft Systems (UAS) in the National Airspace System (NAS) Roadmap (3rd ed. 2020) at 21, https://www.faa.gov/uas/resources/policy_library/media/2019_UAS_Civil_Integration_Roadmap_third_edition.pdf

complex and unpredictable set of often contradictory factors, ranging from whether the technology's benefits are broad and substantial or narrow and overblown, to people's feelings about the technology's safety, to their feelings about the full range of possible privacy invasions discussed above.

From its perch in Washington DC, the FAA should not try to anticipate what all of those privacy problems will be in the coming years and decades, and how all communities will feel about them, and what kinds of restrictions or regulations are needed to solve the conflicts to the satisfaction of all kinds of American communities. It should not treat drones like crewed aviation, and impose a uniform set of drone rules across the entire country that preempts all state and local rules and thereby grant anyone a by-rule right to fly over communities.

With drones flying under 400 feet, a single nationwide rule is not likely to work in the way it does for crewed aviation. Crewed flights are generally too high to trouble most people. Noisy and camera-carrying robots flying in and through Americans' communities will be a whole new ballgame. The issues and controversies that have surrounded aircraft noise around some airports may emerge in every small neighborhood, albeit driven by more than noise. When residents feel there is too much wheeled vehicle traffic or traffic noise at their home, they can call up members of their city council and push to lower the speed limit, or install speed bumps, or make the street one-way. When the equivalent neighborhood complaints arise over drone flights, people should not have to call up the federal government. That is a recipe for political disaster, both for the FAA and for those who wish to see drones succeed at the things they may be well-suited to do.

Most Americans don't give much thought to drones. Most of those who are thinking about the technology today are excited about and invested in them, either emotionally or financially. But we don't want to see drones imposed on unwilling communities in disruptive and inequitable ways as Robert Moses[14] did with highways, acting out of a misguided modernist vision of what "the future" looks like, or on behalf of companies that stand to profit despite community desires and the public interest.

A better path is to allow communities to restrict drone flights in their jurisdictions (subject to limitations imposed by the First Amendment, as discussed below). This will allow accommodations between the various competing equities in drone deployment (privacy, noise, commerce, convenience, environment, etc.) to emerge organically as diverse communities react in different ways to the technology. If the technology proves practical, useful, and popular, then communities that are overly restrictive will quickly come to feel that they're missing out. If, as a practical matter, drones just don't work out for many of the uses now envisioned, or their downsides are starker than boosters hope, then they will recede into the niches where their advantages are greatest and downsides the smallest without degrading the quality of life of American communities.

The privacy problems and conflicts drones are likely to spark are diverse and unpredictable. While nationwide rules make sense in many areas such as safety and

14 Wikipedia, Robert Moses (Last modified Nov. 14, 2021), https://en.wikipedia.org/wiki/Robert_Moses.

transparency, reasonable community control is not only the best way to honor the concept of democratic control over our quality of life, but also the best way to address privacy and other problems that emerge, while avoiding over-regulating to protect against privacy harms that never materialize.

First Amendment considerations

The potential for drone photography as a tool for art, journalism, and activism is significant. The First Amendment generally protects the gathering of news and other information of importance to the public, and specifically protects photography as a means of expression and as a way of gathering information. In general, a person in a public place where they have a right to be may make photographs of anything that is in plain sight. But the First Amendment does not necessarily create a right to operate a BVLOS drone, or to operate one wherever one wants, just because BVLOS drones can be used to make photos.

One thing the First Amendment generally does not permit is for the government to restrict drone flights according to the identity of the photographer or the subject of their photography. It also bars government actors from blocking drone photography of their activities just because it is politically inconvenient or embarrassing. Nor does it allow wide-ranging bans on photography of "critical infrastructure."[15] It may allow bans on drone flights near certain critical infrastructure for safety purposes (though there will be a constant temptation, which some will inevitably give in to, to use safety as a pretext for enacting such bans).

Remote ID

The remote ID requirement is one of the best opportunities for the FAA to implement privacy-related rules that will facilitate the public's acceptance of drones. A key aspect of addressing privacy concerns is to make sure people have the means to know when drones are flying in their proximity and who is flying them. Identification is important because accountability is very hard without it.

Remote ID can also facilitate much-needed transparency. Remote ID is the avenue by which the public can learn about not only what drones are flying near them, but additional information including the surveillance capabilities of the drone, the purpose of the drone, and the information the drone might be collecting.[16]

For the Remote ID requirement to mitigate the privacy risks of drones, the requirement must be usable and useful to the public. It should not be complicated for members of the

15 Ari Rosmarin, Drone Rules Are Already Colliding With The First Amendment, ACLU (July 16, 2015), https://www.aclu.org/blog/privacy-technology/surveillance-technologies/drone-rules-are-already-colliding-first-amendment

16 EPIC et al., Comments on the Noticed of Proposed Rulemaking: Remote Identification of Unmanned Aircraft Systems, Federal Aviation Admin. Docket No. FAA-2019-1100 (Mar. 2, 2020), https://epic.org/wp-content/uploads/apa/comments/EPIC-et-al-Comments-FAA-Remote-Drone-ID-March2020.pdf.

public to identify nearby drones — it should be as simple as downloading a free app to one's phone and opening it up. And the Remote ID's range should be robust enough to give meaningful information about the number of drones in the area at a given time. Generally speaking, if the average drone is within range to collect information about a person or their immediate surroundings, then the Remote ID should have an equivalent range.

The Remote ID should directly or through an easily accessible database provide information about the drone's capabilities, purpose, and operation. This should include the type of surveillance technology on the drones and the purpose of the flight (e.g. package delivery). Drones should be identified as government, commercial, or non-commercial private. For government and commercial drones, the agency or company operating the drone should be made available. Additionally, Remote ID should allow easy access to details about the drone's operation, including what data the drone is collecting, what the data will be used for, and how long the data will be retained.

Network Remote ID, however, which would require every drone to have cellular capability and connect to the Internet to report its location in real time, does not strike the right balance between security, the privacy of those on the ground, and the privacy of drone operators. It would create a nationwide "bird's eye view" of every drone that flies, and under some proposals would give not only law enforcement exclusive access to that data, but also certain private-sector service providers. That would give those companies access to vast amounts of drone-flight data that they could use in unfair ways. For example, it might allow them to secretly gather data about consumer or commercial use of drones that would not be available to others, or to monitor drones that are being flown by a union with which the company is currently battling.

Recommendations

Requirements the FAA should implement

Transparency requirements

Transparency is a fundamental element of acceptance of drone BVLOS operations by the public. It allows the public and agencies to hold operators accountable and is a crucial means by which the public can exercise its rights.

When operating an aircraft, the operator should understand the risks that such operation imposes to the National Airspace System as well as to those on the ground—whether safety impact, noise, or environmental. By the same token, operators should also assess the impact of their operations on the public's privacy. Privacy impact assessments are a routine requirement for many government information collection processes, and increasingly for some companies as well. We would like to see a similar requirement imposed on government and commercial BVLOS operations in the national

air space. These reports should be easily and freely available to the public, and should include details such as:

- Type and Purpose of the drone operation. The operator should detail the purpose of its operation, so the public can understand its nature and also hold them accountable for mission creep, or covert-deceitful uses.
- Technical Capabilities. This should include not only the operational capabilities of the aircraft (distance, time, altitude, payload weight, etc.) but also the sensors on board, their capabilities, and the data collection they will be engaging in. For example, if the drone carries cameras, this data would include the power of any zoom lens and how that zoom is controlled (automated processes or remote operator), the camera's resolution, the camera's spectral range, and any live AI or analytics capabilities that it uses.
- Data collected. Detail of data collection that will occur during the operation. For example, if video will be collected, this would include information on when that video will be collected.
- How that data is used. The intended use of the data, for example, for navigational purposes, detection and avoidance of obstacles, infrastructure inspection, etc.
- Data disclosure. Who, other than the operator, can access the data, or with whom will it be proactively shared, and for what purpose.
- A privacy impact assessment. An assessment of how the operation, with the sensors, data collection, and sharing that it involves, will affect the communities over which this operation will take place, and what mitigations are in place to address these issues.

Community involvement requirements

- The FAA should allow localities to set their own rules in order to protect privacy or other values and to encourage local innovation.
- The FAA should ensure that there is enough transparency regarding drone flights that communities can make informed decisions about what kinds of operations they want to permit.
- The FAA should create ongoing mechanisms for individuals to raise concerns with the FAA, submit complaints, or report privacy invasions that they have experienced from drone operations (as well as noise and safety problems).

Remote ID requirements

The FAA must implement a program of Remote ID that empowers people on the ground to obtain key information about BVLOS drones in their vicinity. It should not implement a system for centrally tracking all drone flights across the nation.

Additional requests

- Minimization requirements. Congress must require government and commercial BVLOS operators to minimize the data collected, used, and shared to what's relevant and necessary to the operation described in their public statements. For

example, if a BVLOS drone is doing delivery, no data can be collected that is not strictly necessary to achieve that purpose, and video and image data collected for that purpose cannot be retained or used for other purposes like mapping services. Where appropriate this mandate should also include use of technical means of minimizing data collection. For example, a drone conducting a safety assessment of a railroad could electronically block out the portion of the video that includes the backyards of neighboring homes

- Additional stakeholder processes. We applaud the FAA for recognizing the need to expand the scope of the stakeholders participating in the Advisory Rulemaking Committee process, and for inviting privacy advocates to contribute their views in this Aviation Rulemaking Committee. It was often difficult for non-aviation stakeholders to participate in the process however, and we recommend that the agency consider convening a separate ARC or other proceeding through which to gather community, privacy, and other non-industry, non-aviation stakeholder input and perspectives. Future ARCs on the ongoing integration of drones into the national air space might also be structured to allow such perspectives to have separate conversations on questions that they themselves define.

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)
Statement of Concurrence / Non-Concurrence

Voting Member Name	Avonne Bell
Voting Member Organization	CTIA

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

1. Concur with the Final Document as written

Voting Member Signature: _____ Date: _____

2. Concur with the Final Document as written with the following exception(s): **(Fully explain the areas of exception below, providing specific page and line number. Submission of separate paper is acceptable).**

CTIA thanks the FAA for the opportunity to participate in this multistakeholder effort. We congratulate the team for effective management of the process and the ability get to a baseline of consensus report in a timely manner. As the FAA begins to work on implementing the BVLOS recommendations into new policy, we also encourage the FAA to also continue its efforts towards developing a UTM system and use of networked communications to support drones.

Voting Member Signature: Avonne Bell Date: 3/3/2022

3. Non-Concur with the Final Document as written. Letter of Dissent must be provided.

Voting Member Signature: _____ Date: _____

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)

Statement of Concurrence / Non-Concurrence

Voting Member Name	Bob Brock
Voting Member Organization	American Association of State Highway and Transportation Officials (AASHTO)

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

1. Concur with the Final Document as written

Voting Member Signature: _____ Date: _____

2. Concur with the Final Document as written with the following exception(s): (Fully explain the areas of exception below, providing specific page and line number. Submission of separate paper is acceptable).

The FAA is to be commended for including a broad and diverse group of stakeholders in this important conversation. The designated federal officer and corporate co-chairs led this group in a manner that was inclusive yet inspired meaningful and productive debate. In fact, the communication within this ARC was so effective as to illuminate more issues than this group had time to fully address. Page 9, lines 264-267 state the ARC considered insights gained from IPP, PSP, BEYOND and other pilot programs. The ARC produced a great deal of valuable insight on issues that could be brought to more definite closure given additional time and structured opportunity. Page 25, lines 768-774 reference a single standard of "acceptable level of risk" as appropriate to support all types of BVLOS operations. This "one-helmet-for-all-sports" approach reduces the positive economic impact that could be available to transportation officials who wish to increase safety using emerging technologies that are geographically-relevant for infrastructure inspection.

Voting Member Signature: _____ Date: MAR 3, 2022

3. Non-Concur with the Final Document as written. Letter of Dissent must be provided.

Voting Member Signature: _____ Date: _____

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)
Statement of Concurrence / Non-Concurrence

Voting Member Name	Brian Wynne
Voting Member Organization	Association for Uncrewed Vehicle Systems International (AUVSI)

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

1. Concur with the Final Document as written

Voting Member Signature: _____ Date: ____3 March 2022_____

2. Concur with the Final Document as written with the following exception(s): **(Fully explain the areas of exception below, providing specific page and line number. Submission of separate paper is acceptable).**

Voting Member Signature: _____ Date: _____

3. Non-Concur with the Final Document as written. Letter of Dissent must be provided.

Voting Member Signature: _____ Date: _____

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)
Statement of Concurrence / Non-Concurrence

Voting Member Name	Catherine F. Cahill
Voting Member Organization	Alaska Center for Unmanned Aircraft Systems Integration, University of Alaska Fairbanks

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

1. Concur with the Final Document as written

Voting Member Signature: Catherine F. Cahill **Date: 2/28/22**

2. Concur with the Final Document as written with the following exception(s): (Fully explain the areas of exception below, providing specific page and line number. Submission of separate paper is acceptable).

Voting Member Signature: _____ Date: _____

3. Non-Concur with the Final Document as written. Letter of Dissent must be provided.

Voting Member Signature: _____ Date: _____

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)
Statement of Concurrence / Non-Concurrence

Voting Member Name	Chad Lipsky
Voting Member Organization	Latino Pilots Association

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

1. Concur with the Final Document as written

Voting Member Signature: _____*Chad Lipsky*/bmw_____ Date: __3/8/22_____

2. Concur with the Final Document as written with the following exception(s): **(Fully explain the areas of exception below, providing specific page and line number. Submission of separate paper is acceptable).**

Voting Member Signature: _____ Date: _____

3. Non-Concur with the Final Document as written. Letter of Dissent must be provided.

Voting Member Signature: _____ Date: _____

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)

Statement of Concurrence / Non-Concurrence

Voting Member Name	Chaim Kaltgrad
Voting Member Organization	AeroVironment

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

1. Concur with the Final Document as written

Voting Member Signature: Chaim Kaltgrad Date: 03-06-22

2. Concur with the Final Document as written with the following exception(s): **(Fully explain the areas of exception below, providing specific page and line number. Submission of separate paper is acceptable).**

Voting Member Signature: _____ Date: _____

3. Non-Concur with the Final Document as written. Letter of Dissent must be provided.

Voting Member Signature: _____ Date: _____

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)
Statement of Concurrence / Non-Concurrence

Voting Member Name	Charles D. Tobin
Voting Member Organization	News Media Coalition

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

1. Concur with the Final Document as written

Voting Member Signature: _____ Date: _____

2. Concur with the Final Document as written with the following exception(s): **(Fully explain the areas of exception below, providing specific page and line number. Submission of separate paper is acceptable).**

Please see the attached Letter

Voting Member Signature: _____ Date: 3/3/2022

3. Non-Concur with the Final Document as written. Letter of Dissent must be provided.

Voting Member Signature: _____ Date: _____

Ballard Spahr LLP

1909 K Street, NW
12th Floor
Washington, DC 20006-1157
TEL 202.661.2200
FAX 202.661.2299
www.ballardspahr.com

Charles D. Tobin
Tel: 202.661.2218
Fax: 202.661.2299
tobinc@ballardspahr.com

March 3, 2022

Federal Aviation Administration
BVLOS Aviation Rulemaking Committee

Re: The News Media Coalition's Statement of Concurrence with One Exception Regarding the UAS BVLOS Aviation Rulemaking Committee Final Report

Introduction

The News Media Coalition ("Coalition"), consisting of news media organizations with significant interest in the development of drone law and policy in the United States, submits these comments on behalf of news executives, journalists, viewers, readers, and social media users regarding the Unmanned Aircraft Systems Beyond Visual Line of Sight Aviation Rulemaking Committee's Final Report ("Final Report").

The Coalition appreciates the opportunity to participate in the FAA ARC process. The Coalition concurs in the Final Report, with the exception of one phrase. We do not agree with the language of the Final Report that recites that there was "general consensus that further consideration should be given to statutory privacy protections." Final Report, 60:1934-35. The Coalition's concerns with this language are three-fold: (1) there was not, in fact, "consensus" on this issue among the stakeholders participating in the ARC, (2) the Coalition does not believe that the BVLOS rulemaking process gives rise to an occasion for Congress to create new "statutory privacy protections", and (3) the FAA has already determined, appropriately, that its mission does not include the development of new privacy laws or regulations.

The News Media Coalition[1] consists of:

- The nation's leading television and cable networks;
- The leading national newspapers;
- More than 479 television stations serving local U.S. markets;

[1] The members of the Coalition are listed on page 10.

- More than 545 regional and local U.S. newspapers;
- More than 35 U.S. radio stations;
- More than 570 local market websites;
- Content providers for hundreds of online and mobile platforms and devices;
- The leading wire services in the U.S. and abroad;
- The largest stock film and photo agencies worldwide;
- The leading professional association of visual journalists;
- The country's premier trade association representing independent photographers; and
- The leading membership association for content providers in all media, supported by more than 115 media members and 200 law firms worldwide.

The companies that make up the Coalition represent a wide cross-section of the news professionals who provide Americans each day with the news they need. They also represent one of the sectors of the economy that is most engaged with the development of sound regulations and best practices governing Unmanned Aircraft Systems ("UAS" or "drones"). While the member companies compete in markets across the country, they have come together in the unified belief that preserving the right to gather news, including by drones, is not a competitive issue but one of universal, and great, importance.

For the past several years, the Coalition has worked cooperatively with the federal government toward the development of statutes, regulations, industry training, and professional best practices for the safe gathering of news by drones. At the same time, the Coalition has strongly encouraged the maintenance of the existing legal framework for privacy protection, especially as it concerns the ability to gather news and information for the public benefit. As part of those efforts, the Coalition actively participated in the rulemaking process that led to the June 2016 implementation of 14 C.F.R. Part 107. In addition, the Coalition has engaged in efforts to integrate the use of drones by journalists into the national airspace system ("NAS"), including:

- Partnering with Virginia Tech through the Mid-Atlantic Aviation Partnership, one of six FAA-designated test sites, to collect data and evaluate the safe use of UAS by journalists for newsgathering (2015);
- Submitting public comments in response to the FAA's NPRM on the "Operation and Certification of Small Unmanned Aircraft Systems" (April 2015);
- Serving as an appointed member on the FAA Micro Unmanned Aircraft Systems Aviation Rulemaking Committee (April 2016);
- Participating in the National Telecommunications and Information Administration (NTIA) multi-stakeholder process on drone privacy, which

culminated in a set of sensible, voluntary "best practices" that exempted First Amendment protected newsgathering (May 2016);
- Submitting public comments to the Federal Trade Commission Fall Seminar Series on Emerging Consumer Technology Issues: Drones (October 2016);
- Participating in the FAA Unmanned Aircraft Safety Team;
- Submitting public comments in response to the FAA's NPRM on the "Operation of Small Unmanned Aircraft Systems Over People" (April 2019);
- Submitting public comments in response to the FAA's NPRM on the "Safe and Secure Operations of Small Unmanned Aircraft Systems" (April 2019); and
- Submitting public comments in response to the FAA's NPRM on the "Remote Identification of Unmanned Aircraft Systems" (March 2020)

In addition, the Coalition served as an appointed member of the FAA's UAS Identification and Tracking Aviation Rulemaking Committee ("UAS-ID ARC"). The UAS-ID ARC included members from federal, state and local governments, law enforcement, drone manufacturers, drone software developers, and drone operators, including journalists. The Coalition provided input on the development of the FAA rulemaking to establish a drone remote identification standard that ensures safety and security of the NAS, while protecting journalists' First Amendment right to newsgathering. In September 2017, at the conclusion of the UAS-ID ARC, the Coalition filed a dissent to the ARC's final report insisting on greater First Amendment protections and less burdensome notification and recordkeeping requirements.[2]

Overview of the Coalition's Comments

The Coalition disagrees that there was "general consensus" among ARC membership that the FAA should consider statutory privacy protections, and for the reasons outlined below, the Coalition firmly believes that the current legal and statutory environment appropriately balances the privacy interests of individuals against the First Amendment rights of journalists to gather and disseminate news. The FAA's proposed rulemaking should, rather than propose a new privacy statutory regime, continue to foster an increasingly flexible regulatory framework for the safe use of drones that encourages innovation, fosters informative journalism, and respects the First Amendment, and it should avoid unnecessarily increasing burdens or costs on journalists who rely on UAS to gather and report the news in the name of protecting the privacy of the public.

[2] *See* Dissent of the News Media Coalition to ARC Recommendations and Final Report to FAA Administrator Michael Huerta (Sept. 30, 2017).

The opportunities that drones afford are many. As predicted by both the government and the private sector, the FAA's Part 107 regulation has fostered rapid, significant innovation and growth in commercial and private unmanned aircraft systems. Drones today are powerful tools for safe and effective newsgathering, and they provide enormous public benefits. The Coalition appreciates the efforts of the FAA to create a regulatory framework that balances the First Amendment rights of journalists and the public with the need for safety and security.

Whether UAS are performing search and rescue missions, gathering news and enhancing the public's access to information, allowing farmers to be more efficient and environmentally friendly, inspecting power lines and cell towers, performing aerial photography to real estate and insurance service providers, surveying and mapping areas for public policy, delivering medicine to rural locations, providing wireless internet, enhancing construction site safety, or more – society is only just beginning to realize the full potential of UAS.

The Coalition, however, is concerned that any attempt to create a federal statutory privacy framework for the operation of UAS would unavoidably, and impermissibly, constitute government surveillance of a journalist's drone operations in violation of the First Amendment. Allowing any more robust tracking of drones by law enforcement or the public than that currently contemplated by the FAA's Remote Identification rules could compromise journalistic independence and access, and increase the risk of harassment of news outlets and journalists on the ground.

Society is only just beginning to realize the full potential of UAS, and the use of drones for newsgathering is no different. We are seeing, time and again, how drones can be utilized to shed light on newsworthy events in a way, and on a scale, not previously thought possible. News organizations and individual journalists now use drones to cover natural disasters – from hurricanes, to volcanic eruptions, to wildfires – providing the world with access and perspectives that previously seemed prohibitively expensive or simply unavailable. These news stories not only serve journalists' audiences, but also fill a critical role in the emergency response system, allowing local law enforcement entities to enlist the help of journalists to provide vital, timely information to ensure public safety during crises.[3]

[3] In fact, in 2018, President Trump signed an omnibus spending bill that expanded the definition of "essential service providers" to include radio and television broadcasters in recognition of the critical role that journalists provide to the public during crises. As a result, broadcasters, cable and satellite providers are among those entities that have priority access to funding and resources through the Federal Emergency Management Agency during natural disasters in order to restore their services. *See* 42 U.S.C. § 5189e(a)(1)(A)(i); Davina

News organizations and journalists are dedicated to the safe and secure operation of drones, and they are demonstrating the many ways that drones can serve the public interest. In the years to come, they will no doubt devise innovative uses for drones that will result in even more impactful news reporting by informing the public, saving lives, and sharing important news. An increasingly flexible regulatory framework can both enhance the safety and security of drones while encouraging innovative and important journalism. The FAA must ensure that its rules do not impede innovation and that its rules continue to respect the protections of the First Amendment.

Privacy Concerns of Individuals and Communities are Already Protected by the Current Framework of State and Federal Regulations and Tort Law

This ARC has given significant consideration to privacy interests throughout the last many months, including convening a privacy task force during Phase 1 and returning to the question of privacy after three ARC members[4] raised additional concerns during Phase 2 of the ARC. At no time during the ARC, however, was "general consensus" reached regarding the recommendation that the FAA consider development of a privacy statute.

Rather, the Phase 1 Task Force recognized that although the privacy interests of individuals may be implicated by BVLOS operations, the FAA has historically concluded that the privacy interests of the general public are out of the scope of the FAA's directive. In addition, the Phase 1 Task Force agreed that the public should not have access to specific, identifying information about BVLOS operations, whether in real-time or more generally.

What appears to be motivating the few organizations who have expressed support for a new privacy statute seems to be concern that the public will not accept the presence of drones in their communities. In some respects, this is similar to the concern raised in 1888 regarding the introduction of the Kodak Brownie camera. The Kodak camera allowed, for the first time, anyone to take photographs in public places, as opposed to the controlled seclusion of photography studio. This sudden appearance and widespread use of the camera

Sashkin, *Repack Funds and First Responders – What Broadcasters Need to Know about the 'Omnibus' Spending Bill of 2018*, CommLawBlog, Mar. 23, 2018 (available at https://www.commlawblog.com/2018/03/articles/fcc/repack-funds-and-first-responders-what-broadcasters-need-to-know-about-the-omnibus-spending-bill-of-2018/).

[4] The ARC participants who raised privacy interests in the discussions were the American Civil Liberties Union, Electronic Frontier Foundation and Electronic Privacy Information Center.

caused the public to react with fear – many places posted signs banning the use of cameras, and newspapers ran stories about the dangers of public photography.[5]

Despite the concern surrounding this technological innovation, and rather than prohibit the use of cameras in public outright, over the past century and a half tort law developed to accommodate the legitimate interests in privacy and the public interest in a free and open society.[6] Additionally, states have developed codes to specifically proscribe unlawful surveillance through use camera technologies in private spaces.[7] Courts have had no trouble adapting both the common law and state codes to each wave of new technology.

Indeed, the FAA has, on several occasions, considered the issue of privacy in the context of UAS operations, and it has repeatedly concluded that the FAA is not authorized to

[5] "The Kodak Camera Starts a Craze," The Wizard of Photography, WNED http://www.pbs.org/wgbh/amex/eastman/peopleevents/pande13.html.

[6] *See, e.g.*, *Shulman v. Group W. Productions, Inc*., 955 P.2d 469 (Cal. 1998) (filming accident victim at scene of accident was not intrusion of victim's seclusion, but victim would have reasonable expectation of privacy in rescue helicopter); *Eick v. Perk Dog Food Co*. 347 Ill. App. 293, 299 (Ill. App. 1952) (the right to privacy is a limited one in areas of legitimate public interest); *Tagouma v. Investigative Consultant Servs., Inc.*, 2010 PA Super 147, 4 A.3d 170, 174 (Pa. Super. 2010) ("there is no liability 'for observing [ ] or even taking [a] photograph while [a person] is walking on the public highway, since he is not then in seclusion, and his appearance is public and open to the public eye."); *Martin v. Dorton*, 210 Miss. 668, 669, 50 So. 2d 391, 391 (Miss. 1951) (public officer cannot complain that his privacy has been invaded when his photograph is taken for publication in connection with a legitimate news story); *c.f. Souder v. Pendleton Detectives*, 88 So. 2d 716 (La. App. 1956) (using camera with telescopic lens to photograph bedroom from neighboring house).

[7] *See e.g.* Cal Pen Code § 647(i) ("Who, while loitering, prowling, or wandering upon the private property of another, at any time, peeks in the door or window of any inhabited building or structure, without visible or lawful business with the owner or occupant" is guilty of a misdemeanor); 11 De. Code Ann. § 1335 ("A person is guilty of violation of privacy when he (1) trespasses on private property intending to subject anyone to eavesdropping or other surveillance"); TCA § 39-13-605 ("It is illegal to knowingly and without consent photograph another person or cause him to be photographed in a place where there is a reasonable expectation of privacy if the photograph (1) would offend or embarrass an ordinary person if such person appeared in the photo and (2) was taken to sexually arouse or gratify another.")

craft privacy regulations.[8] Rather, the FAA has sensibly acted within its mandate to craft regulations that complement tort law and state regulations to ensure the safe and lawful operation of drones in our national airspace. It should continue to abstain from the development of regulation or statute in the name of privacy protection as it considers a rulemaking to authorize the operation of drones beyond visual line of sight.

As the Coalition has repeatedly stated, it does not object to the requirements contained in the FAA's Remote ID rules that each drone have a visible unique identifier, and that law enforcement and the public have a mechanism by which to verify that UAS operations occurring in their communities are lawful – but that is already contemplated by the current statutory framework. The rules enable the quick identification of drones that are behaving in suspicious, or illegal, ways, whether that be flying in a no-fly zone, near a restricted area, or behaving erratically. No additional federal statute is needed to properly protect the privacy interests of the public.[9]

Should the FAA Recommend Congress Adopt a Privacy Statute, it Must Contain Appropriate Safeguards to Preserve the First Amendment Interests in Newsgathering

The news media has a unique and nuanced relationship with law enforcement and the communities they serve. Journalists take seriously their role as the Fourth Estate watchdog on government, which requires that journalists at times investigate the conduct of government officials and law enforcement officers. In addition, journalists each day report on matters of concern in their communities. Any privacy statute that implicates the operations of newsgatherers has the very real potential to act as a de facto prior restraint on certain types of coverage and of increasing the risks to reporters doing their job, chilling the reporting of stories of great public importance.

---

[8] *See, e.g.*, Final Rule, *Operation of Small Unmanned Aircraft Systems Over People*, 86 Fed. Reg. 4314, 4365 (Jan. 15, 2021) ("Although the Agency is not authorized to impose regulations based on privacy concerns, the FAA has collaborated with the public, stakeholders, and other agencies with authority and subject matter expertise in privacy law and policy. As stated in the 2016 final rule, the FAA's mission is to provide the safest, most efficient aerospace system in the world, and does not include regulating privacy or free speech. Privacy issues are outside the focus and scope of the rule.").

[9] Indeed, the area where more transparency is needed, as the News Media Coalition has advocated in the context of other rulemakings, is for the FAA to require law enforcement to articulate grounds under a "probable cause" or "reasonable suspicion" to access personally identifiable information about drone operators. *See* Comments of the News Media Coalition, Docket No. FAA-2019-1100, Notice No. 20-01, Remote Identification of Unmanned Aircraft Systems (Mar. 2, 2020) at 8.

Under well-settled First Amendment law, the Government can impose reasonable time, place, and manner conditions on newsgathering, but only when those conditions are narrowly tailored to address a legitimate government interest.[10] Any statutory provision that governs privacy risks creating an unreasonable First Amendment limitation on the manner of operating a drone that is not narrowly tailored to a legitimate government interest.

Journalists' use of drones is in many ways unique when compared to the typical drone user. Whatever newsgathering tool they use, journalists have an utmost interest in conducting operations without surveillance by the government or by the subjects of their reporting. Across the Coalition, members have dedicated significant time, resources and training to ensure the safe and secure operation of drones in a manner consistent with the independence of the press guaranteed by the First Amendment.

Therefore, at a minimum, any new drone privacy regulation considered by the FAA must exempt news media operations. Indeed, the federal government included a similar carve-out for newsgatherers in the Voluntary Best Practices for UAS Privacy, Transparency, and Accountability, developed by the NTIA, a component of the U.S. Department of Commerce.[11] This carve-out states:

> **Best Practices for Newsgatherers and News Reporting Organizations**
>
> Newsgathering and news reporting are strongly protected by United States law, including the First Amendment to the Constitution. The public relies on an independent press to gather and report the news and ensure an informed public.
>
> For this reason, these Best Practices do not apply to newsgatherers and news reporting organizations. Newsgatherers and news reporting organizations may use UAS in the same manner as any other comparable technology to capture, store, retain and use data or images in public

[10] *See McCullen v. Coakley*, 573 U.S. 464, 486 (2014) (content-neutral regulations "may not regulate expression in such a manner that a substantial portion of the burden on speech does not serve to advance its goals.") (quoting *Ward v. Rock Against Racism*, 491 U.S. 781, 799 (1989)). For instance, effective January 1, 2020, a fixed wing or rotary wing aircraft operated by the news media must broadcast its location through Automatic Dependent Surveillance – Broadcast (ADS-B), if it intends to operate in certain restricted airspace, to maintain the safety of the NAS and the security of restricted airspace. 14 CFR § 91.225.

[11] *See* https://www.ntia.doc.gov/files/ntia/publications/uas_privacy_best_practices_6-21-16.pdf.

spaces. Newsgatherers and news reporting organizations should operate under the ethics rules and standards of their organization, and according to existing federal and state laws.

Indeed, current laws and regulations contain several similar examples that limit access to information about journalists' activities to instances where law enforcement is able to satisfy legal standards:

- The Privacy Protection Act, which governs the issuance of search warrants to journalists, provides that "it shall be unlawful for a government officer" to search or seize a journalist's work product unless "there is probable cause to believe that the person possessing such materials has committed or is committing the criminal offense to which the materials relate[.]"[12]

- Similarly, the United States Attorney General's policy regarding obtaining information from, or records of, journalists, applies in all instances except where the government has "reasonable grounds to believe that the individual or entity is", for example, "a member or affiliate of a terrorism organization."[13] Moreover, before authorizing a subpoena in a criminal matter, the Attorney General himself must articulate, among other requirements, "reasonable grounds to believe, based on public information, or information from non-media sources, that a crime has occurred[.]"[14] In fact, in July 2021, Attorney General Merrick Garland announced that the DOJ would end its use of "compulsory legal process for the purpose of obtaining information from or records of members of the news media acting within the scope of newsgathering activities," and he directed a comprehensive review of regulations to ensure that all regulations comport with the directive.[15]

Any statute that permits broader or unfettered real-time access to location and identifying information is unnecessary to protect the privacy interests of the public, and will impermissibly intrude on journalists' First Amendment rights to gather and report the news.

---

[12] 42 U.S.C. § 2000aa(b).

[13] 28 CFR § 50.10(b)(1)(ii)(B).

[14] *Id*. at (c)(4)(ii)(A).

[15] *Use of Compulsory Process to Obtain Information From, or Records of, Members of the News Media*, Office of the Attorney General (July 19, 2021), *available at* https://int.nyt.com/data/documenttools/attorney-general-memo-re-compulsory-process/862efd19514d7250/full.pdf.

Therefore, to the extent the FAA decides to consider a privacy statutory framework, it must carve out the activities of newsgatherers from that framework.

***

The Coalition appreciates the tireless efforts of the ARC leadership to consider and address the many important issues raised by the operation of drones beyond the visual line of sight. The Coalition is enthusiastic about the opportunities these types of operations will afford them to better tell the important stories of interest to their communities, and its members are committed to maintaining their reputation as respected and trusted operators of drones.

Sincerely,

Charles D. Tobin, Ballard Spahr LLP
Emmy Parsons, Ballard Spahr LLP
Joel Roberson, Holland & Knight LLP

On behalf of the News Media Coalition:

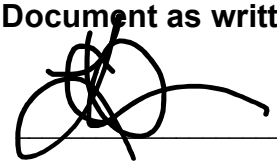
Advance/Newhouse Partnership
American Broadcasting Companies, Inc.
The Associated Press
Capitol Broadcasting Co.
Fusion Media Network
Gannett Co., Inc.
Getty Images (US), Inc.
National Press Photographers Association
NBCUniversal Media, LLC
News Media Alliance
The New York Times Company
The E.W. Scripps Company
Sinclair Broadcast Group, Inc.
TEGNA, Inc.
WP Company LLC

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)
Statement of Concurrence / Non-Concurrence

Voting Member Name	Charles Werner
Voting Member Organization	DRONERESPONDERS Public Safety Alliance

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

1. Concur with the Final Document as written

Voting Member Signature:  Date: 03/03/2022

2. Concur with the Final Document as written with the following exception(s): **(Fully explain the areas of exception below, providing specific page and line number. Submission of separate paper is acceptable).**

No exceptions

Voting Member Signature: _____ Date: 03/03/2022

3. Non-Concur with the Final Document as written. Letter of Dissent must be provided.

Voting Member Signature: _____ Date: _____

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)
Statement of Non-Concurrence

Voting Member Name	Christopher Cooper, Sr. Director, Regulatory Affairs
Voting Member Organization	Aircraft Owners and Pilots Association (AOPA)

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

~~**1. Concur with the Final Document as written**~~

~~**Voting Member Signature:** _____ Date: _____~~

~~**2. Concur with the Final Document as written with the following exception(s):** **(Fully explain the areas of exception below, providing specific page and line number. Submission of separate paper is acceptable).**~~

~~**Voting Member Signature:** _____ Date: _____~~

3. Non-Concur with the Final Document as written. Letter of Dissent must be provided.

Voting Member Signature:  Date: ___3/3/22_____

Attached: AOPA Statement of Non-Concurrence

601 Pennsylvania Ave. NW, Suite 250
Washington, D.C. 20004
202-737-7950

www.aopa.org

March 3, 2022

Ms. Eileen Lockhart, BVLOS ARC Co-Chair
Director of Emerging Markets
Air Methods

Mr. Sean Cassidy, BVLOS ARC Co-Chair
Director, Safety, Flight Ops and Regulatory Affairs
Amazon Prime Air

Re: AOPA Statement of Non-Concurrence to the BVLOS ARC Final Report

Dear Ms. Lockhart and Mr. Cassidy,

The Aircraft Owners and Pilots Association (AOPA) is the world's largest aviation membership association representing individuals who collectively operate 85% of all general aviation aircraft in the United States, as well as tens of thousands of members who fly drones, including several thousand members who solely pilot drones both professionally and recreationally. AOPA respectfully submits this statement of non-concurrence in response to the Beyond Visual Line of Sight (BVLOS) Aviation Rulemaking Committee (ARC) final report.

Since 1939, AOPA's mission has been to protect the freedom to fly while keeping aviation safe, fun, and affordable. While AOPA's mission has traditionally served the interests of general aviation owners and operators, with the rapid growth and interest in drones, we realize the importance of supporting the development and safe integration of the BVLOS drone industry. Integration of BVLOS drones will enable humanitarian, public safety, and commercial applications of this technology. This will, in turn, create many future career opportunities for the next generation of pilots and other aviation professionals who are inspired by flight early in their lives. Whether traditional aircraft or drones, our mission remains the same: to advocate for policies and rules that grow and protect the freedom to fly.

With the rapid growth of BVLOS drones and its planned safe integration into the National Airspace System (NAS) with traditional aircraft, comes the necessity of new polices, rules, and technology to maintain an equivalent level of safety without restricting access or creating undue economic burdens to incumbent operators. While this BVLOS ARC report offers some recommendations to the FAA that will promote the expansion of BVLOS drone operations while maintaining the safety of all users of the airspace, AOPA has considerable concerns about certain recommendations that will reduce the safety of airspace users, and in the long term, will slow the drone industry's effort to fully utilize the benefits of BVLOS operations.

I. SIGNIFICANT ISSUES OF CONCERN

AOPA supports the development and implementation of BVLOS drone operations. However, with the integration of any new technology and operation, how it is implemented to achieve its goals is most important to the stakeholders and public it will impact. AOPA, representing over 300,000 of these individual stakeholders, has the following concerns of the BVLOS ARC report and recommendations:

Issue 1: **Changing Right of Way Rules Based on Equipage or Shielded Operations Will Place Unsafe Burdens and Unfeasible Requirements on Crewed Aircraft**

Recommendation: Recommendations FR 2.2, 2.3, and 2.4, (and all other related recommendations, charts, and rationale) should be removed and replaced with language that requires equal responsibility of uncrewed aircraft to see (detect) and avoid other aircraft, and when required to give another aircraft the right-of-way, is done so based on aircraft maneuverability.

In recommendations FR 2.2, 2.3, and 2.4, the BVLOS ARC leadership effectively proposes that drones operating under BVLOS rules would have 1) complete right-of-way over all crewed aircraft not equipped with either ADS-B or TABS, and 2) right-of-way over all crewed aircraft that are operating in what is being proposed as "shielded areas."

The BVLOS ARC leadership supports these recommendations by offering research evidencing a pilot's limitations with seeing and avoiding other aircraft, such as blocked field of views or the need to divert attention elsewhere. Based on this evidence, they argue, the current see and avoid requirement between crewed aircraft[1] is not the primary mitigation tool for avoiding collisions. Rather, it is suggested the mitigation of avoiding collisions is a result of operating merely in airspace environments where there is very "little GA traffic." Using this "big sky" theory, ARC leadership promotes a recommendation that gives drones a blanket right-of-way over all crewed aircraft not equipped with ADS-B or TABS, including all crewed aircraft operating in "shielded areas" regardless of equipage, with the rationale that very few aircraft operate at those lower altitudes and "shielded areas," and therefore the risk of a collision is very low.

These radical recommendations proposing to change the fundamental responsibility of avoiding other aircraft, and right-of-way rules based on maneuverability, fails to recognize the **reality of aircraft operations at lower altitudes**, and the **unsafe** and **unfeasible** requirements it will place on crewed aircraft.

Aircraft operations at lower altitudes: Currently, 14 CFR 91.119 effectively allows for aircraft operation at any altitude, with limitations and considerations necessary for power unit failures, congested areas, and areas other than congested areas. In addition, helicopters, powered parachutes, and weight-shift-control aircraft can go below these minimum altitudes. All this to say, fixed wing, rotorcraft, lighter than air, powered parachutes, ultralights, antique, agricultural operations, and others operate safely, routinely, and legally at the exact altitudes, geographical

[1] 14 CFR 91.113(b)

areas, and near obstacles/structures, envisioned in these recommendations. Consideration should also be given to the wide-open areas many of these aircraft can take off and land at, including over 14,000 published private use and 5,000 public use airports in the United States. AOPA strongly disagrees with the ARC leadership's characterization that very few aircraft operate at these lower altitudes. In fact, the FAA recognized the realities of aircraft operations at lower altitudes in a recent DronePro Update:

> "The risk of midair collisions between drones and traditional aircraft is greatest when they both share the same airspace. The belief that traditional aircraft only operate at altitudes above 500 feet is a common misconception among drone pilots. The regulation that establishes the minimum flying altitude for traditional aircraft is published in 14 CFR 91.119. Except for takeoff and landing, most fixed-wing aircraft typically operate above 500 feet. However, this is not the case with helicopters. Helicopters often fly below 400 feet and routinely share the same airspace as their drone counterparts." (March 1, 2022)

It is unfortunate the BVLOS ARC leadership failed to recognize the reality of shared aircraft operations at lower altitudes, but we hope the FAA will carefully take this important reality into consideration during its BVLOS rulemaking.

Unsafe and unfeasible reliance on electronic conspicuity: While more than 108,000 aircraft in the general aviation fleet is ADS-B compliant, that number has remained relatively steady since the January 1, 2020 ADS-B mandate.[2] For the remaining non-equipped general aviation fleet, many may never find the need to equip with ADS-B as the majority of the NAS below 10,000 feet does not require ADS-B.[3] In addition, the FAA ADS-B equipage rates do not take into consideration other aircraft that mostly operate in lower altitudes, such as experimental, Light Sport Aircraft, lighter than air, powered parachutes, and ultralights, most of which cannot safely or feasibly install such devices whether technologically (e.g., no electrical system) or operationally (e.g., weight and balance).

ADS-B as a technology also has its shortcomings: ADS-B units can fail, coverage and spectrum issues continue to exist, and some operations have authorization to turn their ADS-B off.[4] The BVLOS ARC leadership's reliance to rely on ADS-B as a tool for collision avoidance and justification for changes to right-of-way rules is misplaced. Overreliance on a technology that is unfeasible for many lower altitude aircraft, was not originally designed for what is being proposed, and cannot be completely relied upon, should raise significant concerns for the safety of the NAS.

AOPA is supportive of low cost, voluntary safety equipment (e.g., Non-Required Safety Enhancing Equipment). And although AOPA is familiar with TABS, the BVLOS ARC report provides little to no background or explanation of the technology, its benefits, or its limitations, and how it might specifically provide a pathway to justify a change in right-of-way rules.

[2] https://www.faa.gov/nextgen/equipadsb/installation/current_equipage_levels/
[3] 14 CFR 91.225
[4] 14 CFR 91.225(f)

Finally, reliance on electronic conspicuity to alter see (detect) and avoid and right-of-way rules completely eviscerates the safety considerations for basing right-of-way rules on maneuverability. Would a less maneuverable drone be required to give way to a highly maneuverable crewed aircraft with ADS-B? Would a balloon without an ADS-B or TABS device be expected to give way to a drone? Between two BVLOS drones, who would have the right-of-way? If the rationale for imposing these new right-of-way rules is that the risk is so low for a collision at lower altitudes, then why have right-of-way rules to begin with? If right-of-way rules becomes a function of conspicuity rather than maneuverability (or the fundamental principle to avoid another aircraft), then arguably a transport category aircraft with ADS-B would have right-of-way over a balloon without ADS-B or TABS. AOPA does not believe this is an outcome the FAA nor the aviation industry should adopt for the interest of safety or the public benefit.

Solutions

AOPA and other ARC member's positions has been that all users have a **shared** responsibility to avoid other aircraft. Unfortunately, these recommendations intend to distribute the collision avoidance responsibilities through changes to right-of-way flight rules in both low altitude and near obstacles/structures. This is not shared responsibility. These recommendations inappropriately attempt to remove a fundamental safety mitigation of avoiding other aircraft (right-of-way) relative to other aircraft who safely and legally operate in areas where the technology proposed by this report (i.e., ADS-B, TABS) is not required nor designed for collision avoidance purposes. This proposal merely shifts risk to an unwilling/unknowing party, who are safely and legally operating.

AOPA recommends the FAA require uncrewed aircraft have some form of detect and avoid capability (e.g., onboard, ground, hybrid, etc.) for BVLOS operations[5] that meets FAA performance requirements (in conjunction with industry consensus standards) to meet a shared responsibility to see (detect) and avoid other aircraft (both crewed and uncrewed).

AOPA recommends maintaining right-of-way rules based on maneuverability, with no blanket right-of-way rules for BVLOS drones over crewed aircraft without ADS-B or TABS equipment, nor over crewed aircraft operating in the proposed definition of "shielded areas."

Adopting the recommendations above will provide for a more direct path to integrate uncrewed BVLOS aircraft into the entire NAS without airspace segregation, the opportunity to leverage current right-of-way rules, and to maintain the safety of the entire NAS.

Issue 2: **The BVLOS ARC Recommendations and Report Fails to Recognize and Accurately Capture the Opinions of its Members**

While having to work with one of the largest ARCs, under extreme time pressure, and what seemed like continuous expansion in the scope of its charter, AOPA appreciates all the hard work and time put in by ARC leadership.

[5] AOPA is not suggesting such requirements be applied to VLOS or Extended VLOS operations, as those operations would have some form of ability to maintain situational awareness of the airspace and air traffic to avoid other aircraft (e.g., visual observer).

Unfortunately, AOPA (along with other ARC members) have raised concerns regarding the process of recording, adjudicating, and accurately characterizing the opinions of the ARC membership, and transparency of ARC leadership decisions. AOPA's concerns to these issues have been raised in prior communication throughout the BVLOS ARC process and is most recently highlighted in a joint statement of non-concurrence with several ARC members (see enclosed).

Individually, AOPA wishes to raise one specific example where transparency and process were neglected. A tactical subgroup was established under subgroup 2.5 (Flight Rules) with participants that cut across multiple subgroups, including AOPA. The creation of this tactical group was done with the knowledge of ARC leadership. This tactical group deliberated and came to consensus on many hot button issues on shared collision avoidance responsibilities, shielded operations and areas, and right-of-way rules. Although not perfect, it was a consensus driven report, which was then submitted to the full 2.5 subgroup and approved. When presented to the full ARC leadership, it was summarily dismissed in lieu of alternative recommendations developed internally by ARC leadership not part of subgroup 2.5's deliberations. Those recommendations are what we now see in the final BVLOS ARC report. The blatant disregard and lack of adjudication of the recommendations created by the tactical group was disappointing and further evidences the broader transparency concerns raised by ARC members throughout the ARC process.

AOPA highly recommends the FAA take time to review the submitted comments by all ARC members and each subgroup's work product to obtain the widest view of opinions shared.

II. AREAS OF SUPPORT

AOPA supports and appreciates the efforts by the BVLOS ARC and the broader uncrewed industry to help educate its operators and members on the importance of safety and culture in the aviation industry. It is then appropriate we support recommendation AG 2.4 emphasizing voluntary safety reporting within the Aviation Safety Reporting System.

In addition, AOPA continues its strong and absolute opposition to unfunded equipage mandates on crewed general aviation aircraft to facilitate the safe integration of uncrewed aircraft. Consequently, we appreciate the ARC's recognition and recommendation to not support a mandated equipage requirement for crewed aircraft, nor mandatory participation in UTM/Third Party Services.

III. ADDITIONAL COMMENTS

AOPA has raised other areas of concern in the BVLOS ARC report not included in this non-concurrence, therefore we ask the FAA review the comments submitted throughout the BVLOS ARC process to obtain a better picture of the various concerns shared by AOPA and the ARC membership.

Again, AOPA appreciates and supports the hard work and dedication of the BVLOS ARC towards the safe integration of drones into the NAS, and we look forward to continued work with you and the entire aviation industry on this important rulemaking project. Please feel free to contact me at 202-737-7950 if you have any questions.

Sincerely,

Christopher J. Cooper
Senior Director, Regulatory Affairs

Enclosure: BVLOS ARC Coalition of Aviation Associations Statement of Non-Concurrence

The Aircraft Owners and Pilots Association (AOPA) is a not-for-profit individual membership organization of General Aviation and Drone Pilots and Aircraft Owners. AOPA's mission is to effectively serve the interests of its members and establish, maintain and articulate positions of leadership to promote the economy, safety, utility, and popularity of flight in General Aviation aircraft and drones. Representing two-thirds of all pilots in the United States including several thousand drone operators, AOPA is the largest civil aviation organization in the world.

BVLOS ARC Coalition of Aviation Associations
Statement of Non-Concurrence

March 3, 2022

Ms. Eileen Lockhart, BVLOS ARC Co-Chair
Director of Emerging Markets
Air Methods

Mr. Sean Cassidy, BVLOS ARC Co-Chair
Director, Safety, Flight Ops and Regulatory Affairs
Amazon Prime Air

Dear Ms. Lockhart, Mr. Cassidy and the BVLOS ARC membership,

After having the opportunity to review the final Beyond Visual Line of Sight (BVLOS) Aviation Rulemaking Committee (ARC) report and its recommendations, the undersigned members of the ARC write this Statement of Non-Concurrence to declare our joint dissent to several recommendations and to renew our continued concerns related to the substance and quality of the report, as well as the processes followed during the report development.

We fundamentally support the safe enabling of BVLOS operations in the U.S. National Airspace System (NAS) and are all working to ensure the future success of this segment of the aerospace community.

However, after reviewing the final report and considering the challenges observed in the past seven months to accurately characterize the positions of the 89 ARC members, the final report could have substantial negative impacts on the safe and efficient integration of BVLOS operations and the safety of NAS users. For these reasons, we non-concur with specific concerns about the following recommendations:

- Target levels of safety and comparison with Light Sport Aircraft (LSA) including the reference to the safety continuum (AG 2.1);
- Change in right of way and see and avoid responsibilities (FR 2.1- 2.4);
- Shielded Operations and Areas and their related definitions (FR 2.2- 2.4);
- Operating requirements proposed to govern Remote Air Carrier and Remote Operating certificate holders (OQ 2.10-2.13);
- Changes in U.S. Air Carrier ownership requirements (GP 2.11);
- Lacking justification in context of safety continuum related to aircraft Size (*i.e.*, 800k ft/lbs limit) (AS 2.1);
- HAZMAT carriage (AG 2.5, OQ 2.19); and
- General lack of defined airspace scope with the BVLOS ARC report and misunderstanding of airspace separation

In addition, the final report possesses neither a coherent structure nor clear guidance upon which the Federal Aviation Administration (FAA) can be reasonably expected to act. Furthermore, there are significant misrepresentations throughout the narrative that inaccurately reflect (or completely neglect to mention) the disagreements and dissent of stakeholders across the ARC membership.

Finally, we must also highlight our ongoing concerns of procedure since the start of the BVLOS ARC. In particular, the lack of transparency and fairness offered to ARC membership. Verbal and written comments and dissents have been ignored, not offered full plenary discussion and adjudication, or given inaccurate representation. This has resulted in certain recommendations appearing as preconceived notions that are not expected to enable safe and fair BVLOS operations. Unfortunately, the above concerns are not new. In fact, all these issues have been brought up in subgroups, comments in response to earlier draft reports, directly in discussions with ARC leadership, and during plenaries.

We understand the historical nature and complexity of past ARCs that have attempted to advance uncrewed operations. We remain committed to continue our work to improve the BVLOS ARC recommendations before and after they are submitted to the FAA. Thank you all for your continued leadership in this very important step towards safely enabling BVLOS operations.

Sincerely,

Aerospace Industries Association
Aircraft Owners and Pilots Association
Air Line Pilots Association
General Aviation Manufacturers Association
Helicopter Association International
Praxis Aerospace Concepts

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)

Statement of Concurrence / Non-Concurrence

Voting Member Name	Christopher Kucera
Voting Member Organization	OneSky Systems, Inc.

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

1. Concur with the Final Document as written

Voting Member Signature: _____ Date: _____

2. Concur with the Final Document as written with the following exception(s): **(Fully explain the areas of exception below, providing specific page and line number. Submission of separate paper is acceptable).**

Please see the attached comments from OneSky.

Voting Member Signature: _____ Date: 3/3/22

3. Non-Concur with the Final Document as written. Letter of Dissent must be provided.

Voting Member Signature: _____ Date: _____

OneSky Systems, Inc. concurs with the final document with this comment on the recommendation. Our comment reference air risk gaps that cause safety issues for both crewed and uncrewed aircraft. The safety issues come from lack of basic notification and authorization capability, provisions for non-TSOd portable transponder devices and the lack of support for UAS Traffic Management (UTM) concepts that have been adopted worldwide.

In the BVLOS ARC report summary, we state that a main objective of this ARC is to consider the… *"Safety objectives of the UA operation and the risk it presents to other aircraft and people and property on the ground."* Furthermore, the ARC recommends on Page 20, under *"Air & Ground Risk"* that *"The ARC should develop a Risk Framework to oversee the operation and integration of UA in the NAS."*. And the ARC uses the table on Page 23 to define a very comprehensive evaluation of risk in different BVLOS operations levels. However, the table ignores two major gaps, #1., methods for avoiding uncrewed aircraft and #2., methods for equipping crewed aircraft under 400 feet.

Addressing #1. Throughout the ARC, Air Risk has been largely categorized by the risk of impacting "crewed" aircraft, but the risk of impacting other "uncrewed" aircraft is largely ignored. For example, the column called *"Strategic Air Risk Mitigations"* mentions *"Shielded Operations"* and *"NOTAM"* as the primary methods of reducing risk, but neither of these limits risk of uncrewed vs. uncrewed collision probability. And even though on Page 29 we mention the benefits of UTM as a *"strategic method of reducing air risk"*, it's left out of the air risk column as a possible solution and left to the 3rd Party Services as *"information sharing"*. This is shortsighted and underestimates the value that networked systems like UTM can provide. How can *"Shielded Operations"* reduce the risk of uncrewed on uncrewed collision probability? In lieu of UTM systems, what technology can be used onboard uncrewed aircraft to support detection of another uncrewed aircraft and furthermore, reduce the secondary ground risk impact of an uncrewed on uncrewed collision to those people on the ground?

Adressing #2. When we consider a right of way for uncrewed aircraft, we need to be able to provide reasonable means of equipage for crewed aircraft to make their position known to uncrewed aircraft. The ARC makes a recommendation that ADS-B and TABS could be used as methods to share position information. However, these devices simply can't be used by some low altitude aviators. We'd like you to consider those pilots that fly hang gliders, powered parachutes, ultralights, gliders or light certified aircraft without electrical systems. We think too much emphasis is put on "certified" transponders to share position information. The reality is that most of the aircraft that fly at those low altitudes are using uncertified, but forced to have certified safety devices. At the very least, the cost is relatively high to equip if not completely impossible due to the need for electronic systems to support these transponder devices. In Europe, new policy will allow for the use of cell phones as a way to share position information. This information can be shared through UTM systems and avoided tactically by the uncrewed operator within the UTM system. Furthermore, a UTM system could also provide means of simply notifying the uncrewed operator of a low-level crewed operation in advance of the operation by notifying a UTM of a crewed flight plan under 400', such as a crop dusting mission.

NASA recognized the need for networked systems to help manage uncrewed aircraft when it invented UTM in 2013, conducted the UTM trials from 2015 to 2019 and instigated the direction of international UTM standards for the sharing of flight plans and tracks within the ASTM UTM standards working groups. The capability has been thoroughly tested by the FAA in UPP 1 & 2, IPP and the Beyond program. UTM is a well established capability and designed for this specific issue of integrating airspace where ATM infrastructure is lacking, but the recommendation to use this method of compliance is left out of the ARC recommendations almost entirely. This is concerning to OneSky as we fully understand the challenges of trying to integrate uncrewed aircraft into the ATM system without cooperative tracking that UTM supports. We don't know of other solutions that can have the same positive impact on safety culture as UTM.

Without a requirement from the ARC to use UTM, the benefits will need to come from the industry and be attached to the operation as an "Associated Element". Industry is more than capable of providing a privately run network of low level air traffic, but we also seek support from the FAA to integrate this information with the ATM system. Otherwise, we are left with segregated environments where uncrewed have more rights below 400 feet and crewed have more rights above 400 feet. This was not the original objective for the ARC, but it's the reality if we don't allow for more flexible methods of sharing flight information.

OneSky concurs with the need to move forward with this rule and establish BVLOS operations, but we are frustrated with the lack of support to integrate the airspace with UTM and ATM. The use of "right of way" concepts allows us to move forward, but we are only supporting a segregated approach to airspace safety unless we recognize the challenges faced by low level operators and their ability to see and be seen. We commend the work of the ARC and hope that continued investment into UTM and integration of UTM into ATM will show the benefits as the volume of BVLOS flights proves the need for these systems.

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)
Statement of Concurrence / Non-Concurrence

Voting Member Name	Christopher Martino
Voting Member Organization	Helicopter Association Intertnational

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

1. Concur with the Final Document as written

Voting Member Signature: _____ Date:

2. Concur with the Final Document as written with the following exception(s): **(Fully explain the areas of exception below, providing specific page and line number. Submission of separate paper is acceptable).**

Voting Member Signature: _____ Date: _____

3. Non-Concur with the Final Document as written. Letter of Dissent must be provided. **(Please include the Recommendation number - e.g., Working Group 2.5.1).**

Voting Member Signature: _____ Date: 03 March 2022

Helicopter Association International

1920 Ballenger Avenue, Alexandria, VA 22314-2898
703-683-4646 | rotor@rotor.org
www.rotor.org

Dedicated to the Advancement of the International Helicopter Community

03 March 2022

Re: Dissent Position – Helicopter Association International, FAA Beyond Visual Line of Sight Aviation Rulemaking Committee (BVLOS ARC) Final Report

On behalf of Helicopter Association International (HAI), I thank the FAA for the opportunity to participate in the BVLOS ARC and to comment on the Final Report.

HAI is the professional trade association for the civil rotorcraft industry which represents more than 3,000 aviation businesses and individuals in more than 70 nations. HAI is dedicated to the promotion of the rotorcraft as a safe, effective method of commerce and to the advancement of the international rotorcraft community, both manned and unmanned.

The rotorcraft industry is unique in that it is the aviation segment most affected by the integration of UAS into the low altitude airspace structure. Manned rotorcraft typically operate at the same low altitudes contemplated for use by UAS and many of the operations conducted by today's rotorcraft are, or soon will be, within the reach of UAS. In the U.S., thousands of rotorcraft and their operators commonly use the airspace at, or below, 500 feet above ground level. While all aircraft transition through this low-level airspace for takeoffs and landings, HAI's members daily use it to conduct a wide range of time-critical missions that provide important benefits to society.

More importantly, future projections for the vertical flight industry clearly indicate that these legacy rotorcraft operators will lead in the use of unmanned rotorcraft to provide their services. As such, it is of critical importance to the aviation industry that integration of unmanned systems, particularly BVLOS operation, be done in a safe manner, driven by safety first and foremost, and performance-based requirements that are harmonized with existing airspace operators. That was HAI's objective throughout the ARC process and our expectation for the final Report.

Unfortunately, the BVLOS ARC Final Report, and the recommendations contained within, fail in this respect. The Report provides recommendations that, if implemented, would create unsafe conditions within the NAS to existing airspace users. As such, HAI, opposes the Final Report of the BVLOS ARC.

If the ARC recommendations are implemented as provided by the Report, we would realize an ecosystem within the NAS that would allow unmanned aircraft in excess of 1,000 lbs to operate without the capability to detect and avoid existing NAS users that the unmanned systems will reasonably expect to encounter. This puts several aviation communities at increased risk. The recommendations in the Report attempt to "mitigate" this safety issue by amending FAR § 91.113 (Right-of-way rules) to give the unmanned systems "right of way" over existing airspace users that the UAS cannot detect. This is a very imbalanced approach, as the Report fails to adequately address the issues associated with manned aircraft detecting the smaller airframes associated with UAS, particularly at low altitudes. What the recommendations in the Report attempt to do is relieve unmanned system operators of the foundational responsibility for detecting and avoiding other aircraft. Amending FAR § 91.113 right of way rules in no way mitigates risk. Essentially, it increases risk to other airspace users and transfers legal liability away from BVLOS operators.

Right of Way. "Right of way assignment" is not, and never should be, a mitigation for an unmanned system's (or any other aircraft's) inability to detect other aircraft in the airspace. FAR § 91.113 very clearly establishes as a foundation, even before discussing any right of way hierarchy, that "regardless of…flight rules, vigilance shall be maintained by each person operating an aircraft so as to see (for UAS "detect") and avoid other aircraft." That foundational responsibility cannot be applicable to only certain operations/aircraft in the airspace.

Right of way is not possible without detection. Detection capability is the foundational element that enables right of way rules to be effective:

- It enables persons operating aircraft to be aware of each other;
- It enables persons operating aircraft to understand the specifics of each aircrafts' position/operation/limitations; and
- It enables persons operating aircraft to make decisions, based on right of way rules, in order to safely proceed.

The right of way hierarchy contained in FAR § 91.113 is based on maneuverability elements and/or restrictions in ability to maneuver. They are not, nor should they be, based on an inability to detect other aircraft in the airspace. Furthermore, it is not a foregone conclusion that crewed aircraft will be able to easily categorize nearby BVLOS air traffic as "crewed" or "uncrewed" by sight alone.

The fact of the matter is that some aircraft being considered for BVLOS operations lack a technical level of maturity to safely conduct BVLOS operations. The ARC failed to address this and, as a result, we see a set of recommendations in the Report that cater to a lowest common denominator and not to performance-based safety. The FAA should strongly consider this and work with industry to develop performance-based detection standards applicable to all BVLOS operations, and sensitive to the full scope of operations in the NAS.

HAI strongly recommends that the FAA in their rule making, establish a set of performance-based standards for BVLOS detect and avoid requirements that enable BVLOS operations to be safely conducted <u>with full consideration of all NAS operators.</u> Limiting BVLOS detect requirements to just a select group of operations ("equipped") is not in the best interest of safety.

Faulty findings. Within the Report, there are several references to prior studies that the ARC writing team attempts to leverage to justify its positions related to "Detect and Avoid," "Right of Way" and "Well-clear" recommendations. The referenced studies, although applicable to some areas of focus, are not applicable to the BVLOS flight operations environment that the ARC was tasked to examine. The "findings" are not sound and should not be recognized as a basis for recommendations that put other NAS operators at a higher level of risk. The "findings" and resulting recommendations support a one-sided approach to rationalize the operation of <u>FAR § 91.113 non-compliant aircraft</u> in the NAS. In accordance with a previous section of the Report: "*There Is a Data Gap. Existing data associated with crewed aircraft operations are not appropriate when applied to UAS BVLOS operations because of the fundamental risk differences that exist between crewed aircraft and UA."* This is a sound statement, and is absolutely applicable to studies associated with this data.

Shielded Operations: HAI does not concur with the recommendations for shielded operations. At the onset of the ARC, the initial concept of shielded operations had merit. BVLOS operations under, or within, the structures of bridges for example were sensible solutions for enabling near term BVLOS operations, and crediting UAS via reduced detect and avoid equipment requirements. However, that concept incrementally expanded to well-beyond the airspace where a UAS would actually be "shielded." What did not expand were the recommendations for increased detect and avoid capabilities beyond actual

shielded areas. The ARC recommendations instead go in a direction that, again, attempts to rationalize mitigation of FAR § 91.113 non-compliant aircraft by giving UAS the "right of way" over all other aircraft in these situations. "Right of way" assignment is not a mitigation for aircraft that do not have a capability to detect.

The ARC Report also fails to adequately describe what a "shielded area" would be. It does discuss "critical infrastructure" per 42 U.S.C. § 5195c, but it also includes operations around "obstacles," which, per the *Definitions* section is vaguely defined, as to include any and all natural growth or terrain, or manmade "construction or alteration." Reference to FAR § 77.13 is partially helpful, but the Report recommendations do not identify "obstructions to air navigation" as described in § 77.13. It merely references "obstacles." Essentially, anything on the ground, natural or manmade, could be considered a "shielded operation."

HAI strongly recommends the FAA develop regulations for shielded operations that capture the actual concept of a UAS being "shielded" and allow credit in those situations in terms of reduced DAA requirements. For operations that are not shielded, regulations should reflect that, with the appropriate requirement for performance-based detection and avoidance.

Operations below 500' AGL. HAI absolutely opposes the Report recommendations that any aircraft operating below 500' AGL, that are not equipped with ADS-B or TABS, must yield the right of way to BVLOS UAS. As previously stated, attempting to distort the foundational safety elements embedded in FAR § 91.113 is not, nor should ever be, a means to enable the operation of UAS in the NAS that lack adequate detection capability for the aircraft that are reasonably expected to be encountered. The inconvenient truth is that there are aircraft operating at/below 500' AGL that do not, or cannot, have these additional systems aboard. They have been safely operating for decades and are compliant with FAR § 91.113. Putting these operators at increased risk due to an inadequate technical level of maturity of new-entrant systems is not in the best interest of safety.

Finally, throughout the months-long process, ARC leadership consistently failed or refused to recognize the level of flight operations currently on-going in the airspace at/below 500' AGL. As one example, utility, patrol and construction operations occur every day in this airspace, accounting for thousands of flight operations per year in support of critical infrastructure. Agricultural and other operations add to those numbers. References and claims in the Report that the NAS will somehow be safer because BVLOS operations will replace these flight operations are unsubstantiated. More importantly, an underlying theme from many on the ARC that these recommendations are acceptable because "there's nobody operating down there anyway" was an ever-present hinderance to open discussion.

HAI strongly recommends that the FAA, in their rule making, establish a set of performance-based standards for BVLOS detect and avoid requirements that enable BVLOS operations to be safely conducted <u>with full consideration of all NAS operators.</u> Limiting BVLOS detect requirements to just a select group of operations ("equipped") is not in the best interest of safety.

In addition to the above-described items, HAI also has concerns with several other topic areas of the Report including:

- Target levels of safety;
- Aircraft size (e.g. 800k ft/lbs limit) related to right-of-way recommendation; and
- HAZMAT carriage

We believe these topic areas require additional study and analysis to properly inform future regulation development. HAI and our members stand ready to assist in these efforts.

In closing, HAI applauds the FAA's efforts to gather meaningful information to inform future BVLOS regulations and we are honored to be a member of the ARC. We agree that the current regulatory framework does not adequately support several areas related to UAS integration into the NAS and, as a result, the FAA should establish new programs to address those gaps.

HAI recognizes and applauds the diversity of the ARC membership. However, we also recognize that it did not reflect a balanced representation between manned and unmanned users/operators. As mentioned earlier, there is a great deal of current, and future, overlap between the legacy rotorcraft industry and the rapidly developing UAS industry. Many legacy rotorcraft organizations have integrated UAS into their operations. More will follow. We believe this provides the FAA a unique and valuable opportunity to gather data from a pool of respondents that have experience related to both manned and unmanned operations. We recommend the FAA target this sector of the industry for additional input as the regulation development process continues to mature.

I thank you for the opportunity to contribute to this initiative. HAI looks forward to the continued partnership with the FAA as we move towards full integration of UAS into the NAS. My point of contact for this issue is Chris Martino. He may be reached at 540-907-9688 or at chris.martino@rotor.org.

Sincerely,

James Viola
President & CEO
Helicopter Association International

BVLOS ARC Coalition of Aviation Associations
Statement of Non-Concurrence

March 3, 2022

Ms. Eileen Lockhart, BVLOS ARC Co-Chair
Director of Emerging Markets
Air Methods

Mr. Sean Cassidy, BVLOS ARC Co-Chair
Director, Safety, Flight Ops and Regulatory Affairs
Amazon Prime Air

Dear Ms. Lockhart, Mr. Cassidy and the BVLOS ARC membership,

After having the opportunity to review the final Beyond Visual Line of Sight (BVLOS) Aviation Rulemaking Committee (ARC) report and its recommendations, the undersigned members of the ARC write this Statement of Non-Concurrence to declare our joint dissent to several recommendations and to renew our continued concerns related to the substance and quality of the report, as well as the processes followed during the report development.

We fundamentally support the safe enabling of BVLOS operations in the U.S. National Airspace System (NAS) and are all working to ensure the future success of this segment of the aerospace community.

However, after reviewing the final report and considering the challenges observed in the past seven months to accurately characterize the positions of the 89 ARC members, the final report could have substantial negative impacts on the safe and efficient integration of BVLOS operations and the safety of NAS users. For these reasons, we non-concur with specific concerns about the following recommendations:

- Target levels of safety and comparison with Light Sport Aircraft (LSA) including the reference to the safety continuum (AG 2.1);
- Change in right of way and see and avoid responsibilities (FR 2.1- 2.4);
- Shielded Operations and Areas and their related definitions (FR 2.2- 2.4);
- Operating requirements proposed to govern Remote Air Carrier and Remote Operating certificate holders (OQ 2.10-2.13);
- Changes in U.S. Air Carrier ownership requirements (GP 2.11);
- Lacking justification in context of safety continuum related to aircraft Size (*i.e.*, 800k ft/lbs limit) (AS 2.1);
- HAZMAT carriage (AG 2.5, OQ 2.19); and
- General lack of defined airspace scope with the BVLOS ARC report and misunderstanding of airspace separation

In addition, the final report possesses neither a coherent structure nor clear guidance upon which the Federal Aviation Administration (FAA) can be reasonably expected to act. Furthermore, there are significant misrepresentations throughout the narrative that inaccurately reflect (or completely neglect to mention) the disagreements and dissent of stakeholders across the ARC membership.

Finally, we must also highlight our ongoing concerns of procedure since the start of the BVLOS ARC. In particular, the lack of transparency and fairness offered to ARC membership. Verbal and written comments and dissents have been ignored, not offered full plenary discussion and adjudication, or given inaccurate representation. This has resulted in certain recommendations appearing as preconceived notions that are not expected to enable safe and fair BVLOS operations. Unfortunately, the above concerns are not new. In fact, all these issues have been brought up in subgroups, comments in response to earlier draft reports, directly in discussions with ARC leadership, and during plenaries.

We understand the historical nature and complexity of past ARCs that have attempted to advance uncrewed operations. We remain committed to continue our work to improve the BVLOS ARC recommendations before and after they are submitted to the FAA. Thank you all for your continued leadership in this very important step towards safely enabling BVLOS operations.

Sincerely,

Aerospace Industries Association
Aircraft Owners and Pilots Association
Air Line Pilots Association
General Aviation Manufacturers Association
Helicopter Association International
Praxis Aerospace Concepts

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)
Statement of Concurrence / Non-Concurrence

Voting Member Name	Christopher Oswald
Voting Member Organization	Airprots Council International-North America

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

1. Concur with the Final Document as written

Voting Member Signature: _____ Date: 3/4/2022

2. Concur with the Final Document as written with the following exception(s): (Fully explain the areas of exception below, providing specific page and line number. Submission of separate paper is acceptable).

Voting Member Signature: _____ Date: _____

3. Non-Concur with the Final Document as written. Letter of Dissent must be provided.

Voting Member Signature: _____ Date: _____

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)

Statement of Concurrence / Non-Concurrence

Voting Member Name	David W. Messina
Voting Member Organization	FPV Freedom Coalition, Inc.

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

1. Concur with the Final Document as written

Voting Member Signature: _____ Date: 3/3/2022

2. Concur with the Final Document as written with the following exception(s): **(Fully explain the areas of exception below, providing specific page and line number. Submission of separate paper is acceptable).**

Voting Member Signature: _____ Date: _____

3. Non-Concur with the Final Document as written. Letter of Dissent must be provided.

Voting Member Signature: _____ Date: _____

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)
Statement of Concurrence / Non-Concurrence

Voting Member Name	Deborah Kirkman
Voting Member Organization	Flight Safety Foundation

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

1. Concur with the Final Document as written

Voting Member Signature: Deborah Kirkman Date: 3 March 2022

2. Concur with the Final Document as written with the following exception(s): (Fully explain the areas of exception below, providing specific page and line number. Submission of separate paper is acceptable).

Voting Member Signature: _____ Date: _____

3. Non-Concur with the Final Document as written. Letter of Dissent must be provided.

Voting Member Signature: _____ Date: _____

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)
Statement of Concurrence / Non-Concurrence

Voting Member Name	Douglas Johnson
Voting Member Organization	Consumer Technology Association (CTA)

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

1. Concur with the Final Document as written

Voting Member Signature: _____ Date: _____

2. Concur with the Final Document as written with the following exception(s): **(Fully explain the areas of exception below, providing specific page and line number. Submission of separate paper is acceptable).**

CTA strongly supports the recommendations as a whole. CTA also urges FAA to expedite a final rule for BVLOS drone operations. It has been 10 years since Congress directed FAA to integrate drones into the national airspace system. An expedited final rule is needed to ensure American leadership in drone technology and innovation, and to accelerate the economic and societal benefits of BVLOS operations.

Voting Member Signature:  Date: __03 March 2022_____

3. Non-Concur with the Final Document as written. Letter of Dissent must be provided.

Voting Member Signature: _____ Date: _____

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)

Statement of Concurrence / Non-Concurrence

Voting Member Name	Drew Van Duren
Voting Member Organization	Qualcomm, Inc.

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

1. Concur with the Final Document as written

Voting Member Signature: _____ Date: _____

2. Concur with the Final Document as written with the following exception(s): (Fully explain the areas of exception below, providing specific page and line number. Submission of separate paper is acceptable).

Lines 4627 to 4635: Whether or not the FAA is 'equipped' to determine appropriate cybersecurity regulations for UAS is beside the point; it is within its purview to do so however light-handed the regulation may be. In particular, the FAA and industry should, at minimum, attempt to develop regulatory language for a cyber "applicability framework". An applicability framework needn't name specific cybersecurity controls for all scenarios (indeed a challenge for any regulator), but it but should clarify the context and semantics by which reduced or heightened controls/assurances are warranted and expressed. This would 1) be consistent with the ARC's recommended approach of segregating air and ground risk mitigation methods into 'strategic' and 'technical' categories, and 2) in the process be able to codify suggestions that a small 1000 ft-lb kinetic energy UAS operating in remote, rural area may demand less cybersecurity assurance than a 800,000 ft-lb UAS operating over urban areas or next to critical infrastructure. We suggest that the ARC's recommended tasking for the cybersecurity working group include development of 'applicability semantics' (i.e., an applicability framework) to which standards organizations can map certain types and levels of cybersecurity control. These should be reconciled with and potentially include elements of the JARUS cybersecurity approach and NIST's recommendations for cyber-physical systems.

Voting Member Signature: _Drew Van Duren _____ Date: March 1st, 2022

3. Non-Concur with the Final Document as written. Letter of Dissent must be provided.

Voting Member Signature: _____ Date: _____

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)
Statement of Concurrence / Non-Concurrence

Voting Member Name	Eileen Lockhart
Voting Member Organization	Air Methods Corporation

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

1. Concur with the Final Document as written

Voting Member Signature: _____ Date: _____3-3-2022_____

2. Concur with the Final Document as written with the following exception(s): **(Fully explain the areas of exception below, providing specific page and line number. Submission of separate paper is acceptable).**

Voting Member Signature: _____ Date: _____

3. Non-Concur with the Final Document as written. Letter of Dissent must be provided.

Voting Member Signature: _____ Date: _____

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)
Statement of Concurrence / Non-Concurrence

Voting Member Name	Emily Sanford Fisher
Voting Member Organization	Edison Electric Institute

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

1. Concur with the Final Document as written

Voting Member Signature: _____ Date: March 3, 2022

2. Concur with the Final Document as written with the following exception(s): (Fully explain the areas of exception below, providing specific page and line number. Submission of separate paper is acceptable).

Voting Member Signature: _____ Date: _____

3. Non-Concur with the Final Document as written. Letter of Dissent must be provided.

Voting Member Signature: _____ Date: _____

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)
Statement of Concurrence / Non-Concurrence

Voting Member Name	Eric J Bergesen
Voting Member Organization	UPS Flight Forward

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

1. Concur with the Final Document as written

Voting Member Signature: _____ _____ Date: ___3-3-2022___

2. Concur with the Final Document as written with the following exception(s): **(Fully explain the areas of exception below, providing specific page and line number. Submission of separate paper is acceptable).**

Voting Member Signature: _____ Date: _____

3. Non-Concur with the Final Document as written. Letter of Dissent must be provided.

Voting Member Signature: _____ Date: _____

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)
Statement of Concurrence / Non-Concurrence

Voting Member Name	Eric Schwartz
Voting Member Organization	Florida Power and Light Company

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

1. Concur with the Final Document as written

Voting Member Signature: Eric Schwartz _____ Date: 2-28-2022

2. Concur with the Final Document as written with the following exception(s): (Fully explain the areas of exception below, providing specific page and line number. Submission of separate paper is acceptable).

Voting Member Signature: _____ Date: _____

3. Non-Concur with the Final Document as written. Letter of Dissent must be provided.

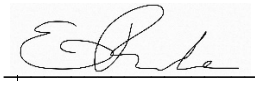
Voting Member Signature: _____ Date: _____

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)
Statement of Concurrence / Non-Concurrence

Voting Member Name	Erin Roesler
Voting Member Organization	Northern Plains UAS Test Site

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

1. Concur with the Final Document as written

Voting Member Signature:  Date: __3/2/2022_____

2. Concur with the Final Document as written with the following exception(s): **(Fully explain the areas of exception below, providing specific page and line number. Submission of separate paper is acceptable).**

Voting Member Signature: _____ Date: _____

3. Non-Concur with the Final Document as written. Letter of Dissent must be provided.

Voting Member Signature: _____ Date: _____

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)
Statement of Concurrence / Non-Concurrence

Voting Member Name	Gregory J Agvent
Voting Member Organization	CNN

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

1. Concur with the Final Document as written

Voting Member Signature: _____Gregory J Agvent _____Date: _____3/4/2022 _____

2. Concur with the Final Document as written with the following exception(s): **(Fully explain the areas of exception below, providing specific page and line number. Submission of separate paper is acceptable).**

Voting Member Signature: _____ Date: _____

3. Non-Concur with the Final Document as written. Letter of Dissent must be provided.

Voting Member Signature: _____ Date: _____

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)
Statement of Concurrence / Non-Concurrence

Voting Member Name	Gregory Pecoraro, CEO
Voting Member Organization	National Association of State Aviation Officials (NASAO)

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

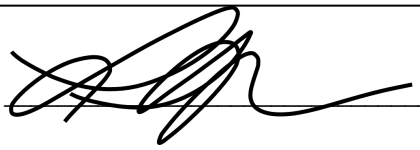
1. Concur with the Final Document as written

Voting Member Signature: _____ Date: _____

2. Concur with the Final Document as written with the following exception(s): **(Fully explain the areas of exception below, providing specific page and line number. Submission of separate paper is acceptable).**

NASAO encourages the FAA to continue efforts to clearly define the roles and responsibilities of state, local, and tribal governments where their authorities intersect with those of the FAA.

NASAO also encourages the FAA to keep state, local, and tribal law enforcement in mind while drafting regulations. If codified in federal regulations, the ARC's excellent recommendations will lead to a great increase in the number of drone operations and a subsequent increase in the number of UAS-related calls and complains that local authorities will have to handle.

Voting Member Signature:  Date: 3 March 2022

3. Non-Concur with the Final Document as written. Letter of Dissent must be provided.

Voting Member Signature: _____ Date: _____

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)

Statement of Concurrence / Non-Concurrence

Voting Member Name	James H. (Jim) Williams
Voting Member Organization	Aura Network Systems, LLC

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

1. Concur with the Final Document as written

Voting Member Signature: James H. Williams Date: 3/1/2022

2. Concur with the Final Document as written with the following exception(s): (Fully explain the areas of exception below, providing specific page and line number. Submission of separate paper is acceptable).

Voting Member Signature: _____ Date: _____

3. Non-Concur with the Final Document as written. Letter of Dissent must be provided.

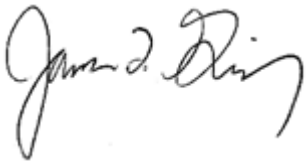
Voting Member Signature: _____ Date: _____

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)
Statement of Concurrence / Non-Concurrence

Voting Member Name	James L Grimsley
Voting Member Organization	Choctaw Nation of Oklahoma

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

1. Concur with the Final Document as written

Voting Member Signature: ____  _____ Date: _2 March 2022_____

2. Concur with the Final Document as written with the following exception(s): **(Fully explain the areas of exception below, providing specific page and line number. Submission of separate paper is acceptable).**

Voting Member Signature: _____ Date: _____

3. Non-Concur with the Final Document as written. Letter of Dissent must be provided.

Voting Member Signature: _____ Date: _____

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)
Statement of Concurrence / Non-Concurrence

Voting Member Name	James O'Sullivan
Voting Member Organization	Matternet, Inc.

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

1. Concur with the Final Document as written

Voting Member Signature: _____ Date: 3/3/22

2. Concur with the Final Document as written with the following exception(s): (Fully explain the areas of exception below, providing specific page and line number. Submission of separate paper is acceptable).

Voting Member Signature: _____ Date: _____

3. Non-Concur with the Final Document as written. Letter of Dissent must be provided.

Voting Member Signature: _____ Date: _____

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)

Statement of Concurrence / Non-Concurrence

Voting Member Name	JAMES SMITH
Voting Member Organization	NATIONAL AIR TRAFFIC CONTROLLERS ASSOCIATION

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

1. Concur with the Final Document as written

Voting Member Signature: _____ **Date:** 28 FEB 2022

2. Concur with the Final Document as written with the following exception(s): **(Fully explain the areas of exception below, providing specific page and line number. Submission of separate paper is acceptable).**

Voting Member Signature: _____ Date: _____

3. Non-Concur with the Final Document as written. Letter of Dissent must be provided.

Voting Member Signature: _____ Date: _____

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)
Statement of Concurrence / Non-Concurrence

Voting Member Name	Jay Stanley
Voting Member Organization	American Civil Liberties Union (ACLU)

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

1. Concur with the Final Document as written

Voting Member Signature: _____ Date: _____

2. Concur with the Final Document as written with the following exception(s): (Fully explain the areas of exception below, providing specific page and line number. Submission of separate paper is acceptable).

Voting Member Signature: _____ Date: _____

3. Non-Concur with the Final Document as written. Letter of Dissent must be provided.

Voting Member Signature: _____/s/ Jay C. Stanley_____ Date: __March 3, 2022__

ACLU BVLOS ARC letter of dissent

The American Civil Liberties Union (ACLU) cannot sign on to this report, as it did not incorporate the policy recommendations for which we advocated during the Beyond Visual Line of Sight (BVLOS) Aviation Rulemaking Committee (ARC). We summarized those recommendations in a joint memo written with the Electronic Frontier Foundation and Electronic Privacy Information Center, which we circulated to the ARC leadership and FAA staff (appended to this letter). Some of our most significant concerns can be summarized as follows:

- Privacy practices should not be voluntary. Non-binding principles offer no protection for the public nor any real incentive for operators to comply, leaving the field wide open for abuse.
- The transparency of operators' practices must be mandatory. This ARC was adamant about performance-based and data-driven proposals, so it seems counter to the FAA's mission not to require that basic information that would be necessary to understand the privacy risks be made public.
- Community engagement and control are critical. The "community response to drones" conversation was focused on noise and environmental impact, but not community concerns about privacy and intrusion. It seemed to us important to evaluate whether and to what extent there is a risk of negative community reaction to normalized and scaled BVLOS operations stemming from such concerns, and what the path will be for addressing such reactions. Insofar as the ARC considered negative community responses to drones, the solution that was endorsed was communicating with and educating the public. But that was envisioned as a one-way street; there was a studious refusal to consider whether and how communities should have control over the drones that fly above them.
- There was no consideration given to negative uses of drones, and how to constrain them, other than government security agency concerns over security threats. We think that the section on "societal benefits" of drones contains many legitimate points about the possible advantages this technology might bring. But the omission of a full, balancing discussion of the technology's potential downsides (other than security threats) does not reflect our agnostic views on the extent to which drones are likely to provide benefits to the American people. We cannot join what is, essentially, a brief arguing mainly for the advantages of drones without addressing substantial issues they create for the public.

We greatly appreciate that the FAA recognized the need to include privacy advocates as well as various other community and non-aviation stakeholders in this Advisory Rulemaking Committee process. This initial effort at expanding that stakeholder representation was not entirely successful, however.

Industry representatives led the ARC, set its agenda, and dominated in numbers. Reflecting past practice, ARC leaders and participants and FAA staff consistently spoke of the ARC as a process by which "industry" provided feedback to the FAA. Some industry representatives had little interest in discussing challenging questions. Consideration of the privacy risks of drones inherently means thinking about their potential downsides, yet the ARC was dominated by and structured for drone boosters, with much conversation over how to sell the technology to the

public. That was inherently in conflict with the desire of privacy advocates to consider the potential downsides of drones and their possible negative uses, and how those might be addressed.

Our participation was also hampered at times by the highly technical nature of some of the discussions. To be sure, we understood that much of the discussion would involve technical safety and other aviation questions about which our organizations hold no opinion. However, it was not always clear when a technical question had policy implications. Even where those implications seemed clear, it was often difficult to have a nuanced discussion on the issues presented and the implications of various decisions. Despite laudable efforts by FAA staff to encourage the industry and aviation community participants to "level-set" and "explain terms," such participants couldn't help but slip back into lingo, and the gap in knowledge was significant enough that it effectively excluded non-aviation participants from important discussions.

As the FAA continues to work on incorporating broad multi-stakeholder feedback on drones, which will interact with American life and communities in far more intimate ways than crewed aviation, we recommend that the agency consider convening a separate ARC or other proceeding through which to gather community, privacy, and other non-industry, non-aviation stakeholder input and perspectives, or structuring future ARCs related to the integration of drones to allow such participants to have separate conversations on questions that they themselves define. The model of creating an ARC for "industry" input may not make sense as a mechanism for input from this more diverse set of stakeholders in the same way it may have in other ARCs.

We found the ARC a valuable way to learn more about the aviation and drone industry, and we applaud the FAA for inviting privacy groups and other stakeholders to this process. We also found that FAA staff were uniformly helpful, encouraging, and open to hearing our points of view, and we feel it gave us the opportunity to communicate our point of view to the agency even though they are not reflected in the report.

Appended: December 2021 memo by ACLU, EFF, and EPIC to the ARC

Privacy Considerations for BVLOS Drones:

Privacy Considerations for FAA Aviation Rulemaking Committee on Beyond Visual Line of Sight Drone Flights

Arrieta Andrés, Scott Jeramie, Stanley Jay

Authors: Arrieta Andrés, Scott Jeramie, Stanley Jay

A publication of the American Civil Liberties Union, Electronic Frontier Foundation, and Electronic Privacy Information Center, 2021.

December 2021

Introduction

Our organizations recognize the many potential positive uses to which Beyond Visual Line Of Sight ("BVLOS") drone flights could be put. But it is also our job to consider some of the implications that a regime of routine and scaled BVLOS flights could have for privacy and surveillance, how such a regime could harm Americans' privacy, and what the pathway is for ensuring that we can maximize the benefits of this technology while minimizing the harms.

Why addressing privacy is important

Drones are very powerful surveillance platforms that greatly increase the ease and possibility of aerial surveillance. As drone technologies advance, drones will be able to fly longer and farther, carry heavier and more diverse payloads of surveillance equipment, and become even more capable of autonomous operation—all at an increasingly cheaper price point. The operational flexibility of duration, distance, and altitude makes it harder for people on the ground to detect and understand what is happening with a particular surveillance drone.

Drones can carry numerous surveillance technologies

Most drones by default are equipped with cameras that can record images or take pictures. These cameras can be quite powerful. Even consumer drones can come equipped with cameras with the ability to shoot in 4K, and military drones carry gigapixel cameras that can photograph city-sized areas.

Cameras are not the only technology that can be added to drones, of course. Drones are a platform, and the only limits on what they can carry are size and weight. Among the sensors that can be attached to drones are microphones, heat and movement sensors, mobile phone interception devices (aka IMSI catchers), GPS, radar, Lidar, sonar, range-finders, magnetic-field change sensing, radio frequency sensors, and chemical and biochemical sensors. Data from drone surveillance can be combined with other surveillance technologies such as facial

recognition and license plate readers or correlated with data from surveillance technology on the ground or online to identify people and vehicles, track their movements across time and space, or analyze their associations or habits. The lack of rules concerning drones and the technology they can carry means there will be vast opportunities for surreptitious data collection from the public.

Drones increase the risk of aerial surveillance

The lack of legal protections against aerial surveillance combined with the lowered bar for entry that drones create for aerial surveillance, raises the risk of privacy invasions. The law of aerial surveillance of public spaces is murky at best and is not well enough developed to protect the public in the face of the broad availability of drones.

Drones make it cheaper and easier to conduct aerial surveillance. Drones are generally orders of magnitude cheaper than other aircraft capable of conducting aerial surveillance (i.e. airplanes and helicopters). Drones are much cheaper to maintain and don't require the same level of training to operate as do crewed aircraft making the cost of the "pilot" much cheaper. Drones are increasingly equipped with technology to steady their flight, hover in one place, and avoid crashing into objects. Many consumer drones can track specific objects on the ground or can be programmed to fly a specific flight path.

Additionally, advancing drone technology will allow for semi-autonomous or even completely autonomous drone operations, removing the need for a pilot at all. This allows a single person to oversee multiple drone flights at once—making it even easier and cheaper to operate a drone. Autonomous BVLOS drone operations, in particular, will enable widespread drone surveillance in ways that manual line of sight drone operations could not.

Protecting the public's expectation of privacy

Members of the public are not in a position to know if their privacy is being compromised by drone surveillance, and even if they were they would have no recourse. How is someone currently supposed to know if they or their community is subject to drone surveillance? Drones can be hard to detect, flying high enough to make spotting them visually or hearing them above ground noise next to impossible.

Even if someone does become aware that a drone is nearby, there is currently no practical way to know what surveillance capabilities it possesses or if it is actively collecting information. There is no consistent and clear way to know if the drone is a government, commercial, or private drone or what its purpose is. When it comes to protecting privacy from drone surveillance, the public is largely at the mercy of drone operators.

Protecting the public's expectation of privacy from drone surveillance and preventing privacy violations will facilitate acceptance of drones in the National Airspace. The public is wary of

drones[1] and will only become more so when BVLOS drone operations start occurring in populated areas. And too often, a disproportionate amount of the negative impact of new technologies falls on the most vulnerable and marginalized communities[2]. Without privacy protections in place, drone incidents violating people's privacy will taint the whole industry. A few bad actors could seriously hamper integration of drones into the airspace, especially for BVLOS flights. Protecting everyone's privacy, but particularly that of vulnerable and marginalized communities, will speed up acceptance and integration of drones.

Categories of privacy invasion

Given the vast range of creative uses to which a generative technology such as BVLOS drones could be put, it is impossible to anticipate all the ways that the technology might be used to violate privacy. Some potential concerns, however, fit into the following categories:

Individual privacy-invading operators

BVLOS operations may eventually become relatively common, widespread, and democratized, as the barriers to entry continue to fall. If the FAA achieves its goal of allowing by-rule BVLOS flights[3], and such a general rule doesn't include privacy protections, we are likely to see BVLOS drones used for aerial reconnaissance in privacy-offensive ways. For example, drones might be used to follow other people for extended periods of time and/or across extended distances. People might follow the car of a celebrity, their ex-wife's new boyfriend, a driver that one is angry at, or an attractive person as they complete their jog.

Corporate privacy invasions

If BVLOS flights are permitted by any operator complying with a rule, numerous uses of such flights will emerge that have significant privacy implications. In today's world, data is worth money, so there will be constant market incentives to maximize privacy-invasive aerial data collection practices.

Possible privacy-invasive uses of BVLOS drones include:

---

1 DACUS, Drones and Drone Operations – Citizen's Perspective: Representative population survey on the acceptance of drones and the social impact of drone operations in urban areas (2021), https://dacus-research.eu/wp-content/uploads/2021/08/D5.1-Social-Acceptance-Survey-Results.pdf; Terance D. Miethe, Ph.D. et al., UNLV Center for Crime and Justice Policy, Public Attitudes about Aerial Drone Activities: Results of a National Survey (July 2014), https://www.unlv.edu/sites/default/files/page_files/27/PublicAttitudesAboutAerialDroneActivities.pdf;Paul Hitlin, 8% of Americans Say They Own a Drone, While More Than Half Have Seen One in Operation, Pew Research Center (December 19, 2017), https://www.pewresearch.org/fact-tank/2017/12/19/8-of-americans-say-they-own-a-drone-while-more-than-half-have-seen-one-in-operation/.

2 Nathan Sheard & Adam Schwartz, Community Control of Police Spy Tech, Electronic Frontier Foundation (May 19, 2021), https://www.eff.org/deeplinks/2021/05/community-control-police-spy-tech.

3 Currently, anyone wanting to fly BVLOS has to apply for special, individualized FAA permission. By-rule flights would allow any party to carry out a BVLOS flight as long as they comply with the rules.

- Collecting data on traffic or pedestrian patterns across a town or city, both aggregated and individually targeted.
- Measuring home occupancy rates by surveying which houses are lit up or heated in the visual or infrared spectrum, and when and to what degree, or by measuring the amount and type of vehicles parked outside at different times and days.
- Following randomly selected customers home from a store or restaurant to get a sense of where their customer base is coming from.
- Collecting information about homes and their owners for marketing purposes, such as who owns a backyard grill, who has a neat garden and who doesn't, or who could use some roof repairs.
- Intercepting cell phone signals using IMSI catchers (aka "Stingrays") to collect location data or other information that can be associated with specific people through the unique identifiers of cellphones.
- Collecting WiFi identifiers to correlate online profiles to individuals' physical locations.

There could also emerge many other privacy-invasive uses yet to be conceived of. The companies that are operating the most flights with the most time in the air might be in an especially good position to collect data that, because of its greater comprehensiveness, would be all the more valuable.

While effective transparency measures could create reputational and market pressures against such data collection, much surveillance is silent and invisible. If a company engaged in delivery operations, for example, decided to use those delivery flights to collect information on people along flight paths, those people might never know.

Mass surveillance

These kinds of privacy-sensitive commercial uses could be pushed to extremes if companies or services emerge that use rotating parallel flights to create 24/7 wide-area surveillance of cities and towns. Such a wide-area surveillance service is already being pitched to police departments (none of which have adopted it, partially due to community opposition as well as a successful ACLU constitutional challenge[4]). But similar services could establish private markets for such surveillance, for example by selling to insurance companies, real estate firms, and others.

Law enforcement

Law enforcement uses of drones raise many issues, including routine surveillance and tracking; the retention and sharing of imagery, including incidentally collected imagery; discriminatory deployments; the potential for abuse; and use in automated enforcement. The ACLU[5], EFF[6], and

4 Saira Hussain & Hannah Zhao, Victory! Fourth Circuit Rules Baltimore's Warrantless Aerial Surveillance Program Unconstitutional, EFF (July 2, 2021), https://www.eff.org/deeplinks/2021/07/victory-fourth-circuit-rules-baltimores-warrantless-aerial-surveillance-program.

5 Jay Stanley & Catherine Crump, Protecting Privacy from Aerial Surveillance: Recommendations for Government Use of Drone Aircraft, ACLU (Dec. 2011), https://www.aclu.org/sites/default/files/field_document/protectingprivacyfromaerialsurveillance.pdf.

EPIC[7] have all made recommendations for checks and balances on law enforcement's use of drones.

Unwanted intrusions

Even in the absence of unwanted collection of personal information or the like, many people will resent the presence of video cameras hovering in the air over their heads, especially around their homes. Whether a drone has a camera or other potentially intrusive sensors on board may not matter; it is a well-established principle of privacy that people are just as affected by the possibility[8] that they are being watched as they are by actually being watched. This kind of privacy invasion involves a diffuse set of feelings that combines the dislike of being watched, intrusion upon seclusion, spoliation of environment, intimidation, nuisance, and noise. We strongly suspect that the frequent incidences of "drone rage" that have been experienced in the drone community reflect this cluster of feelings.

To the extent the kinds of invasions take place, that will only intensify this set of negative feelings towards drones.

There is a strong possibility that routine and scaled BVLOS operations, especially package delivery, will increase the public's exposure to drone operations over time. Today's relatively rare line-of-sight operations will become tomorrow's daily or even hourly BVLOS operations over or near people's homes, especially if they find themselves situated in a flight pattern or chokepoint. It's possible that drones will initially be welcomed as a novelty but will quickly wear out their welcome.

The FAA's role in addressing privacy risks

From the beginning, FAA recognized the importance of addressing privacy to facilitate the integration of drones into the National Airspace. Soon after the FAA Modernization Act of 2012 was passed, then Representatives Ed Markey and Joe Barton, the Co-Chairmen of the Bi-Partisan Privacy Caucus, sent a letter to the Acting FAA Administrator, Michael Huerta, to "express our concerns about the [FAA Modernization Act's] potential privacy implications and to request information about how the FAA is addressing these important matters."[9] Markey and Barton stated:

---

6 Letter from Jennifer Lynch, EFF Staff Attorney, to Lieutenant Governor Mead Treadwell & Mr. Robert Davis (May 31, 2013), https://www.eff.org/files/eff_asa_model_drone_legislation_letter.pdf.

7 Use of Unmanned Aerial Vehicles (Drones): Hearing Before the Majority Policy Comm. of the Penn. State Senate (Mar. 15, 2016), (statement of Jeramie D. Scott, EPIC Director of Domestic Surveillance Project), https://epic.org/privacy/drones/EPIC-Drone-Testimony-20160315.pdf.

8 Karen Gullo, Surveillance Chills Speech—As New Studies Show—And Free Association Suffers (May 19, 2016), https://www.eff.org/deeplinks/2016/05/when-surveillance-chills-speech-new-studies-show-our-rights-free-association.

9 Letter from S. Markey & Rep. Barton, to Michael P. Huerta, Fed. Aviation Acting Admin. (Apr. 19, 2012), https://irp.fas.org/congress/2012_cr/drones041912.pdf.

> "Now that the FAA has initiated the rulemaking process for implementing the FAA Modernization and Reform Act, the agency has the opportunity and responsibility to ensure that the privacy of individuals is protected and that the public is fully informed about who is using drones in public airspace and why.[10]"

The FAA responded by stating that "[t]he FAA recognizes that there are privacy concerns related to UAS operations, and the agency will review these concerns in the context of the ongoing UAS rulemaking activities and integration plans."[11]

The FAA's Comprehensive Plan and Roadmaps for drone integration have repeatedly recognized privacy as a key issue. In the Comprehensive Plan to guide the integration of drones required by the 2012 act, the FAA stated that "[m]embers of the NextGen SPC [Senior Policy Committee] agree on the need to address privacy concerns of the public at large while safely integrating UAS in the NAS."[12] All subsequent versions of the Roadmap also speak to the importance of addressing privacy with the most recent one stating:

> "The public has real concerns regarding UAS operations with respect to safety and privacy. If people don't feel safe when drones are operating around them, or they have persistent fears of drones intruding in their private lives, then UAS commercial opportunities will be very limited."[13]

As the FAA has made clear, the public acceptance of drones is required for the integration of drones into the national airspace, and the public will not accept drones if privacy is not addressed. As the agency overseeing the integration of drones, the FAA must make sure that there is a pathway for addressing ongoing privacy risks and new ones as they emerge.

Considerations in addressing privacy risks

Community response to drones

One of our biggest concerns is that an FAA BVLOS regulation will leave no room for addressing privacy problems that emerge with the technology. The FAA must not preempt localities from restricting BVLOS flights to address privacy invasions, whether or not the FAA decides to protect privacy in a rulemaking opening the skies to by-rule operations.

---

10 *Id.*

11 Letter from Fed. Aviation Acting Admin., Michael P. Huerta, to S. Markey (Sept. 21, 2012).

12 JOINT PLAN. & DEV. OFF., UNMANNED AIRCRAFT SYSTEMS (UAS) COMPREHENSIVE PLAN (Sept. 2013), 7, https://www.faa.gov/about/office_org/headquarters_offices/agi/reports/media/UAS_Comprehensive_Plan.

13 Fed. Aviation Admin., Integration of Civil Unmanned Aircraft Systems (UAS) in the National Airspace System (NAS) Roadmap (3rd ed. 2020) at 21, https://www.faa.gov/uas/resources/policy_library/media/2019_UAS_Civil_Integration_Roadmap_third_edition.pdf

The truth is that we don't know to what extent communities will want or accept regular or frequent drone flights, or where, or under what conditions. That will depend on a complex and unpredictable set of often contradictory factors, ranging from whether the technology's benefits are broad and substantial or narrow and overblown, to people's feelings about the technology's safety, to their feelings about the full range of possible privacy invasions discussed above.

From its perch in Washington DC, the FAA should not try to anticipate what all of those privacy problems will be in the coming years and decades, and how all communities will feel about them, and what kinds of restrictions or regulations are needed to solve the conflicts to the satisfaction of all kinds of American communities. It should not treat drones like crewed aviation, and impose a uniform set of drone rules across the entire country that preempts all state and local rules and thereby grant anyone a by-rule right to fly over communities.

With drones flying under 400 feet, a single nationwide rule is not likely to work in the way it does for crewed aviation. Crewed flights are generally too high to trouble most people. Noisy and camera-carrying robots flying in and through Americans' communities will be a whole new ballgame. The issues and controversies that have surrounded aircraft noise around some airports may emerge in every small neighborhood, albeit driven by more than noise. When residents feel there is too much wheeled vehicle traffic or traffic noise at their home, they can call up members of their city council and push to lower the speed limit, or install speed bumps, or make the street one-way. When the equivalent neighborhood complaints arise over drone flights, people should not have to call up the federal government. That is a recipe for political disaster, both for the FAA and for those who wish to see drones succeed at the things they may be well-suited to do.

Most Americans don't give much thought to drones. Most of those who are thinking about the technology today are excited about and invested in them, either emotionally or financially. But we don't want to see drones imposed on unwilling communities in disruptive and inequitable ways as Robert Moses[14] did with highways, acting out of a misguided modernist vision of what "the future" looks like, or on behalf of companies that stand to profit despite community desires and the public interest.

A better path is to allow communities to restrict drone flights in their jurisdictions (subject to limitations imposed by the First Amendment, as discussed below). This will allow accommodations between the various competing equities in drone deployment (privacy, noise, commerce, convenience, environment, etc.) to emerge organically as diverse communities react in different ways to the technology. If the technology proves practical, useful, and popular, then communities that are overly restrictive will quickly come to feel that they're missing out. If, as a practical matter, drones just don't work out for many of the uses now envisioned, or their downsides are starker than boosters hope, then they will recede into the niches where their advantages are greatest and downsides the smallest without degrading the quality of life of American communities.

14 Wikipedia, Robert Moses (Last modified Nov. 14, 2021), https://en.wikipedia.org/wiki/Robert_Moses.

The privacy problems and conflicts drones are likely to spark are diverse and unpredictable. While nationwide rules make sense in many areas such as safety and transparency, reasonable community control is not only the best way to honor the concept of democratic control over our quality of life, but also the best way to address privacy and other problems that emerge, while avoiding over-regulating to protect against privacy harms that never materialize.

First Amendment considerations

The potential for drone photography as a tool for art, journalism, and activism is significant. The First Amendment generally protects the gathering of news and other information of importance to the public, and specifically protects photography as a means of expression and as a way of gathering information. In general, a person in a public place where they have a right to be may make photographs of anything that is in plain sight. But the First Amendment does not necessarily create a right to operate a BVLOS drone, or to operate one wherever one wants, just because BVLOS drones can be used to make photos.

One thing the First Amendment generally does not permit is for the government to restrict drone flights according to the identity of the photographer or the subject of their photography. It also bars government actors from blocking drone photography of their activities just because it is politically inconvenient or embarrassing. Nor does it allow wide-ranging bans on photography of "critical infrastructure."[15] It may allow bans on drone flights near certain critical infrastructure for safety purposes (though there will be a constant temptation, which some will inevitably give in to, to use safety as a pretext for enacting such bans).

Remote ID

The remote ID requirement is one of the best opportunities for the FAA to implement privacy-related rules that will facilitate the public's acceptance of drones. A key aspect of addressing privacy concerns is to make sure people have the means to know when drones are flying in their proximity and who is flying them. Identification is important because accountability is very hard without it.

Remote ID can also facilitate much-needed transparency. Remote ID is the avenue by which the public can learn about not only what drones are flying near them, but additional information including the surveillance capabilities of the drone, the purpose of the drone, and the information the drone might be collecting.[16]

---

15 Ari Rosmarin, Drone Rules Are Already Colliding With The First Amendment, ACLU (July 16, 2015), https://www.aclu.org/blog/privacy-technology/surveillance-technologies/drone-rules-are-already-colliding-first-amendment

16 EPIC et al., Comments on the Noticed of Proposed Rulemaking: Remote Identification of Unmanned Aircraft Systems, Federal Aviation Admin. Docket No. FAA-2019-1100 (Mar. 2, 2020), https://epic.org/wp-content/uploads/apa/comments/EPIC-et-al-Comments-FAA-Remote-Drone-ID-March2020.pdf.

For the Remote ID requirement to mitigate the privacy risks of drones, the requirement must be usable and useful to the public. It should not be complicated for members of the public to identify nearby drones — it should be as simple as downloading a free app to one's phone and opening it up. And the Remote ID's range should be robust enough to give meaningful information about the number of drones in the area at a given time. Generally speaking, if the average drone is within range to collect information about a person or their immediate surroundings, then the Remote ID should have an equivalent range.

The Remote ID should directly or through an easily accessible database provide information about the drone's capabilities, purpose, and operation. This should include the type of surveillance technology on the drones and the purpose of the flight (e.g. package delivery). Drones should be identified as government, commercial, or non-commercial private. For government and commercial drones, the agency or company operating the drone should be made available. Additionally, Remote ID should allow easy access to details about the drone's operation, including what data the drone is collecting, what the data will be used for, and how long the data will be retained.

Network Remote ID, however, which would require every drone to have cellular capability and connect to the Internet to report its location in real time, does not strike the right balance between security, the privacy of those on the ground, and the privacy of drone operators. It would create a nationwide "bird's eye view" of every drone that flies, and under some proposals would give not only law enforcement exclusive access to that data, but also certain private-sector service providers. That would give those companies access to vast amounts of drone-flight data that they could use in unfair ways. For example, it might allow them to secretly gather data about consumer or commercial use of drones that would not be available to others, or to monitor drones that are being flown by a union with which the company is currently battling.

Recommendations

Requirements the FAA should implement

Transparency requirements

Transparency is a fundamental element of acceptance of drone BVLOS operations by the public. It allows the public and agencies to hold operators accountable and is a crucial means by which the public can exercise its rights.

When operating an aircraft, the operator should understand the risks that such operation imposes to the National Airspace System as well as to those on the ground—whether safety impact, noise, or environmental. By the same token, operators should also assess the impact of

their operations on the public's privacy. Privacy impact assessments are a routine requirement for many government information collection processes, and increasingly for some companies as well. We would like to see a similar requirement imposed on government and commercial BVLOS operations in the national air space. These reports should be easily and freely available to the public, and should include details such as:

- Type and Purpose of the drone operation. The operator should detail the purpose of its operation, so the public can understand its nature and also hold them accountable for mission creep, or covert-deceitful uses.
- Technical Capabilities. This should include not only the operational capabilities of the aircraft (distance, time, altitude, payload weight, etc.) but also the sensors on board, their capabilities, and the data collection they will be engaging in. For example, if the drone carries cameras, this data would include the power of any zoom lens and how that zoom is controlled (automated processes or remote operator), the camera's resolution, the camera's spectral range, and any live AI or analytics capabilities that it uses.
- Data collected. Detail of data collection that will occur during the operation. For example, if video will be collected, this would include information on when that video will be collected.
- How that data is used. The intended use of the data, for example, for navigational purposes, detection and avoidance of obstacles, infrastructure inspection, etc.
- Data disclosure. Who, other than the operator, can access the data, or with whom will it be proactively shared, and for what purpose.
- A privacy impact assessment. An assessment of how the operation, with the sensors, data collection, and sharing that it involves, will affect the communities over which this operation will take place, and what mitigations are in place to address these issues.

Community involvement requirements

- The FAA should allow localities to set their own rules in order to protect privacy or other values and to encourage local innovation.
- The FAA should ensure that there is enough transparency regarding drone flights that communities can make informed decisions about what kinds of operations they want to permit.
- The FAA should create ongoing mechanisms for individuals to raise concerns with the FAA, submit complaints, or report privacy invasions that they have experienced from drone operations (as well as noise and safety problems).

Remote ID requirements

The FAA must implement a program of Remote ID that empowers people on the ground to obtain key information about BVLOS drones in their vicinity. It should not implement a system for centrally tracking all drone flights across the nation.

Additional requests

- Minimization requirements. Congress must require government and commercial BVLOS operators to minimize the data collected, used, and shared to what's relevant and necessary to the operation described in their public statements. For example, if a BVLOS drone is doing delivery, no data can be collected that is not strictly necessary to achieve that purpose, and video and image data collected for that purpose cannot be retained or used for other purposes like mapping services. Where appropriate this mandate should also include use of technical means of minimizing data collection. For example, a drone conducting a safety assessment of a railroad could electronically block out the portion of the video that includes the backyards of neighboring homes
- Additional stakeholder processes. We applaud the FAA for recognizing the need to expand the scope of the stakeholders participating in the Advisory Rulemaking Committee process, and for inviting privacy advocates to contribute their views in this Aviation Rulemaking Committee. It was often difficult for non-aviation stakeholders to participate in the process however, and we recommend that the agency consider convening a separate ARC or other proceeding through which to gather community, privacy, and other non-industry, non-aviation stakeholder input and perspectives. Future ARCs on the ongoing integration of drones into the national air space might also be structured to allow such perspectives to have separate conversations on questions that they themselves define.

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)
Statement of Concurrence / Non-Concurrence

Voting Member Name	Jeff Decker
Voting Member Organization	Boeing/Insitu

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

1. Concur with the Final Document as written

Voting Member Signature: _____ Date: _____

2. Concur with the Final Document as written with the following exception(s): **(Fully explain the areas of exception below, providing specific page and line number. Submission of separate paper is acceptable).**

Voting Member Signature: _____ Date: _____

3. Non-Concur with the Final Document as written. Letter of Dissent must be provided.

Voting Member Signature: _____ Date: _____

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)
Statement of Concurrence / Non-Concurrence

Voting Member Name	Jeff Gunnulfsen
Voting Member Organization	AFPM

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

1. Concur with the Final Document as written

Voting Member Signature: 

_____ Date: ___3-4-2022_____

2. Concur with the Final Document as written with the following exception(s): (Fully explain the areas of exception below, providing specific page and line number. Submission of separate paper is acceptable).

Voting Member Signature: _____ Date: _____

3. Non-Concur with the Final Document as written. Letter of Dissent must be provided.

Voting Member Signature: _____ Date: _____

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)
Statement of Concurrence / Non-Concurrence

Voting Member Name	Jennifer Player
Voting Member Organization	Skydio, Inc.

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

1. Concur with the Final Document as written

Voting Member Signature: _____ Date: _____

2. Concur with the Final Document as written with the following exception(s): **(Fully explain the areas of exception below, providing specific page and line number. Submission of separate paper is acceptable).**

Integrating new technology is always a story of fits and starts, of long arcs of progress rather than short and decisive success. When automobiles first took to the streets, governments struggled to integrate them into already busy roads and thoroughfares. Initially, some governments required people to walk in front of vehicles waving flags to warn pedestrians of their presence. The story of automotive integration was a long one, but the overall arc bent toward progress.

The same holds true for drones. Today's Aviation Rulemaking Committee report on BVLOS represents a momentous step forward in our country's march to capitalize on the benefits of drone technology. It would be easy to read the report in a vacuum, paying attention only to its four corners. But, as with the history of automotive integration, there is much more to the story. Today's report builds on over a decade of slow, steady progress. As early as 2013, the FAA's Pathfinder Programs began to explore the promise of long-range BVLOS operations, beginning with flights in the Arctic and expanding to flights over linear infrastructure and agricultural fields.

In 2017, the White House, DOT, and FAA launched the Integration Pilot Program (IPP), a public-private partnership that tested new concepts in a way designed to learn lessons and build community support. Under that program, Skydio helped to pioneer new frontiers for first responders flying BVLOS to gain critical situational awareness in emergency situations. Now, thanks to the FAA's leadership, any public safety agency can obtain that authorization. We understand that more than 200 agencies have done so, relying on this special authority to facilitate life-saving operations.

In the IPP, Skydio also helped to accelerate advanced drone operations for the inspection of infrastructure. Partnering with North Carolina DOT's pioneering drone program, we secured the first statewide BVLOS waiver to inspect bridges, of which North Carolina has almost 14,000. We believe this was the first "true BVLOS" waiver under Part 107, meaning that it did not require the use of visual observers or "detect and avoid" technology, such as radars. In 2020, FAA launched the BEYOND program to build on the success of the IPP.

In 2021, the FAA announced the formation of an Aviation Rulemaking Committee (ARC) to recommend "performance-based regulatory requirements to normalize safe, scaleable, economically viable, and environmentally advantageous UAS BVLOS operations." The report released today responds to that calling.

We urge every reader to review the report in light of the long arc of progress explained above. At first blush, some elements of the ARC report may seem futuristic or unfounded, but make sense against the backdrop of integration efforts completed over the last decade.

We urge policy makers to read the report with an eye on the future. The United States dominated the first century of flight, defined by crewed aircraft with a pilot at the controls. US leadership enabled countless economic and societal benefits, creating millions of high-skill, high-pay jobs and making air travel accessible for the masses. We have now entered a new century of flight. This century, the second century of flight, will be defined by uncrewed, and increasingly, autonomous aircraft---beginning with small, smart drones flying at very low altitudes and building towards larger, higher-flying aircraft delivering cargo and people.

Other nations are not content to let the US lead the second century in the way we led the first. We must summon the political will to win. In the same way that President Kennedy led us to the moon with his stirring speech in 1961, today's policy makers have the opportunity to inaugurate a new era of US leadership for a new era of aviation. Implementing the ARC report is the way to begin.

While noting our **concurrence** on the ARC report, we offer the following comments for consideration.

Operator Qualification Recommendations

Skydio provides two comments with respect to the recommendations on Remote Operator Certificate (ROC).

The first comment involves the threshold for the ROC. In general, the ARC recommends (OQ 2.12) that operations exceeding certain human-to-UA ratios--1:5 and 1:20, respectively--must obtain a ROC. That requirement is well intended but misguided, suffering from three fundamental flaws:

1. The human-to-UA ratios that underpin the ROC requirement are not performance based, contrary to the ARC Charter's mandate to provide recommendations based on "performance-based regulatory requirements." Static numerical ratios provide a paradigmatic example of prescriptive rulemaking, rather than performance-based requirements. A performance-based approach would revolve around the level of safety to be achieved in one-to-many operations, not fixed ratios.

2. In addition to being prescriptive rather than performance-based, the static numerical thresholds proposed by the ARC are not based on data. Those ratios were lifted from the FAA's Durability & Reliability Process, which adopted them in the very different context of airworthiness certification. Even in that context, the ratios were not backed by studies displaying that operations in excess of those ratios present special safety risks that must be addressed by regulatory measures, such as a ROC.

3. Finally, the static numerical thresholds proposed by the ARC are not future proof and may inadvertently inhibit innovation. Even if data showed that ratios above 1:5 or 1:20 present greater levels of risk based on present-day technology (which is not the case), that may not be true next year--much less three or five or ten years from now. Adopting static ratios would anchor the BVLOS rule in the past, rendering the rule incapable of accommodating improvements in technology and operations. The FAA writes performance-based rules to avoid this very problem. These ratios will drive system requirements and organizational structures. Instead of focusing on enabling safe and effective operations, companies will revolve their designs around the ratios, inhibiting innovation and potentially stifling the development of more advanced systems capable of providing even higher levels of safety with ratios that fall outside of the ARC's thresholds.

The FAA should adopt a performance-based approach to solve this potential problem. Specifically, thresholds for one-to-many operations should be based on the operating limitations of the UAS--which could be more or less than the 1:5 and 1:20 figures proposed for Automation Levels 2 and 3 in the ARC report. The thresholds would vary according to a variety of factors, including the human machine interface, safety features of the UAS, and relative risk of the operation. Consensus-based industry standards could flesh that out, outlining the technical means necessary to achieve the goal of safe and effective one-to-many operations. In the end, what matters is the level of safety to be achieved--not an arbitrary, static threshold.

The second comment focuses on the scope of the ROC recommendation. The ARC report recommends that the Remote Air Carrier Certification apply to package delivery operations that exceed the one-to-many thresholds above. Requiring package delivery operators to obtain an operating certificate is sensible. That requirement aligns with the current requirement to obtain Part 135 approval before carrying the property of another for compensation.

But the ROC recommendation reaches too far. It would apply to operations that do not currently require approval under Part 135--namely, industrial inspection operations. Crewed operations inspecting infrastructure are traditionally categorized as Aerial Work Operations and do not necessarily require an operating certificate. (See OQ2.11 Approach 2c versus 14 CFR 119.1e(4) and 8900.1 CHG 775 Volume 2 Chapter 2 2-127C).

The ROC recommendation would reach any other kind of operation, including low-altitude inspection operations over pipelines, power plants, and remote industrial facilities. That approach has no analogue in the crewed aviation context. And no information has been presented to suggest that extending the ROC requirement outside of those confines is necessary to advance safety goals. As explained elsewhere in the ARC report, industrial inspection operations offer tremendous benefits in terms of safety and efficiency. Requiring a ROC for those operations--which do not necessarily require an operating certificate for crewed aircraft--is unnecessary and potentially counter-productive. Accordingly, we respectfully recommend that the FAA apply the ROC requirement only to categories of operations subject to present-day operating certificate requirements, such as package delivery.

Some may suggest that the ROC requirement is necessary because it provides a platform for operator training. The ARC did not require a practical exam for the BVLOS rating, but did specify that one-to-many operations over the thresholds above would require a structured training program on the operator's system through the ROC process. It is important to recognize, however, that the additional knowledge and examination areas outlined under the BVLOS rating (in recommendation OQ2.7) cover helpful aspects of one-to-many operations. For aerial work / inspection operations, we believe the inclusion of scenario-based questions in the examination for the BVLOS rating will sufficiently evaluate the situational awareness and aeronautical decision making key for safe one-to-many operations, given the level of automation which will be available in the coming years.

At bottom, industrial inspection operations within the human-to-drone ratio specified in the UAS operating limitations should be permitted under the Part 108 operating rules, rather than requiring a new ROC system that has no analogue in the crewed aviation context, is not based on data, and is not future proof.

Voting Member Signature:  Date: 3/3/2022

3. Non-Concur with the Final Document as written. Letter of Dissent must be provided.

Voting Member Signature: _____ Date: _____

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)

Statement of Concurrence / Non-Concurrence

Voting Member Name	Jens Hennig, Vice President Operations
Voting Member Organization	General Aviation Manufacturers Association (GAMA)

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

1. Concur with the Final Document as written

Voting Member Signature: _____ Date: _____

2. Concur with the Final Document as written with the following exception(s): **(Fully explain the areas of exception below, providing specific page and line number. Submission of separate paper is acceptable).**

Voting Member Signature: _____ Date: _____

3. Non-Concur with the Final Document as written. Letter of Dissent must be provided.

Voting Member Signature: _____ Date: MARCH 3, 2022

March 3, 2022

Federal Aviation Administration
Attn: Jay Merkle
800 Independence Avenue, SW
Washington, DC 20591

Subject: Non-Concur with Beyond Visual Line of Sight (BVLOS) Aviation Rulemaking Committee (ARC) Report

Dear Mr. Merkle and BVLOS ARC Leadership,

The General Aviation Manufacturers Association (GAMA) is an international trade association representing over 140 companies. GAMA exists to foster and advance the general welfare, safety, interests, and activities of the global business and general aviation industry. This includes promoting a better understanding of general aviation manufacturing, maintenance, repair, and overhaul and the important role these industry segments play in economic growth and opportunity, and in serving the critical transportation needs of communities, companies, and individuals worldwide.

GAMA supports the safe integration of uncrewed/remotely piloted aircraft into the U.S. National Airspace System (NAS). A number of our members are actively working to advance the safe integration of UAS and similar aircraft and operations into the U.S. airspace and internationally.

Unfortunately, GAMA is not in a position to support the BVLOS ARC Final Report (version shared in draft on February 25, 2022) due to remaining concerns with the content of the report and a number of its recommendations. GAMA has actively engaged in several BVLOS ARC working groups and during each plenary. Additionally, dozens of comments were provided during Phase 1 as well as the draft final reports on December 17, 2021 and February 11, 2022. GAMA also appreciates the additional time provided since December 2021 in response to our request to attempt to resolve remaining disagreements and areas of confusion in the December 17 version of the report, but alas many issues were left unresolved in the final document. This is a missed opportunity for the UAS industry and the broader aviation industry's goal to advance aviation safety while integrating an important emerging segment of aviation into the NAS.

In lieu of restating the detailed comments previously submitted during consultations and discussions, GAMA recommends that the Excel comment documents, and their resolution be provided to the FAA in their entirety as part of the ARC record for the agency's use in potential future rulemaking, because many concerns raised during those exchanges are not captured in the text of the ARC report. GAMA's specific concerns include, but are not limited to:

- The report does not accurately discuss the safety continuum, especially the importance of considering not only the weight of the vehicle, but the complexity of the operation, its purpose, and where the operation is planned, including specifically the higher level of care that must be afforded to operations in a densely populated area and consideration of public acceptance and expectations.

General Aviation Manufacturers Association
HEADQUARTERS 1400 K Street NW | Suite 801 | Washington, DC 20005 USA | +1 202 393 1500 MAIN | +1 202 842 4063 FAX
EUROPEAN OFFICE Rue de la Loi 67/3 | 1040 Brussels Belgium | +32 (0) 2 550 39 00 MAIN
www.GAMA.aero

- The inclusion of a flawed analogy between the operation of Light Sport Aircraft (LSA) and conducting a BVLOS operation. This analogy underscores an inappropriate consideration of the safety continuum.
- A misunderstanding about general aviation being willing to accept the risk of midair collisions when vast FAA and industry resources have been expended over the past several decades to eliminate this type of accident by analyzing each event and developing and deploying mitigations, including new aircraft technology.
- The proposed amendment to right-of-way regulations (*i.e.*, 14 CFR 91.113) which raises safety concerns for low altitude operations of various general aviation aircraft.
- And, indications of a misunderstanding of how the FAA participates in Standards Development Organizations (SDO) during the development of industry consensus standards, including the FAA's role and responsibility in determining whether to accept those standards as a means of compliance.

Additional feedback is also captured in the joint-association letter which is included with this letter together with the requested ARC non-concurrence form.

As part of the record, I authorize and specifically request the inclusion of GAMA's letter of dissent as an appendix to the BVLOS ARC report as required by FAA's Office of Rulemaking Committee Manual (*see*, ARM-001-015; Section 2.4 and 2.6).

GAMA looks forward to continuing to work with the FAA on the safe integration of new entrants into the NAS, including operations with uncrewed aircraft beyond visual line of sight and more broadly in the airspace. We note that the ARC charter provides for up to 32 months of work under the umbrella of the June 8, 2021 framework. The FAA should leverage the expertise that resides within the ARC membership to continue to advance the development of a regulatory framework that enables BVLOS operations, including as part of the agency's response to this report. As you know, the FAA has previously leveraged many ARCs and Aviation Rulemaking Advisory Committee groups during the comment resolution proposed for proposed regulations.

Please contact me (jhennig@GAMA.aero; +1-202-393-1500) with any questions about GAMA's comments.

Respectfully,

Jens C. Hennig
Vice President, Operations

Enclosure: BVLOS ARC Coalition of Aviation Association Statement of Non-Concurrence

BVLOS ARC Coalition of Aviation Associations
Statement of Non-Concurrence

March 3, 2022

Ms. Eileen Lockhart, BVLOS ARC Co-Chair
Director of Emerging Markets
Air Methods

Mr. Sean Cassidy, BVLOS ARC Co-Chair
Director, Safety, Flight Ops and Regulatory Affairs
Amazon Prime Air

Dear Ms. Lockhart, Mr. Cassidy and the BVLOS ARC membership,

After having the opportunity to review the final Beyond Visual Line of Sight (BVLOS) Aviation Rulemaking Committee (ARC) report and its recommendations, the undersigned members of the ARC write this Statement of Non-Concurrence to declare our joint dissent to several recommendations and to renew our continued concerns related to the substance and quality of the report, as well as the processes followed during the report development.

We fundamentally support the safe enabling of BVLOS operations in the U.S. National Airspace System (NAS) and are all working to ensure the future success of this segment of the aerospace community.

However, after reviewing the final report and considering the challenges observed in the past seven months to accurately characterize the positions of the 89 ARC members, the final report could have substantial negative impacts on the safe and efficient integration of BVLOS operations and the safety of NAS users. For these reasons, we non-concur with specific concerns about the following recommendations:

- Target levels of safety and comparison with Light Sport Aircraft (LSA) including the reference to the safety continuum (AG 2.1);
- Change in right of way and see and avoid responsibilities (FR 2.1- 2.4);
- Shielded Operations and Areas and their related definitions (FR 2.2- 2.4);
- Operating requirements proposed to govern Remote Air Carrier and Remote Operating certificate holders (OQ 2.10-2.13);
- Changes in U.S. Air Carrier ownership requirements (GP 2.11);
- Lacking justification in context of safety continuum related to aircraft Size (*i.e.*, 800k ft/lbs limit) (AS 2.1);
- HAZMAT carriage (AG 2.5, OQ 2.19); and
- General lack of defined airspace scope with the BVLOS ARC report and misunderstanding of airspace separation

In addition, the final report possesses neither a coherent structure nor clear guidance upon which the Federal Aviation Administration (FAA) can be reasonably expected to act. Furthermore, there are significant misrepresentations throughout the narrative that inaccurately reflect (or completely neglect to mention) the disagreements and dissent of stakeholders across the ARC membership.

Finally, we must also highlight our ongoing concerns of procedure since the start of the BVLOS ARC. In particular, the lack of transparency and fairness offered to ARC membership. Verbal and written comments and dissents have been ignored, not offered full plenary discussion and adjudication, or given inaccurate representation. This has resulted in certain recommendations appearing as preconceived notions that are not expected to enable safe and fair BVLOS operations. Unfortunately, the above concerns are not new. In fact, all these issues have been brought up in subgroups, comments in response to earlier draft reports, directly in discussions with ARC leadership, and during plenaries.

We understand the historical nature and complexity of past ARCs that have attempted to advance uncrewed operations. We remain committed to continue our work to improve the BVLOS ARC recommendations before and after they are submitted to the FAA. Thank you all for your continued leadership in this very important step towards safely enabling BVLOS operations.

Sincerely,

Aerospace Industries Association
Aircraft Owners and Pilots Association
Air Line Pilots Association
General Aviation Manufacturers Association
Helicopter Association International
Praxis Aerospace Concepts

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)
Statement of Concurrence / Non-Concurrence

Voting Member Name	Jeramie D. Scott
Voting Member Organization	Electronic Privacy Information Center (EPIC)

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

1. Concur with the Final Document as written

Voting Member Signature: _____ Date: _____

2. Concur with the Final Document as written with the following exception(s): **(Fully explain the areas of exception below, providing specific page and line number. Submission of separate paper is acceptable).**

Voting Member Signature: _____ Date: _____

3. Non-Concur with the Final Document as written. Letter of Dissent must be provided.

Voting Member Signature: _____ Date: March 3, 2022

epic.org

Electronic Privacy Information Center
1519 New Hampshire Avenue NW
Washington, DC 20036, USA

+1 202 483 1140
+1 202 483 1248
@EPICPrivacy
https://epic.org

The Electronic Privacy Information Center (EPIC) is a public interest research center in Washington, D.C. and was established in 1994 to focus public attention on emerging privacy issues. Since Congress mandated the FAA integrate drones into the National Airspace, EPIC has urged the agency to address the privacy implications of drones.

The FAA established the Unmanned Aircraft Systems (UAS) Beyond Visual Line-of-Sight (BVLOS) Operations Aviation Rulemaking Committee (ARC) to make recommendations regarding regulatory requirements for BVLOS drone operations. Unfortunately, EPIC cannot concur with the resulting final ARC report.

EPIC joins the ACLU and EFF in not signing this report, as it did not incorporate the policy recommendations for which we advocated during the ARC. We summarized those recommendations in a memo that we circulated to the ARC leadership and FAA staff (appended to this letter). Some of our most significant concerns can be summarized as follows:

- Privacy practices should not be voluntary. Non-binding principles offer no protection for the public nor any real incentive for operators to comply, leaving the field wide open for abuse.
- The transparency of operators' practices must be mandatory. This ARC was adamant about performance-based and data-driven proposals, so it seems counter to the FAA's mission not to require that basic information that would be necessary to understand the privacy risks be made public.
- Community engagement and control are critical. The "community response to drones" conversation was focused on noise and environmental impact, but not community concerns about privacy and intrusion. It seemed to us important to evaluate whether and to what extent there is a risk of negative community reaction to normalized and scaled BVLOS operations stemming from such concerns, and what the path will be for addressing such reactions. Insofar as the ARC considered negative community responses to drones, the solution that was endorsed was communicating with and educating the public. But that was envisioned as a one-way street; there was a studious refusal to consider whether and how communities should have control over the drones that fly above them.
- There was no consideration given to negative uses of drones, and how to constrain them, other than government security agency concerns over security threats. We think that the section on "societal benefits" of drones contains many legitimate points about the possible advantages this technology might bring. But the omission of a full, balancing discussion of the technology's potential downsides (other than security threats) does not reflect our agnostic views on the extent to which drones are likely to provide benefits to the American people. We cannot join what is, essentially, a brief arguing mainly for the advantages of drones without addressing substantial issues they create for the public.

We greatly appreciate that the FAA recognized the need to include privacy advocates as well as various other community and non-aviation stakeholders in this Advisory Rulemaking Committee process. This initial effort at expanding that stakeholder representation was not entirely successful, however.

Industry representatives led the ARC, set its agenda, and dominated in numbers. Reflecting past practice, ARC leaders and participants and FAA staff consistently spoke of the ARC as a process by which "industry" provided feedback to the FAA. Some industry representatives had little interest in discussing challenging questions. Consideration of the privacy risks of drones inherently means thinking about their potential downsides, yet the ARC was dominated by and structured for drone boosters, with much conversation over how to sell the technology to the public. That was inherently in conflict with the desire of privacy advocates to consider the potential downsides of drones and their possible negative uses, and how those might be addressed.

Our participation was also hampered at times by the highly technical nature of some of the discussions. To be sure, we understood that much of the discussion would involve technical safety and other aviation questions about which our organizations hold no opinion. However, it was not always clear when a technical question had policy implications. Even where those implications seemed clear, it was often difficult to have a nuanced discussion on the issues presented and the implications of various decisions. Despite laudable efforts by FAA staff to encourage the industry and aviation community participants to "level-set" and "explain terms," such participants couldn't help but slip back into lingo, and the gap in knowledge was significant enough that it effectively excluded non-aviation participants from important discussions.

As the FAA continues to work on incorporating broad multi-stakeholder feedback on drones, which will interact with American life and communities in far more intimate ways than crewed aviation, we recommend that the agency consider convening a separate ARC or other proceeding through which to gather community, privacy, and other non-industry, non-aviation stakeholder input and perspectives, or structuring future ARCs related to the integration of drones to allow such participants to have separate conversations on questions that they themselves define. The model of creating an ARC for "industry" input may not make sense as a mechanism for input from this more diverse set of stakeholders in the same way it may have in other ARCs.

We found the ARC a valuable way to learn more about the aviation and drone industry, and we applaud the FAA for inviting privacy groups and other stakeholders to this process. We also found that FAA staff were uniformly helpful, encouraging, and open to hearing our points of view, and we feel it gave us the opportunity to communicate our point of view to the agency even though they are not reflected in the report.

Memo by ACLU, EFF, and EPIC to the ARC:

Privacy Considerations for BVLOS Drones:

Privacy Considerations for FAA Aviation Rulemaking Committee on Beyond Visual Line of Sight Drone Flights

Arrieta Andrés, Scott Jeramie, Stanley Jay

Authors: Arrieta Andrés, Scott Jeramie, Stanley Jay

A publication of the American Civil Liberties Union, Electronic Frontier Foundation, and Electronic Privacy Information Center, 2021.

December 2021

Introduction

Our organizations recognize the many potential positive uses to which Beyond Visual Line Of Sight ("BVLOS") drone flights could be put. But it is also our job to consider some of the implications that a regime of routine and scaled BVLOS flights could have for privacy and surveillance, how such a regime could harm Americans' privacy, and what the pathway is for ensuring that we can maximize the benefits of this technology while minimizing the harms.

Why addressing privacy is important

Drones are very powerful surveillance platforms that greatly increase the ease and possibility of aerial surveillance. As drone technologies advance, drones will be able to fly longer and farther, carry heavier and more diverse payloads of surveillance equipment, and become even more capable of autonomous operation—all at an increasingly cheaper price point. The operational flexibility of duration, distance, and altitude makes it harder for people on the ground to detect and understand what is happening with a particular surveillance drone.

Drones can carry numerous surveillance technologies

Most drones by default are equipped with cameras that can record images or take pictures. These cameras can be quite powerful. Even consumer drones can come equipped with cameras with the ability to shoot in 4K, and military drones carry gigapixel cameras that can photograph city-sized areas.

Cameras are not the only technology that can be added to drones, of course. Drones are a platform, and the only limits on what they can carry are size and weight. Among the sensors that can be attached to drones are microphones, heat and movement sensors, mobile phone interception devices (aka IMSI catchers), GPS, radar, Lidar, sonar, range-

finders, magnetic-field change sensing, radio frequency sensors, and chemical and biochemical sensors. Data from drone surveillance can be combined with other surveillance technologies such as facial recognition and license plate readers or correlated with data from surveillance technology on the ground or online to identify people and vehicles, track their movements across time and space, or analyze their associations or habits. The lack of rules concerning drones and the technology they can carry means there will be vast opportunities for surreptitious data collection from the public.

Drones increase the risk of aerial surveillance

The lack of legal protections against aerial surveillance combined with the lowered bar for entry that drones create for aerial surveillance, raises the risk of privacy invasions. The law of aerial surveillance of public spaces is murky at best and is not well enough developed to protect the public in the face of the broad availability of drones.

Drones make it cheaper and easier to conduct aerial surveillance. Drones are generally orders of magnitude cheaper than other aircraft capable of conducting aerial surveillance (i.e. airplanes and helicopters). Drones are much cheaper to maintain and don't require the same level of training to operate as do crewed aircraft making the cost of the "pilot" much cheaper. Drones are increasingly equipped with technology to steady their flight, hover in one place, and avoid crashing into objects. Many consumer drones can track specific objects on the ground or can be programmed to fly a specific flight path.

Additionally, advancing drone technology will allow for semi-autonomous or even completely autonomous drone operations, removing the need for a pilot at all. This allows a single person to oversee multiple drone flights at once—making it even easier and cheaper to operate a drone. Autonomous BVLOS drone operations, in particular, will enable widespread drone surveillance in ways that manual line of sight drone operations could not.

Protecting the public's expectation of privacy

Members of the public are not in a position to know if their privacy is being compromised by drone surveillance, and even if they were they would have no recourse. How is someone currently supposed to know if they or their community is subject to drone surveillance? Drones can be hard to detect, flying high enough to make spotting them visually or hearing them above ground noise next to impossible.

Even if someone does become aware that a drone is nearby, there is currently no practical way to know what surveillance capabilities it possesses or if it is actively collecting information. There is no consistent and clear way to know if the drone is a government, commercial, or private drone or what its purpose is. When it comes to protecting privacy from drone surveillance, the public is largely at the mercy of drone operators.

Protecting the public's expectation of privacy from drone surveillance and preventing privacy violations will facilitate acceptance of drones in the National Airspace. The public is wary of drones[1] and will only become more so when BVLOS drone operations start occurring in populated areas. And too often, a disproportionate amount of the negative impact of new technologies falls on the most vulnerable and marginalized communities[2]. Without privacy protections in place, drone incidents violating people's privacy will taint the whole industry. A few bad actors could seriously hamper integration of drones into the airspace, especially for BVLOS flights. Protecting everyone's privacy, but particularly that of vulnerable and marginalized communities, will speed up acceptance and integration of drones.

Categories of privacy invasion

Given the vast range of creative uses to which a generative technology such as BVLOS drones could be put, it is impossible to anticipate all the ways that the technology might be used to violate privacy. Some potential concerns, however, fit into the following categories:

Individual privacy-invading operators

BVLOS operations may eventually become relatively common, widespread, and democratized, as the barriers to entry continue to fall. If the FAA achieves its goal of allowing by-rule BVLOS flights[3], and such a general rule doesn't include privacy protections, we are likely to see BVLOS drones used for aerial reconnaissance in privacy-offensive ways. For example, drones might be used to follow other people for extended periods of time and/or across extended distances. People might follow the car of a celebrity, their ex-wife's new boyfriend, a driver that one is angry at, or an attractive person as they complete their jog.

Corporate privacy invasions

If BVLOS flights are permitted by any operator complying with a rule, numerous uses of such flights will emerge that have significant privacy implications. In today's world, data

1 DACUS, Drones and Drone Operations – Citizen's Perspective: Representative population survey on the acceptance of drones and the social impact of drone operations in urban areas (2021), https://dacus-research.eu/wp-content/uploads/2021/08/D5.1-Social-Acceptance-Survey-Results.pdf; Terance D. Miethe, Ph.D. et al., UNLV Center for Crime and Justice Policy, Public Attitudes about Aerial Drone Activities: Results of a National Survey (July 2014), https://www.unlv.edu/sites/default/files/page_files/27/PublicAttitudesAboutAerialDroneActivities.pdf;Paul Hitlin, 8% of Americans Say They Own a Drone, While More Than Half Have Seen One in Operation, Pew Research Center (December 19, 2017), https://www.pewresearch.org/fact-tank/2017/12/19/8-of-americans-say-they-own-a-drone-while-more-than-half-have-seen-one-in-operation/.

2 Nathan Sheard & Adam Schwartz, Community Control of Police Spy Tech, Electronic Frontier Foundation (May 19, 2021), https://www.eff.org/deeplinks/2021/05/community-control-police-spy-tech.

3 Currently, anyone wanting to fly BVLOS has to apply for special, individualized FAA permission. By-rule flights would allow any party to carry out a BVLOS flight as long as they comply with the rules.

is worth money, so there will be constant market incentives to maximize privacy-invasive aerial data collection practices.

Possible privacy-invasive uses of BVLOS drones include:

- Collecting data on traffic or pedestrian patterns across a town or city, both aggregated and individually targeted.
- Measuring home occupancy rates by surveying which houses are lit up or heated in the visual or infrared spectrum, and when and to what degree, or by measuring the amount and type of vehicles parked outside at different times and days.
- Following randomly selected customers home from a store or restaurant to get a sense of where their customer base is coming from.
- Collecting information about homes and their owners for marketing purposes, such as who owns a backyard grill, who has a neat garden and who doesn't, or who could use some roof repairs.
- Intercepting cell phone signals using IMSI catchers (aka "Stingrays") to collect location data or other information that can be associated with specific people through the unique identifiers of cellphones.
- Collecting WiFi identifiers to correlate online profiles to individuals' physical locations.

There could also emerge many other privacy-invasive uses yet to be conceived of. The companies that are operating the most flights with the most time in the air might be in an especially good position to collect data that, because of its greater comprehensiveness, would be all the more valuable.

While effective transparency measures could create reputational and market pressures against such data collection, much surveillance is silent and invisible. If a company engaged in delivery operations, for example, decided to use those delivery flights to collect information on people along flight paths, those people might never know.

Mass surveillance

These kinds of privacy-sensitive commercial uses could be pushed to extremes if companies or services emerge that use rotating parallel flights to create 24/7 wide-area surveillance of cities and towns. Such a wide-area surveillance service is already being pitched to police departments (none of which have adopted it, partially due to community opposition as well as a successful ACLU constitutional challenge[4]). But similar services could establish private markets for such surveillance, for example by selling to insurance companies, real estate firms, and others.

4 Saira Hussain & Hannah Zhao, Victory! Fourth Circuit Rules Baltimore's Warrantless Aerial Surveillance Program Unconstitutional, EFF (July 2, 2021), https://www.eff.org/deeplinks/2021/07/victory-fourth-circuit-rules-baltimores-warrantless-aerial-surveillance-program.

Law enforcement

Law enforcement uses of drones raise many issues, including routine surveillance and tracking; the retention and sharing of imagery, including incidentally collected imagery; discriminatory deployments; the potential for abuse; and use in automated enforcement. The ACLU[5], EFF[6], and EPIC[7] have all made recommendations for checks and balances on law enforcement's use of drones.

Unwanted intrusions

Even in the absence of unwanted collection of personal information or the like, many people will resent the presence of video cameras hovering in the air over their heads, especially around their homes. Whether a drone has a camera or other potentially intrusive sensors on board may not matter; it is a well-established principle of privacy that people are just as affected by the possibility[8] that they are being watched as they are by actually being watched. This kind of privacy invasion involves a diffuse set of feelings that combines the dislike of being watched, intrusion upon seclusion, spoliation of environment, intimidation, nuisance, and noise. We strongly suspect that the frequent incidences of "drone rage" that have been experienced in the drone community reflect this cluster of feelings.

To the extent the kinds of invasions take place, that will only intensify this set of negative feelings towards drones.

There is a strong possibility that routine and scaled BVLOS operations, especially package delivery, will increase the public's exposure to drone operations over time. Today's relatively rare line-of-sight operations will become tomorrow's daily or even hourly BVLOS operations over or near people's homes, especially if they find themselves situated in a flight pattern or chokepoint. It's possible that drones will initially be welcomed as a novelty but will quickly wear out their welcome.

The FAA's role in addressing privacy risks

From the beginning, FAA recognized the importance of addressing privacy to facilitate the integration of drones into the National Airspace. Soon after the FAA Modernization Act of 2012 was passed, then Representatives Ed Markey and Joe Barton, the Co-Chairmen of the Bi-Partisan Privacy Caucus, sent a letter to the Acting FAA Administrator, Michael

5 Jay Stanley & Catherine Crump, Protecting Privacy from Aerial Surveillance: Recommendations for Government Use of Drone Aircraft, ACLU (Dec. 2011), https://www.aclu.org/sites/default/files/field_document/protectingprivacyfromaerialsurveillance.pdf.

6 Letter from Jennifer Lynch, EFF Staff Attorney, to Lieutenant Governor Mead Treadwell & Mr. Robert Davis (May 31, 2013), https://www.eff.org/files/eff_asa_model_drone_legislation_letter.pdf.

7 Use of Unmanned Aerial Vehicles (Drones): Hearing Before the Majority Policy Comm. of the Penn. State Senate (Mar. 15, 2016), (statement of Jeramie D. Scott, EPIC Director of Domestic Surveillance Project), https://epic.org/privacy/drones/EPIC-Drone-Testimony-20160315.pdf.

8 Karen Gullo, Surveillance Chills Speech—As New Studies Show—And Free Association Suffers (May 19, 2016), https://www.eff.org/deeplinks/2016/05/when-surveillance-chills-speech-new-studies-show-our-rights-free-association.

Huerta, to "express our concerns about the [FAA Modernization Act's] potential privacy implications and to request information about how the FAA is addressing these important matters."[9] Markey and Barton stated:

> "Now that the FAA has initiated the rulemaking process for implementing the FAA Modernization and Reform Act, the agency has the opportunity and responsibility to ensure that the privacy of individuals is protected and that the public is fully informed about who is using drones in public airspace and why.[10]"

The FAA responded by stating that "[t]he FAA recognizes that there are privacy concerns related to UAS operations, and the agency will review these concerns in the context of the ongoing UAS rulemaking activities and integration plans."[11]

The FAA's Comprehensive Plan and Roadmaps for drone integration have repeatedly recognized privacy as a key issue. In the Comprehensive Plan to guide the integration of drones required by the 2012 act, the FAA stated that "[m]embers of the NextGen SPC [Senior Policy Committee] agree on the need to address privacy concerns of the public at large while safely integrating UAS in the NAS."[12] All subsequent versions of the Roadmap also speak to the importance of addressing privacy with the most recent one stating:

> "The public has real concerns regarding UAS operations with respect to safety and privacy. If people don't feel safe when drones are operating around them, or they have persistent fears of drones intruding in their private lives, then UAS commercial opportunities will be very limited."[13]

As the FAA has made clear, the public acceptance of drones is required for the integration of drones into the national airspace, and the public will not accept drones if privacy is not addressed. As the agency overseeing the integration of drones, the FAA must make sure that there is a pathway for addressing ongoing privacy risks and new ones as they emerge.

9 Letter from S. Markey & Rep. Barton, to Michael P. Huerta, Fed. Aviation Acting Admin. (Apr. 19, 2012), https://irp.fas.org/congress/2012_cr/drones041912.pdf.

10 *Id.*

11 Letter from Fed. Aviation Acting Admin., Michael P. Huerta, to S. Markey (Sept. 21, 2012).

12 JOINT PLAN. & DEV. OFF., UNMANNED AIRCRAFT SYSTEMS (UAS) COMPREHENSIVE PLAN (Sept. 2013), 7, https://www.faa.gov/about/office_org/headquarters_offices/agi/reports/media/UAS_Comprehensive_Plan.

13 Fed. Aviation Admin., Integration of Civil Unmanned Aircraft Systems (UAS) in the National Airspace System (NAS) Roadmap (3rd ed. 2020) at 21, https://www.faa.gov/uas/resources/policy_library/media/2019_UAS_Civil_Integration_Roadmap_third_edition.pdf

Considerations in addressing privacy risks

Community response to drones

One of our biggest concerns is that an FAA BVLOS regulation will leave no room for addressing privacy problems that emerge with the technology. The FAA must not preempt localities from restricting BVLOS flights to address privacy invasions, whether or not the FAA decides to protect privacy in a rulemaking opening the skies to by-rule operations.

The truth is that we don't know to what extent communities will want or accept regular or frequent drone flights, or where, or under what conditions. That will depend on a complex and unpredictable set of often contradictory factors, ranging from whether the technology's benefits are broad and substantial or narrow and overblown, to people's feelings about the technology's safety, to their feelings about the full range of possible privacy invasions discussed above.

From its perch in Washington DC, the FAA should not try to anticipate what all of those privacy problems will be in the coming years and decades, and how all communities will feel about them, and what kinds of restrictions or regulations are needed to solve the conflicts to the satisfaction of all kinds of American communities. It should not treat drones like crewed aviation, and impose a uniform set of drone rules across the entire country that preempts all state and local rules and thereby grant anyone a by-rule right to fly over communities.

With drones flying under 400 feet, a single nationwide rule is not likely to work in the way it does for crewed aviation. Crewed flights are generally too high to trouble most people. Noisy and camera-carrying robots flying in and through Americans' communities will be a whole new ballgame. The issues and controversies that have surrounded aircraft noise around some airports may emerge in every small neighborhood, albeit driven by more than noise. When residents feel there is too much wheeled vehicle traffic or traffic noise at their home, they can call up members of their city council and push to lower the speed limit, or install speed bumps, or make the street one-way. When the equivalent neighborhood complaints arise over drone flights, people should not have to call up the federal government. That is a recipe for political disaster, both for the FAA and for those who wish to see drones succeed at the things they may be well-suited to do.

Most Americans don't give much thought to drones. Most of those who are thinking about the technology today are excited about and invested in them, either emotionally or financially. But we don't want to see drones imposed on unwilling communities in disruptive and inequitable ways as Robert Moses[14] did with highways, acting out of a

14 Wikipedia, Robert Moses (Last modified Nov. 14, 2021), https://en.wikipedia.org/wiki/Robert_Moses.

misguided modernist vision of what "the future" looks like, or on behalf of companies that stand to profit despite community desires and the public interest.

A better path is to allow communities to restrict drone flights in their jurisdictions (subject to limitations imposed by the First Amendment, as discussed below). This will allow accommodations between the various competing equities in drone deployment (privacy, noise, commerce, convenience, environment, etc.) to emerge organically as diverse communities react in different ways to the technology. If the technology proves practical, useful, and popular, then communities that are overly restrictive will quickly come to feel that they're missing out. If, as a practical matter, drones just don't work out for many of the uses now envisioned, or their downsides are starker than boosters hope, then they will recede into the niches where their advantages are greatest and downsides the smallest without degrading the quality of life of American communities.

The privacy problems and conflicts drones are likely to spark are diverse and unpredictable. While nationwide rules make sense in many areas such as safety and transparency, reasonable community control is not only the best way to honor the concept of democratic control over our quality of life, but also the best way to address privacy and other problems that emerge, while avoiding over-regulating to protect against privacy harms that never materialize.

First Amendment considerations

The potential for drone photography as a tool for art, journalism, and activism is significant. The First Amendment generally protects the gathering of news and other information of importance to the public, and specifically protects photography as a means of expression and as a way of gathering information. In general, a person in a public place where they have a right to be may make photographs of anything that is in plain sight. But the First Amendment does not necessarily create a right to operate a BVLOS drone, or to operate one wherever one wants, just because BVLOS drones can be used to make photos.

One thing the First Amendment generally does not permit is for the government to restrict drone flights according to the identity of the photographer or the subject of their photography. It also bars government actors from blocking drone photography of their activities just because it is politically inconvenient or embarrassing. Nor does it allow wide-ranging bans on photography of "critical infrastructure."[15] It may allow bans on drone flights near certain critical infrastructure for safety purposes (though there will be a constant temptation, which some will inevitably give in to, to use safety as a pretext for enacting such bans).

15 Ari Rosmarin, Drone Rules Are Already Colliding With The First Amendment, ACLU (July 16, 2015), https://www.aclu.org/blog/privacy-technology/surveillance-technologies/drone-rules-are-already-colliding-first-amendment

Remote ID

The remote ID requirement is one of the best opportunities for the FAA to implement privacy-related rules that will facilitate the public's acceptance of drones. A key aspect of addressing privacy concerns is to make sure people have the means to know when drones are flying in their proximity and who is flying them. Identification is important because accountability is very hard without it.

Remote ID can also facilitate much-needed transparency. Remote ID is the avenue by which the public can learn about not only what drones are flying near them, but additional information including the surveillance capabilities of the drone, the purpose of the drone, and the information the drone might be collecting.[16]

For the Remote ID requirement to mitigate the privacy risks of drones, the requirement must be usable and useful to the public. It should not be complicated for members of the public to identify nearby drones — it should be as simple as downloading a free app to one's phone and opening it up. And the Remote ID's range should be robust enough to give meaningful information about the number of drones in the area at a given time. Generally speaking, if the average drone is within range to collect information about a person or their immediate surroundings, then the Remote ID should have an equivalent range.

The Remote ID should directly or through an easily accessible database provide information about the drone's capabilities, purpose, and operation. This should include the type of surveillance technology on the drones and the purpose of the flight (e.g. package delivery). Drones should be identified as government, commercial, or non-commercial private. For government and commercial drones, the agency or company operating the drone should be made available. Additionally, Remote ID should allow easy access to details about the drone's operation, including what data the drone is collecting, what the data will be used for, and how long the data will be retained.

Network Remote ID, however, which would require every drone to have cellular capability and connect to the Internet to report its location in real time, does not strike the right balance between security, the privacy of those on the ground, and the privacy of drone operators. It would create a nationwide "bird's eye view" of every drone that flies, and under some proposals would give not only law enforcement exclusive access to that data, but also certain private-sector service providers. That would give those companies access to vast amounts of drone-flight data that they could use in unfair ways. For example, it might allow them to secretly gather data about consumer or commercial use of drones that would not be available to others, or to monitor drones that are being flown by a union with which the company is currently battling.

16 EPIC et al., Comments on the Noticed of Proposed Rulemaking: Remote Identification of Unmanned Aircraft Systems, Federal Aviation Admin. Docket No. FAA-2019-1100 (Mar. 2, 2020), https://epic.org/wp-content/uploads/apa/comments/EPIC-et-al-Comments-FAA-Remote-Drone-ID-March2020.pdf.

Recommendations

Requirements the FAA should implement

Transparency requirements

Transparency is a fundamental element of acceptance of drone BVLOS operations by the public. It allows the public and agencies to hold operators accountable and is a crucial means by which the public can exercise its rights.

When operating an aircraft, the operator should understand the risks that such operation imposes to the National Airspace System as well as to those on the ground—whether safety impact, noise, or environmental. By the same token, operators should also assess the impact of their operations on the public's privacy. Privacy impact assessments are a routine requirement for many government information collection processes, and increasingly for some companies as well. We would like to see a similar requirement imposed on government and commercial BVLOS operations in the national air space. These reports should be easily and freely available to the public, and should include details such as:

- Type and Purpose of the drone operation. The operator should detail the purpose of its operation, so the public can understand its nature and also hold them accountable for mission creep, or covert-deceitful uses.
- Technical Capabilities. This should include not only the operational capabilities of the aircraft (distance, time, altitude, payload weight, etc.) but also the sensors on board, their capabilities, and the data collection they will be engaging in. For example, if the drone carries cameras, this data would include the power of any zoom lens and how that zoom is controlled (automated processes or remote operator), the camera's resolution, the camera's spectral range, and any live AI or analytics capabilities that it uses.
- Data collected. Detail of data collection that will occur during the operation. For example, if video will be collected, this would include information on when that video will be collected.
- How that data is used. The intended use of the data, for example, for navigational purposes, detection and avoidance of obstacles, infrastructure inspection, etc.
- Data disclosure. Who, other than the operator, can access the data, or with whom will it be proactively shared, and for what purpose.
- A privacy impact assessment. An assessment of how the operation, with the sensors, data collection, and sharing that it involves, will affect the communities over which this operation will take place, and what mitigations are in place to address these issues.

Community involvement requirements

- The FAA should allow localities to set their own rules in order to protect privacy or other values and to encourage local innovation.
- The FAA should ensure that there is enough transparency regarding drone flights that communities can make informed decisions about what kinds of operations they want to permit.
- The FAA should create ongoing mechanisms for individuals to raise concerns with the FAA, submit complaints, or report privacy invasions that they have experienced from drone operations (as well as noise and safety problems).

Remote ID requirements

The FAA must implement a program of Remote ID that empowers people on the ground to obtain key information about BVLOS drones in their vicinity. It should not implement a system for centrally tracking all drone flights across the nation.

Additional requests

- Minimization requirements. Congress must require government and commercial BVLOS operators to minimize the data collected, used, and shared to what's relevant and necessary to the operation described in their public statements. For example, if a BVLOS drone is doing delivery, no data can be collected that is not strictly necessary to achieve that purpose, and video and image data collected for that purpose cannot be retained or used for other purposes like mapping services. Where appropriate this mandate should also include use of technical means of minimizing data collection. For example, a drone conducting a safety assessment of a railroad could electronically block out the portion of the video that includes the backyards of neighboring homes
- Additional stakeholder processes. We applaud the FAA for recognizing the need to expand the scope of the stakeholders participating in the Advisory Rulemaking Committee process, and for inviting privacy advocates to contribute their views in this Aviation Rulemaking Committee. It was often difficult for non-aviation stakeholders to participate in the process however, and we recommend that the agency consider convening a separate ARC or other proceeding through which to gather community, privacy, and other non-industry, non-aviation stakeholder input and perspectives. Future ARCs on the ongoing integration of drones into the national air space might also be structured to allow such perspectives to have separate conversations on questions that they themselves define.

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)
Statement of Concurrence / Non-Concurrence

Voting Member Name	John “JC” Coffey
Voting Member Organization	Cherokee Nation Federal

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

1. Concur with the Final Document as written

Voting Member Signature: John J. Coffey Date: 03/03/2022

2. Concur with the Final Document as written with the following exception(s): (Fully explain the areas of exception below, providing specific page and line number. Submission of separate paper is acceptable).

Voting Member Signature: _____ Date: _____

3. Non-Concur with the Final Document as written. Letter of Dissent must be provided.

Voting Member Signature: _____ Date: _____

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)

Statement of Concurrence / Non-Concurrence

Voting Member Name	John Vernon
Voting Member Organization	DroneUp

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

1. Concur with the Final Document as written

Voting Member Signature: _____ Date: 03/03/2021

2. Concur with the Final Document as written with the following exception(s): (Fully explain the areas of exception below, providing specific page and line number. Submission of separate paper is acceptable).

Voting Member Signature: _____ Date: _____

3. Non-Concur with the Final Document as written. Letter of Dissent must be provided.

Voting Member Signature: _____ Date: _____

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)
Statement of Concurrence / Non-Concurrence

Voting Member Name	Jon Damush
Voting Member Organization	Iris Automation, Inc.

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

1. Concur with the Final Document as written

Voting Member Signature: _____ Date: _____

2. Concur with the Final Document as written with the following exception(s): **(Fully explain the areas of exception below, providing specific page and line number. Submission of separate paper is acceptable).**

Page 79, Line 2554, FR 2.3. Iris Automation does NOT concur with this recommendation, and feels that all users of the NAS have a responsibility to avoid collisions, and that a crewed aircraft is severely disadvantaged to see and avoid a small UAS with the human eye, and therefore will be unable to 'give way'. Iris supports right of way rules that are based on maneuverability of aircraft in the NAS and that ALL users of the NAS have a collision avoidance responsibility.

Page 112, Line 3307, OQ 2.1 but also GENERALLY. Iris Automation does not concur with a recommendation to create a new 'part' to 14 CFR, but instead supports the integration of new rules into the existing 14 CFR structure and framework up to and including the inclusion of Part 107. This will better allow for certification of aircraft, operators and operations in a manner consistent with existing aviation processes and expectations. Air-people in the future will be operating across many if not all of these domains at time, and using the existing rule set and framework will aid in the integration, adoption and enforcement of new rules.

Voting Member Signature:  Date: 3 March 2022

3. Non-Concur with the Final Document as written. Letter of Dissent must be provided.

Voting Member Signature: _____ Date: _____

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)
Statement of Concurrence / Non-Concurrence

Voting Member Name	Jon Hegranes
Voting Member Organization	Aloft Technologies, Inc.

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

~~1. Concur with the Final Document as written.~~

2. Concur with the Final Document as written with the following exception(s): (Fully explain the areas of exception below, providing specific page and line number. Submission of separate paper is acceptable).

We concur with 99% of the report and are excited with the significant progress that this report makes with respect to BVLOS, especially for specific use cases, as well as fundamentally redefining how risk (air and ground) is assessed, evaluated, and mitigated. Quickly moving forward and implementing the ARC recommendations into formal rulemaking is important for all airspace stakeholders.

While the report makes over a dozen references to UTM and its critical role in supporting "complex, scaled operations" (page 62, line 1992), the ARC recommendations do not go far enough in establishing the rules and process for UTM systems to obtain FAA approval or how UTM systems will operate in a scaled UAS future – despite having a perfect foundation in LAANC to build upon.

Similar to other ARCs, the key role of UTM capabilities such as Network Remote ID are discussed but only resulting in undefined, soft recommendations for the FAA "to explore" these technologies (page 65, line 2105).

Meanwhile, we have clear use cases in the report around notification requirements (page 79, line 2578) – a perfect use case for UTM that builds on existing frameworks like LAANC – but the ARC report does not put forward clear, cogent requirements and recommendations to put such systems in place.

This ARC missed a key opportunity to solve for complex, scaled drone flight necessary for the integration of UAS into the NAS. By not going far enough and failing to address UTM requirements, the ARC has put the drone industry and the U.S. at large in a continued lagging position of competitiveness and innovation.

Voting Member Signature: DocuSigned by: Jon Hegranes D2690CDD147B425... Date: 3/2/2022

~~3. Non-Concur with the Final Document as written. Letter of Dissent must be provided.~~

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)
Statement of Concurrence / Non-Concurrence

Voting Member Name	Jonathan Daniels
Voting Member Organization	Praxis Aerospace Concepts International, Inc.

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

1. Concur with the Final Document as written

Voting Member Signature: _____ Date: _____

2. Concur with the Final Document as written with the following exception(s): (Fully explain the areas of exception below, providing specific page and line number. Submission of separate paper is acceptable).

Voting Member Signature: _____ Date: _____

3. Non-Concur with the Final Document as written. Letter of Dissent must be provided.

Voting Member Signature: _____ Date: 3 MARCH 2022

Praxis Aerospace Concepts International, Incorporated

March 3, 2022

Federal Aviation Administration
Attn: Jay Merkle
800 Independence Avenue, SW
Washington, DC 20591

Ms. Eileen Lockhart, BVLOS ARC Co-Chair
Director of Emerging Markets
Air Methods

Mr. Sean Cassidy, BVLOS ARC Co-Chair
Director, Safety, Flight Ops and Regulatory Affairs
Amazon Prime Air

Subject: Non-Concur with Beyond Visual Line of Sight (BVLOS) Aviation Rulemaking Committee (ARC) Report

Dear Mr. Merkle, Ms. Lockhart, Mr. Cassidy, and the BVLOS ARC membership,

On behalf of Praxis Aerospace Concepts International, Inc., I thank the FAA for the opportunity to participate in the Beyond Visual Line of Sight (BVLOS) Aviation Rulemaking Committee (ARC) and to comment on the final report.

PACI fundamentally supports the safe enabling of BVLOS operations in "navigable airspace"[1] and is committed to working to ensure the future success of the advanced aviation segment of the aerospace community.

PACI is a Service-Disabled Veteran-Owned Small Business, and is proud to represent not only our clientele, but also the aspirations and interests of other small-businesses that are active within the industry. We were one of the first ten companies to receive Part 107 BVLOS waivers (07W-2018-12266) in 2018, and have assisted with multiple BVLOS authorizations for our clients over the last four years.

Even with our constrained resources, PACI has actively engaged in several BVLOS ARC working groups and during each plenary. We appreciate the additional time provided since December 2021 in response to our request to attempt to resolve remaining disagreements.

After having the opportunity to review the final BVLOS ARC report and its recommendations, PACI is submitting this Statement of Non-Concurrence. PACI will also submit a joint letter with other organizations to declare our joint dissent to several recommendations and renew our continued concerns about the report's content.

Of the five major recommendations described by the Executive Summary (acceptable level of risk for UAS, right of way modifications, crewmember/operator qualifications, UA qualification, and non-mandatory third-party services), we can only support a minority of the content (i.e, the latter two: UA qualification, and non-mandatory third-party services).

[1] pursuant to 49 U.S.C. §§ 44802 and 44807

Acceptable Level of Risk

The ARC's methodology for determining the acceptable level of safety followed two themes. First, it relied on the concept of removing and replacing the existing air operators with their drone counterparts, insisting that this would reduce deaths.

A recent GAO Report[2]raised several issues about the FAA's authority and obligation under 49 U.S.C. § 40103(b)(2)(B)—authorizing the agency to regulate "navigable airspace" by issuing "air traffic regulations" for "protecting individuals and property on the ground". The report dismissed the concept of property damage summarily, while incentivizing high-density flights in the proximity of critical infrastructure in a manner that is untested and unverified.

Secondly, while determining the methodology that supported the creation of a nation-wide capillary network of low-altitude BVLOS corridors within 100' of infrastructure, the ARC report does not address the impact to air risk posed by fixed takeoff and landing areas (aka "droneports" and defined within the report). Recommendations we raised that aligned drone activity with 14 CFR § 157.1 – Applicability at every plenary and multiple working group sessions, yet remained summarily ignored and dismissed.

Right of Way Modifications

Changing right of way rules based on equipage will place unsafe burdens and unfeasible requirements on existing aircraft. We suggest that Recommendations FR 2.2, 2.3, and 2.4, (and all other related recommendations, charts, and rationale) be replaced with language that requires equal responsibility of drone aircraft to see (detect) and avoid other aircraft, and when required to give another aircraft the right-of-way, is done so based on aircraft maneuverability.

The right of way hierarchy contained in 14 CFR § 91.113 is based on maneuverability elements and/or restrictions in ability to maneuver. Other than the updating the exiting requirement "to see and avoid" so that it reflects technological means, they are not, and should not be, based on the active conspicuity of other aircraft in the airspace.

It is a premature conclusion that crewed aircraft, by human vision alone, will be able to easily categorize nearby air traffic as a "drone operating BVLOS" timely enough to remain avoid a near midair collision (NMAC). Consider this: A crewed airplane yields right of way to a crewed helicopter, but a crewed helicopter without electronic conspicuity would have to yield right of way to an uncrewed airplane. With the added element of different right of way during Low-Altitude Shielded Operations that could exist over uncharted subsurface critical infrastructure (i.e., underground fiber optics cables or natural gas pipelines) and the recommended concept becomes untenable.

The FAA recognizes the complexities of the low-altitude operating environment in yesterday's DronePro Update:

> "The risk of midair collisions between drones and traditional aircraft is greatest when they both share the same airspace. The belief that traditional aircraft only operate at altitudes above 500 feet is a common misconception among drone pilots. The regulation that establishes the minimum flying altitude for traditional aircraft is published in 14 CFR 91.119. Except for takeoff and landing, most fixed-wing aircraft typically operate above 500 feet. However, this is not the case with helicopters. Helicopters often fly below 400 feet and routinely share the same airspace as their drone counterparts." (March 1, 2022)

[2] Unmanned Aircraft Systems: Current Jurisdictional, Property, and Privacy Legal Issues Regarding the Commercial and Recreational Use of Drones (Correspondence) B-330570

Crewmember/Operator Qualifications

We support the recommendation to establish a BVLOS rating for the Remote Pilot Certificate, and the creation of a Remote Pilot Certificate that allows the piloting of drone aircraft >55lbs. We recommend that the FAA review the incredible data and research that is available in CJCSI 3255.01 Joint Unmanned Aircraft Systems Minimum Training Standards (published in 2009) and all 192-pages of the Joint UAS Training Qualification and Standards Architecture (published in 2008), which represented a multiyear and multimillion dollar effort by DoD to categorize the very types of qualifications roughly presented by this report, when developing the formal rulemaking that results from the BVLOS ARC.

We fully support leveling the playing field and reducing the barriers to entry for underserved populations and the new entrants of advanced aviation. We also recognize that the Operator Certificates presented in the ARC report were additions to the penultimate draft, did not receive the benefit of a plenary review, and remain unrefined.

The proposed operator certification for Remote Air Carriers , Remote Agricultural Operators and Remote Commercial Operators, as written, seek to short-cut and expedite access to an existing market for the new entrants at the detriment of existing business aviation.

We recommended an adoption of the light UAS operator certificate (LUC), as described by ICAO Advisory Circular 102-1, to address the unique characteristics of drone operators, and suggested an incorporation by reference (IBR) that would remove 90% of the current reliance upon exemption provided by 49 U.S.C. §44807[3].

Unfortunately, these recommendations were not presented to the plenary for discussion and summarily dismissed by the ARC Leadership during a sequestered adjudication session.

Closing comments

A significant number of ARC members felt that the 1) recommended right-of-way amendments introduced unnecessary risk to low-altitude airspace, and 2) that the ARC governance procedures were both opaque and lacked transparency.

Since a significant number of members felt strongly enough about one or both of the aforementioned items to warrant indirect acknowledgement of those concerns in the Chairs' Comments [4] of the BVLOS ARC Final Report (version shared in draft on February 25, 2022), my belief is the recommendations as currently presented do not accurately capture the sentiments of the majority of the ARC, and disproportionately represent the interests of organizations that served as Working Group Leadership.

There remain significant misrepresentations throughout the narrative that inaccurately reflect (or completely neglect to mention) the disagreements and dissent of stakeholders across the ARC membership.

[3] Special Authority for Certain Unmanned Systems, 49 U.S.C. §44807 grants the Secretary of Transportation the authority to use a risk-based approach to determine whether an airworthiness certificate is required for a drone to operate safely in the national airspace system (NAS). Under this authority, the Secretary may grant exemptions to the applicable operating rules, aircraft requirements, and pilot requirements for a specific operation on a case-by-case basis.

[4] "The ARC recognized that the large number of stakeholders and variety of perspectives made consensus on the recommendations an ambitious goal, particularly within the timeframe granted in the Charter." BVLOS ARC Final Report (draft dated February 25, 2022)

As a SDVOSB, we are used to being the minority voice in a discussion. We hope that our candor and vocal dissent are not viewed in a negative light for consideration and participation in future rulemaking activities.

We remain committed to improving the BVLOS ARC recommendations before and after submitting them to the FAA. Thank you all for your continued leadership in this crucial step towards safely enabling BVLOS operations.

Very Respectfully,

Jonathan Daniels
CEO
Praxis Aerospace Concepts International, Inc.
Enclosure: BVLOS ARC Coalition of Aviation Associations Statement of Non-Concurrence

BVLOS ARC Coalition of Aviation Associations
Statement of Non-Concurrence

March 3, 2022

Ms. Eileen Lockhart, BVLOS ARC Co-Chair
Director of Emerging Markets
Air Methods

Mr. Sean Cassidy, BVLOS ARC Co-Chair
Director, Safety, Flight Ops and Regulatory Affairs
Amazon Prime Air

Dear Ms. Lockhart, Mr. Cassidy and the BVLOS ARC membership,

After having the opportunity to review the final Beyond Visual Line of Sight (BVLOS) Aviation Rulemaking Committee (ARC) report and its recommendations, the undersigned members of the ARC write this Statement of Non-Concurrence to declare our joint dissent to several recommendations and to renew our continued concerns related to the substance and quality of the report, as well as the processes followed during the report development.

We fundamentally support the safe enabling of BVLOS operations in the U.S. National Airspace System (NAS) and are all working to ensure the future success of this segment of the aerospace community.

However, after reviewing the final report and considering the challenges observed in the past seven months to accurately characterize the positions of the 89 ARC members, the final report could have substantial negative impacts on the safe and efficient integration of BVLOS operations and the safety of NAS users. For these reasons, we non-concur with specific concerns about the following recommendations:

- Target levels of safety and comparison with Light Sport Aircraft (LSA) including the reference to the safety continuum (AG 2.1);
- Change in right of way and see and avoid responsibilities (FR 2.1- 2.4);
- Shielded Operations and Areas and their related definitions (FR 2.2- 2.4);
- Operating requirements proposed to govern Remote Air Carrier and Remote Operating certificate holders (OQ 2.10-2.13);
- Changes in U.S. Air Carrier ownership requirements (GP 2.11);
- Lacking justification in context of safety continuum related to aircraft Size (*i.e.*, 800k ft/lbs limit) (AS 2.1);
- HAZMAT carriage (AG 2.5, OQ 2.19); and
- General lack of defined airspace scope with the BVLOS ARC report and misunderstanding of airspace separation

In addition, the final report possesses neither a coherent structure nor clear guidance upon which the Federal Aviation Administration (FAA) can be reasonably expected to act. Furthermore, there are significant misrepresentations throughout the narrative that inaccurately reflect (or completely neglect to mention) the disagreements and dissent of stakeholders across the ARC membership.

Finally, we must also highlight our ongoing concerns of procedure since the start of the BVLOS ARC. In particular, the lack of transparency and fairness offered to ARC membership. Verbal and written comments and dissents have been ignored, not offered full plenary discussion and adjudication, or given inaccurate representation. This has resulted in certain recommendations appearing as preconceived notions that are not expected to enable safe and fair BVLOS operations. Unfortunately, the above concerns are not new. In fact, all these issues have been brought up in subgroups, comments in response to earlier draft reports, directly in discussions with ARC leadership, and during plenaries.

We understand the historical nature and complexity of past ARCs that have attempted to advance uncrewed operations. We remain committed to continue our work to improve the BVLOS ARC recommendations before and after they are submitted to the FAA. Thank you all for your continued leadership in this very important step towards safely enabling BVLOS operations.

Sincerely,

Aerospace Industries Association
Aircraft Owners and Pilots Association
Air Line Pilots Association
General Aviation Manufacturers Association
Helicopter Association International
Praxis Aerospace Concepts

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)
Statement of Concurrence / Non-Concurrence

Voting Member Name	Judith Ritchie
Voting Member Organization	SAE International

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

1. Concur with the Final Document as written

Voting Member Signature: _____*J.Ritchie*_____ Date: __3/3/2022_____

2. Concur with the Final Document as written with the following exception(s): (Fully explain the areas of exception below, providing specific page and line number. Submission of separate paper is acceptable).

Voting Member Signature: _____ Date: _____

3. Non-Concur with the Final Document as written. Letter of Dissent must be provided.

Voting Member Signature: _____ Date: _____

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)
Statement of Concurrence / Non-Concurrence

Voting Member Name	Justin Barkowski
Voting Member Organization	American Association of Airport Executives

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

1. Concur with the Final Document as written

Voting Member Signature: _____ Date: 3/3/2022

2. Concur with the Final Document as written with the following exception(s): **(Fully explain the areas of exception below, providing specific page and line number. Submission of separate paper is acceptable).**

Voting Member Signature: _____ Date: _____

3. Non-Concur with the Final Document as written. Letter of Dissent must be provided.

Voting Member Signature: _____ Date: _____

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)
Statement of Concurrence / Non-Concurrence

Voting Member Name	Karina Perez Molina
Voting Member Organization	Aerospace Industries Association

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

1. Concur with the Final Document as written

Voting Member Signature: _____ Date: _____

2. Concur with the Final Document as written with the following exception(s): **(Fully explain the areas of exception below, providing specific page and line number. Submission of separate paper is acceptable).**

Voting Member Signature: _____ Date: _____

3. Non-Concur with the Final Document as written. Letter of Dissent must be provided.

Voting Member Signature: _____ Date: March 3, 2022

AIA
AEROSPACE
INDUSTRIES
ASSOCIATION

March 3, 2022

Ms. Eileen Lockhart, BVLOS ARC Co-Chair
Director of Emerging Markets
Air Methods

Mr. Sean Cassidy, BVLOS ARC Co-Chair
Director, Safety, Flight Ops and Regulatory Affairs
Amazon Prime Air

Dear Ms. Lockhart, Mr. Cassidy, and the BVLOS ARC membership,

On behalf of the Aerospace Industries Association (AIA), I thank the FAA for the opportunity to participate in the Beyond Visual Line of Sight (Beyond Visual Line of Sight (BVLOS) Aviation Rulemaking Committee (ARC) and to comment on the final report.

After having the opportunity to review the final BVLOS ARC report and its recommendations, AIA is submitting this Statement of Non-Concurrence. AIA will also submit a joint letter with other organizations to declare our joint dissent to several recommendations and renew our continued concerns about the report's substance.

AIA fundamentally supports the safe enabling of BVLOS operations in the U.S. National Airspace System (NAS) and is committed to working to ensure the future success of this segment of the aerospace community.

However, after reviewing the final report, we believe it could have substantial negative impacts on the successful integration of BVLOS operations and the safety of NAS users. For these reasons, we do not concur with specific concerns about the following recommendations:

- General lack of defined airspace scope with the BVLOS ARC report and misunderstanding of airspace separation. During the course of the ARC, the membership and leadership discussed everything in the range of under 400'; however, the final version of the ARC Report mentions and utilizes the "500' AGL operating environment", which would have broader implications than discussed.
- Insufficient justification in the context of safety continuum related to aircraft Size (*i.e.*, 800k ft/lbs limit) (AS 2.1). We believe safety should be based on the operation type and not weight. The proposed recommendations can harm larger aircraft and burden existing and future operations.
    - If the ARC recommendations are implemented as provided by the report, we would create an ecosystem within the NAS that would allow unmanned aircraft to operate without the capability to detect and avoid existing NAS users that the unmanned systems will reasonably expect to encounter. This puts several aviation communities at increased risk.
- Change in right of way and see and avoid responsibilities (FR 2.1- 2.4)

1000 Wilson Boulevard, Suite 1700
Arlington, VA 22209-3928
703.358.1000

- Some of the aircraft being considered for BVLOS operations lack a technical maturity to safely conduct BVLOS operations. The ARC did not elaborate or explained this in the set recommendations.
- The report caters to a lowest common denominator and not to performance-based safety. The FAA should strongly consider this and work with industry to develop performance-based detection standards applicable to all BVLOS operations, and sensitive to the full scope of operations in the NAS.

We remain committed to improving the BVLOS ARC recommendations before and after submitting them to the FAA. Thank you all for your continued leadership in this crucial step towards safely enabling BVLOS operations.

Respectfully submitted,

Karina Perez Molina
Director, Unmanned and Emerging Aviation Technologies

1000 Wilson Boulevard, Suite 1700
Arlington, VA 22209-3928
703.358.1000

BVLOS ARC Coalition of Aviation Associations
Statement of Non-Concurrence

March 3, 2022

Ms. Eileen Lockhart, BVLOS ARC Co-Chair
Director of Emerging Markets
Air Methods

Mr. Sean Cassidy, BVLOS ARC Co-Chair
Director, Safety, Flight Ops and Regulatory Affairs
Amazon Prime Air

Dear Ms. Lockhart, Mr. Cassidy and the BVLOS ARC membership,

After having the opportunity to review the final Beyond Visual Line of Sight (BVLOS) Aviation Rulemaking Committee (ARC) report and its recommendations, the undersigned members of the ARC write this Statement of Non-Concurrence to declare our joint dissent to several recommendations and to renew our continued concerns related to the substance and quality of the report, as well as the processes followed during the report development.

We fundamentally support the safe enabling of BVLOS operations in the U.S. National Airspace System (NAS) and are all working to ensure the future success of this segment of the aerospace community.

However, after reviewing the final report and considering the challenges observed in the past seven months to accurately characterize the positions of the 89 ARC members, the final report could have substantial negative impacts on the safe and efficient integration of BVLOS operations and the safety of NAS users. For these reasons, we non-concur with specific concerns about the following recommendations:

- Target levels of safety and comparison with Light Sport Aircraft (LSA) including the reference to the safety continuum (AG 2.1);
- Change in right of way and see and avoid responsibilities (FR 2.1- 2.4);
- Shielded Operations and Areas and their related definitions (FR 2.2- 2.4);
- Operating requirements proposed to govern Remote Air Carrier and Remote Operating certificate holders (OQ 2.10-2.13);
- Changes in U.S. Air Carrier ownership requirements (GP 2.11);
- Lacking justification in context of safety continuum related to aircraft Size (*i.e.*, 800k ft/lbs limit) (AS 2.1);
- HAZMAT carriage (AG 2.5, OQ 2.19); and
- General lack of defined airspace scope with the BVLOS ARC report and misunderstanding of airspace separation

In addition, the final report possesses neither a coherent structure nor clear guidance upon which the Federal Aviation Administration (FAA) can be reasonably expected to act. Furthermore, there are significant misrepresentations throughout the narrative that inaccurately reflect (or completely neglect to mention) the disagreements and dissent of stakeholders across the ARC membership.

Finally, we must also highlight our ongoing concerns of procedure since the start of the BVLOS ARC. In particular, the lack of transparency and fairness offered to ARC membership. Verbal and written comments and dissents have been ignored, not offered full plenary discussion and adjudication, or given inaccurate representation. This has resulted in certain recommendations appearing as preconceived notions that are not expected to enable safe and fair BVLOS operations. Unfortunately, the above concerns are not new. In fact, all these issues have been brought up in subgroups, comments in response to earlier draft reports, directly in discussions with ARC leadership, and during plenaries.

We understand the historical nature and complexity of past ARCs that have attempted to advance uncrewed operations. We remain committed to continue our work to improve the BVLOS ARC recommendations before and after they are submitted to the FAA. Thank you all for your continued leadership in this very important step towards safely enabling BVLOS operations.

Sincerely,

Aerospace Industries Association
Aircraft Owners and Pilots Association
Air Line Pilots Association
General Aviation Manufacturers Association
Helicopter Association International
Praxis Aerospace Concepts

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)
Statement of Concurrence / Non-Concurrence

Voting Member Name	Ken Stewart
Voting Member Organization	NUAIR

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

1. Concur with the Final Document as written

Voting Member Signature: _____ Date: _____

2. Concur with the Final Document as written with the following exception(s): **(Fully explain the areas of exception below, providing specific page and line number. Submission of separate paper is acceptable).**

With regards to GP 2.13 and section IX.D(9) on network Remote ID, "While network remote ID is not a condition precedent for UTM operations..." NUAIR recognizes that EASA has mandated Network Identification as one of the four required services for U-Space. We believe security agencies in the US will also desire such a service. The language currently in the ARC's rationale does indeed "leave the door open", but NUAIR was hoping for more of a "push" through that door. NUAIR understands there was no consensus in the ARC to recommend the EASA approach to U-Space and that the recommendation language represents the general consensus of the ARC. However, NUAIR is in favor of more aggressive language recommending steps that will eventually lead to a fieldable UTM solution.

With regards to FR 2.1 rationale, while NUAIR agrees with the recommendation, we take issue with the statement, "Currently, there are no FAA recognized standards for the acceptability of detect and avoid systems suitable for the types of aircraft used in low altitude operating environments." ASTM F3442-20 Standard Specification for Detect and Avoid System Performance Requirements has been published since late 2020 and has been used by the FAA in civil waivers. So, while the statement "there is not an FAA **accepted** [emphasis added] standard to evaluate their performance" is true, this paragraph could be misleading to the average reader. NUAIR would like to highlight the availability of the F3442-20 standard.

Voting Member Signature: Ken Stewart Date: 3/2/2022

3. Non-Concur with the Final Document as written. Letter of Dissent must be provided.

Voting Member Signature: _____ Date: _____

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)
Statement of Concurrence / Non-Concurrence

Voting Member Name	Kenji Sugahara
Voting Member Organization	Ariascend/DSPA

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

1. Concur with the Final Document as written

Voting Member Signature:  Date: 3/3/2022

2. Concur with the Final Document as written with the following exception(s): (Fully explain the areas of exception below, providing specific page and line number. Submission of separate paper is acceptable).

Voting Member Signature: _____ Date: _____

3. Non-Concur with the Final Document as written. Letter of Dissent must be provided.

Voting Member Signature: _____ Date: _____

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)
Statement of Concurrence / Non-Concurrence

Voting Member Name	Kraettli L Epperson
Voting Member Organization	Vigilant Aerospace Systems, Inc.

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

1. Concur with the Final Document as written

Voting Member Signature: _____ Date: ____3-3-2022_____

2. Concur with the Final Document as written with the following exception(s): **(Fully explain the areas of exception below, providing specific page and line number. Submission of separate paper is acceptable).**

Voting Member Signature: _____ Date: _____

3. Non-Concur with the Final Document as written. Letter of Dissent must be provided.

Voting Member Signature: _____ Date: _____

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)
Statement of Concurrence / Non-Concurrence

Voting Member Name	Leo McCloskey
Voting Member Organization	Echodyne Corp

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

1. Concur with the Final Document as written

Voting Member Signature: Leo McCloskey Date: 03/03/2022

2. Concur with the Final Document as written with the following exception(s): (Fully explain the areas of exception below, providing specific page and line number. Submission of separate paper is acceptable).

Voting Member Signature: _____ Date: _____

3. Non-Concur with the Final Document as written. Letter of Dissent must be provided.

Voting Member Signature: _____ Date: _____

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)
Statement of Concurrence / Non-Concurrence

Voting Member Name	Lisa Ellman
Voting Member Organization	Commercial Drone Alliance

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

1. Concur with the Final Document as written

Voting Member Signature: _____ Date: _____

2. Concur with the Final Document as written with the following exception(s): (Fully explain the areas of exception below, providing specific page and line number. Submission of separate paper is acceptable).

Voting Member Signature: Lisa Ellman Date: _March 3, 2022_____

The Commercial Drone Alliance believes this ARC report is a crucial first step for making aviation safer, creating the next generation of American aerospace jobs, restoring American leadership in the skies, and unlocking the countless public benefits of BVLOS UAS operations.

Unlocking the BVLOS marketplace will advance progress toward sustainable transportation infrastructure, carbon emission reduction, job creation, equitable access to medicines and vaccines, safer and more effective critical infrastructure inspection, emergency response, aerospace jobs creation, and domestic manufacturing.

The industry is at a point where UAS companies are ready to operationalize and scale in the U.S., as they are scaling around the world. In this country, however, policy has lagged behind technology and integration efforts have lagged behind the pace of innovation, in large part due to the limitations of the regulatory framework and the federal bureaucracy's struggle to move nimbly.

While there has been some improvement over the years, many of the federal government's policies, procedures, and processes have failed to adapt to and embrace an emerging industry. Instead, the federal government continues to hold back the UAS industry by unnecessarily applying incongruous standards and approaches designed for crewed aircraft. This mismatch results in disjointed regulation that suppresses the industry's progress by making it too slow and too difficult to secure the necessary approvals.

This report contains critical expert recommendations, advice, and information that the FAA needs to safely and effectively update its regulatory framework and normalize safe, scalable, and economically viable advanced aircraft operations in the United States. While it is an important step, the report is only a step; the key is that the FAA must now expeditiously implement this set of recommendations and build upon them.

While we appreciate the diligent work of this ARC, and we recognize that this report represents a compromise agreement between various stakeholders, we do wish the ARC had gone further in setting timelines and deadlines for the federal government to meet in implementing the report's recommendations. UAS integration has been a work in progress over the last decade, and with every passing day, the U.S. is falling further behind our international peers in aviation innovation.

CDA also believes that while network remote identification is not mandatory, it should be allowed as a substitute form of remote identification. While we believe this was the consensus view of the ARC, we worry that the language used to communicate this concept was not made clear in the final report. (See line 2106 of the report, which we believe should delete the words "to supplement broadcast remote ID for" so it would read: "While network remote ID is not a condition precedent for UTM operations, the FAA should explore additional identification solutions for UAS BVLOS operations.")

CDA looks forward to continuing to work with all stakeholders – federal government, civil society organizations, industry, states, localities and others – to make safe, secure, routine BVLOS operations a reality in the United States, for the benefit of all Americans.

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)
Statement of Concurrence / Non-Concurrence

Voting Member Name	Margaret Nagle
Voting Member Organization	Wing

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

1. Concur with the Final Document as written

Voting Member Signature: _____ Date: _____

2. Concur with the Final Document as written with the following exception(s): **(Fully explain the areas of exception below, providing specific page and line number. Submission of separate paper is acceptable).**

Wing strongly supports the recommendations contained in the FAA's UAS Beyond Visual Line-of-Sight (BVLOS) Aviation Rulemaking Committee (ARC) Final Report. The ARC's recommendations provide the most comprehensive and safety-focused review of policies, regulations, procedures and practices ever conducted for uncrewed aircraft systems. From the application of FAA-proven risk management and approval approaches, to integration of aviation's most advanced safety technologies, and through the implementation of safe and equitable flight rules, the ARC Final Report provides a path to sustained and scalable growth for *all aviation*--whether crewed or uncrewed. Wing believes that the future success of the industry hinges on the adoption of the recommendations made in the ARC.

As the ARC recommendations are reviewed and considered by the FAA, Wing also encourages the FAA to emphasize the ability for UAS to scale in our National Airspace System (NAS) through adoption of globally-recognized UAS data exchange standards. ASTM International has produced performance-based standards which provide technical solutions supporting the real-time exchange of aircraft position and operational intent. Use of such international standards to identify and deconflict UA in the NAS will enable greater flexibility of the airspace, increasing access in the NAS. Specifically, the ASTM International specification for Remote Identification establishes an interoperability paradigm through the use of network remote identification which will vastly improve privacy for both public and private UAS stakeholders, as well as increased protection of personal data, and decreased cost and reliance upon aging physical infrastructure.

Together with the ARC recommendations, adoption of ASTM International standards ensure robust, seamless and above all safe integration for UAS across the nation. Adoption of these additional capabilities will enable the FAA to reduce barriers for future aviators which will in turn create vast economic and equitable opportunities. It is Wing's belief that embracing strategies that are focused on reducing risk and increasing automated safety features are critical in positioning the FAA, and the nation, for future success.

Wing is excited to help usher in this next age of aviation. We believe that implementing the ARC's recommendations are critical for our nation's growth and continued leadership on the world stage of aviation, and will help to finally unlock the tremendous benefits that drone technology will bring to the US.

Voting Member Signature: _____ Date: March 3rd, 2022

3. Non-Concur with the Final Document as written. Letter of Dissent must be provided.

Voting Member Signature: _____ Date: _____

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)
Statement of Concurrence / Non-Concurrence

Voting Member Name	Mario Rodriguez
Voting Member Organization	Indianapolis Airport Authority

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

1. Concur with the Final Document as written

Voting Member Signature: _____Mario Rodriguez_____ Date: 3/4/2022_____

2. Concur with the Final Document as written with the following exception(s): (Fully explain the areas of exception below, providing specific page and line number. Submission of separate paper is acceptable).

Voting Member Signature: _____ Date: _____

3. Non-Concur with the Final Document as written. Letter of Dissent must be provided.

Voting Member Signature: _____ Date: _____

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)
Statement of Concurrence / Non-Concurrence

Voting Member Name	Melissa Glidden Tye
Voting Member Organization	Verizon/Skyward

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

1. Concur with the Final Document as written

Voting Member Signature: _____ Date: _____

2. Concur with the Final Document as written with ~~the following exception(s)~~ comment: (Fully explain the areas of exception below, providing specific page and line number. Submission of separate paper is acceptable).

Verizon is pleased to concur with the BVLOS ARC final report, and commends the work of all of the ARC participants, and the ARC leadership in particular. We urge the FAA to adopt the proposals set forth in the report to enable routine BVLOS flight operations by rule, which will, among other things, allow enterprises like Verizon to deliver critical services to the public more quickly and efficiently, especially in times of crisis. In tandem with a BVLOS rulemaking, we also urge the FAA to continue to work with industry, government, and other stakeholders on a universal traffic management (UTM) system and corresponding networked UAS communications. Although UTM is not necessary for near-term drone operations, it will be necessary for the commercial drone industry to reach its full scale potential. Verizon looks forward to serving as a trusted third-party service provider to deliver essential connectivity in a future UTM system.

Voting Member Signature: _s/ Melissa Glidden Tye_____ Date: _March 3, 2022_____

3. Non-Concur with the Final Document as written. Letter of Dissent must be provided.

Voting Member Signature: _____ Date: _____

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)
Statement of Concurrence / Non-Concurrence

Voting Member Name	Nathaniel Robie
Voting Member Organization	Dominion Energy

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

1. Concur with the Final Document as written

Voting Member Signature: Nathaniel Robie Date: 3/3/2022

2. Concur with the Final Document as written with the following exception(s): (Fully explain the areas of exception below, providing specific page and line number. Submission of separate paper is acceptable).

Voting Member Signature: _____ Date: _____

3. Non-Concur with the Final Document as written. Letter of Dissent must be provided.

Voting Member Signature: _____ Date: _____

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)
Statement of Concurrence / Non-Concurrence

Voting Member Name	Neta Gliksman
Voting Member Organization	Percepto

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

1. Concur with the Final Document as written

Voting Member Signature: _____ Date: _3/3/2022__

2. Concur with the Final Document as written with the following exception(s): **(Fully explain the areas of exception below, providing specific page and line number. Submission of separate paper is acceptable).**

Voting Member Signature: _____ Date: _____

3. Non-Concur with the Final Document as written. Letter of Dissent must be provided.

Voting Member Signature: _____ Date: _____

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)
Statement of Concurrence / Non-Concurrence

Voting Member Name	Okeoma Moronu
Voting Member Organization	Zipline International

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

1. Concur with the Final Document as written

Voting Member Signature: _____ Date: _____

2. Concur with the Final Document as written with the following exception(s): **(Fully explain the areas of exception below, providing specific page and line number. Submission of separate paper is acceptable).**

See attached.

Voting Member Signature: *Okeoma Moronu* Date: 3/3/2022

3. Non-Concur with the Final Document as written. Letter of Dissent must be provided.

Voting Member Signature: _____ Date: _____

Zipline's mission is to provide instant access to vital medical supplies for every human on Earth. Zipline's engagement on the ARC was informed by its experience safely operating uncrewed aircraft since 2016: As of January 2022, Zipline has made over 250,000 UAS commercial deliveries and flown over 17 million miles - flying *beyond visual line of sight*. At Zipline, every day we see the impact that commercial UAS operations can have on individuals and communities.

Countries around the world are realizing the health, environmental, and economic benefits of drones *today.* This isn't happening in the U.S. at scale because current regulations cannot support advanced commercial drone operations.

Flying beyond visual line of sight is critical to unlocking the benefits of drones. Like a ship unable to leave sight of land, the potential of drones is hamstrung under those restrictions. Requiring that drone operators station humans every few miles on the ground to watch drones flying above them does little to improve safety, while gutting the economic viability of drones.

These recommendations are an opportunity to restore American global leadership in autonomous aviation, which has currently fallen far behind countries like China, Japan, Ghana and Rwanda.

The recommendations in this report detail key changes to the regulatory framework that are needed to safely integrate UAS into the NAS. Bringing the benefits of drones to the United States has been a bipartisan goal of Congress and the Executive Branch for over a decade, but as the Federal Aviation Administration ("FAA") recognizes, this cannot happen without modernizing our aviation regulatory framework.

Fully integrating UAS into the NAS necessitates identifying requirements, and rationale for requirements, to enable BVLOS. The report provides this critical first step towards integration.

The 2018 FAA Reauthorization Act (Public Law 114-254) required the FAA to "update existing regulations to authorize the carriage of property by operators of small unmanned aircraft systems for compensation or hire within the United States" within a year of the date of enactment. 49 U.S.C 44808. While Zipline appreciates the ARC's mandate was limited in time and scope, we also recognize that it will require meaningful federal government engagement to achieve normalized, scalable, economically viable commercial small package delivery drone operations in the United States. Zipline believes that the ARC could have gone further in establishing the path towards complex small package delivery operations. However, Zipline understands this report represents a compromise agreement between various stakeholders, and we look forward to the FAA's expeditious implementation of the BVLOS rule as a critical first step to bringing the benefits of UAS delivery to the United States and ensure American leadership in this critical sector.

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)

Statement of Concurrence / Non-Concurrence

Voting Member Name	Peter Musgrove
Voting Member Organization	AT&T

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

1. Concur with the Final Document as written

Voting Member Signature: _____ Date: _____

2. Concur with the Final Document as written with the following exception(s): (Fully explain the areas of exception below, providing specific page and line number. Submission of separate paper is acceptable).

AT&T appreciates the opportunity to participate in the ARC and looks forward to future interactions with the FAA and others in industry on network remote ID and UTM services.

Voting Member Signature: C. Peter Musgrove Date: March 3, 2021

3. Non-Concur with the Final Document as written. Letter of Dissent must be provided.

Voting Member Signature: _____ Date: _____

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)
Statement of Concurrence / Non-Concurrence

Voting Member Name	Philip Kenul
Voting Member Organization	ASTM International

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

1. Concur with the Final Document as written

Voting Member Signature: _____ Date: _____

2. Concur with the Final Document as written with the following exception(s): **(Fully explain the areas of exception below, providing specific page and line number. Submission of separate paper is acceptable).**

On final review, as a first step, the report generally exceeds expectations presenting balanced recommemndations to move the industry forward. The one recommendation that I cannot endorse at this time is the one that generated the most discussion during delberations is the following change to the right of way rule:

"The ARC recommends that UA operations in Non-Shielded Low Altitude Areas (i.e., below 400') have right of way over crewed aircraft that are not equipped with an ADS-B out system as specified in 14 CFR § 91.225"

Transferring responsibility for see and avoid to only manned aircraft under these circumstances is a risk which may not be in thje best interest of the industry. All that being said I am voting to concur since the majority of recommemndations will supporet the industry.

Voting Member Signature: *//s// Philip Kenul* **Date: 3/3/2022**

3. Non-Concur with the Final Document as written. Letter of Dissent must be provided.

Voting Member Signature: _____ Date: _____

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)
Statement of Concurrence / Non-Concurrence

Voting Member Name	Robert Gettler
Voting Member Organization	L3Harris Technologies

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

1. Concur with the Final Document as written

Voting Member Signature: _____ Date: ___3/3/2022_____

2. Concur with the Final Document as written with the following exception(s): (Fully explain the areas of exception below, providing specific page and line number. Submission of separate paper is acceptable).

Voting Member Signature: _____ Date: _____

3. Non-Concur with the Final Document as written. Letter of Dissent must be provided.

Voting Member Signature: _____ Date: _____

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)
Statement of Concurrence / Non-Concurrence

Voting Member Name	Sam McGuire
Voting Member Organization	NATE

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

1. Concur with the Final Document as written

Voting Member Signature:  Date: ___3/4/2022_____

2. Concur with the Final Document as written with the following exception(s): **(Fully explain the areas of exception below, providing specific page and line number. Submission of separate paper is acceptable).**

Voting Member Signature: _____ Date: _____

3. Non-Concur with the Final Document as written. Letter of Dissent must be provided.

Voting Member Signature: _____ Date: _____

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)

Statement of Concurrence / Non-Concurrence

Voting Member Name	Scot Campbell
Voting Member Organization	Airbus

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

1. Concur with the Final Document as written

Voting Member Signature: _____ Date: _____

2. Concur with the Final Document as written with the following exception(s): **(Fully explain the areas of exception below, providing specific page and line number. Submission of separate paper is acceptable).**

Voting Member Signature: _____ Date: _____

3. Non-Concur with the Final Document as written. Letter of Dissent must be provided. **(Please include the Recommendation number - e.g., Working Group 2.5.1).**

Voting Member Signature: _____ Date: 3/3/22

Airbus letter of Non-Concur attached dated 03 March 2022

03 March 2022

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC). Statement of Non-Concurrence.

1.Introduction

Airbus is an international reference in the aerospace sector. We design, manufacture and deliver industry-leading commercial aircraft, helicopters, military transports, satellites and launch vehicles, as well as providing data services, navigation, secure communications, urban mobility and other solutions for customers on a global scale. The number one priority at Airbus is the continued safe transport of everyone, and everything, that flies aboard an Airbus product.

The ARC was tasked in June 2021 to provide recommendations to the FAA for performance-based regulatory requirements to normalize safe, scalable, economically viable, and environmentally advantageous Uncrewed Aircraft (UA) BVLOS operations that are not under positive air traffic control. Airbus has actively engaged in this work and supports the evolution of UA to conduct BVLOS operations recognizing the benefits that uncrewed aircraft operations will bring to business and society.

2. The ARC report - non concur

The ARC has been a good opportunity for industry to lay out the potential benefits of BVLOS operations, establish key stakeholder relationships and highlight important work areas and considerations. However, it is Airbus's opinion that more work is needed to determine the most suitable solutions to enable the safe operation of low altitude BVLOS operations. Airbus therefore submits a non-concur with the final report as written. The primary areas of concern are listed below.

- *Recommendation FR 2.3. Non-Shielded Low Altitude UAS BVLOS – UA Have Right of Way.*

  Airbus does not concur that UA should have right of way over non-equipped crewed aircraft. In any air-to-air encounter between crewed and uncrewed aircraft, the majority of the risk resides with the people in the air. Airbus therefore recommends that additional work is required to further consider solutions to enable the safe co-existence of aircraft in the same low altitude airspace. In particular, technology based solutions that enable uncrewed and crewed aircraft to detect and avoid one another. More information is provided in paragraph 3 below.

- *Recommendation FR 2.4 – UA Has Right of Way for Shielded Operations*

  In any air-to-air encounter between crewed and uncrewed aircraft, the majority of the risk resides with the people in the air. Therefore, Airbus does not concur that UA should have

priority over all aircraft in a shielded environment. Helicopters routinely operate close to structures and should retain their right of way priority to help ensure the safety of aircraft occupants.

- *Kinetic energy of no more than 800,000 ft lbs. Operational Risk Matrix and Recommendation AS 2.1.*

  The consequences of a collision between an unequipped crewed aircraft and a UA of the kinetic energy of a light sport aircraft would be severe. The UA kinetic energy of no more than 800,000 ft.-lbs is proposed in the report to limit the consequences of ground collisions without adequate consideration to the consequences related to air collisions with crewed aircraft. We therefore do not concur with using this kinetic energy limit as the sole boundary criteria for the proposed BVLOS operations.

3. Supporting information

The following information is provided in relation to concerns raised in section 2. Airbus supports the use of Detect And Avoid (DAA) and electronic conspicuity for collision avoidance and situational awareness. However, in our opinion, the report does not adaquately consider the following key issues relating to low altitude operations:

- Data availability and coverage. As the UA is reliant upon receiving information from ADS-B/TABS equipped aircraft, consideration must be given to data availability at low altitudes. Due to range restrictions (including air to air) and obstructions at low altitude, ADS-B/TABS equipped aircraft may not be routinely detectable to UA. Ground based surveillance data feeds therefore may be needed as an additional means of receiving DAA and surveillance data.

- Human Factors. The automated flight rules and right of way proposals will mean that pilots of crewed and uncrewed aircraft will have additional responsibilities. The operation of UA introduces new risks (i.e. UA malfunction or non compliance) meaning pilots of crewed aircraft may want more information about other aircraft operating in the airspace, especially those UA operating autonomously. It is therefore important to ensure that pilots are not overloaded or confused by the information and alerts presented to them. Pilots must be able to safely execute their responsibilities whilst sharing airspace and operating under new rules and conditions. The report identifies current FAA work on human factors in four key research categories[1]. Airbus suggests that these work areas be expanded to consider the issues raised.

[1] Unmanned Aircraft Systems Human Factors Considerations, https://www.faa.gov/uas/research_development/information_papers/#hf.

4. Further work requirements

Considering the topics above, Airbus suggests that more work is needed to investigate different technology solutions to avoid collisions and ensure their suitability for operation at low altitudes. Airbus is investing in new technological solutions to deconflict UA from low level crewed helicopter operations addressing the future airborne collision avoidance needs of rotorcraft in the NAS as well as in the rest of the world. The objective of these activities is to integrate a cost effective solution into the existing airborne collision avoidance system solutions on board the aircraft.

The report explains that there are no FAA recognized standards for the acceptability of detect and avoid systems suitable for the types of aircraft used in low altitude operating environments. The technologies and concepts identified in the report therefore may not be the most suitable solution to enable BVLOS operations at scale. Airbus considers that an FAA accepted standard for DAA is essential for a definitive solution and that third party UTM services[2] will be an important component to help BVLOS operations scale safely and efficiently. As stated in recommendation 2.2, further work is required however to determine what level of aircraft operations, in a defined volume of airspace, would trigger the need for UTM third-party services.

Although the ARC work was focussed only on Class G airspace, the report also recommends that the FAA create a method to authorize coordination with ATC for operations of UA in controlled airspace e.g., Low Altitude Authorization and Notification Capability (LAANC). Airbus is a certified LAANC provider and would support the evolution of the current VLOS notification and approval capability to help facilitate future BVLOS operations.

Conclusion and next steps

As previously mentioned, Airbus supports the evolution of UA to conduct BVLOS operations and recognizes the hard work and commitment of all the ARC members. It is critically important however that consensus between airspace users is reached before fundamental changes are made to how operations are conducted within the NAS. Although progress has been made, we consider that there is still important work to be done. We therefore strongly support report recommendation AG 2.8 which is intended to expedite R&D activities that provide the FAA with critical information in areas such as DAA, UAS Communications, Human Factors and System Safety, all of which will aid in the FAA's efforts to safely integrate UAS into the NAS.

[2] UTM - A set of automated functions and digital services designed to support safe, efficient and secure access to airspace for UAS. These services include Network remote identification, Strategic deconfliction, Constraint services, Conformance services and Operations planning (as listed in Table 2) and any other services as defined by the Administrator.

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)

Statement of Concurrence / Non-Concurrence

Voting Member Name	Sean Cassidy
Voting Member Organization	Amazon Prime Air

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

1. Concur with the Final Document as written

Voting Member Signature: _____ Date: 1 March, 2022

2. Concur with the Final Document as written with the following exception(s): **(Fully explain the areas of exception below, providing specific page and line number. Submission of separate paper is acceptable).**

Voting Member Signature: _____ Date: _____

3. Non-Concur with the Final Document as written. Letter of Dissent must be provided.

Voting Member Signature: _____ Date: _____

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)

Statement of Concurrence / Non-Concurrence

Voting Member Name	Sean Murphy
Voting Member Organization	T-Mobile USA

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

1. Concur with the Final Document as written

Voting Member Signature: _____ Date: 3/3/22

2. Concur with the Final Document as written with the following exception(s): **(Fully explain the areas of exception below, providing specific page and line number. Submission of separate paper is acceptable).**

Voting Member Signature: _____ Date: _____

3. Non-Concur with the Final Document as written. Letter of Dissent must be provided.

Voting Member Signature: _____ Date: _____

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)
Statement of Concurrence / Non-Concurrence

Voting Member Name	Sharon Rossmark
Voting Member Organization	Women and Drones

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

1. Concur with the Final Document as written

Voting Member Signature: _Sharon Rossmark_____ Date: _03/03/2022____

2. Concur with the Final Document as written with the following exception(s): **(Fully explain the areas of exception below, providing specific page and line number. Submission of separate paper is acceptable).**

Voting Member Signature: _____ Date: _____

3. Non-Concur with the Final Document as written. Letter of Dissent must be provided.

Voting Member Signature: _____ Date: _____

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)
Statement of Concurrence / Non-Concurrence

Voting Member Name	**Stephen P. Luxion**
Voting Member Organization	**ASSURE**

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

1. Concur with the Final Document as written

Voting Member Signature: _____ Date: 2/28/2022_____

2. Concur with the Final Document as written with the following exception(s): **(Fully explain the areas of exception below, providing specific page and line number. Submission of separate paper is acceptable).**

Voting Member Signature: _____ Date: _____

3. Non-Concur with the Final Document as written. Letter of Dissent must be provided.

Voting Member Signature: _____ Date: _____

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)

Statement of Concurrence / Non-Concurrence

Voting Member Name	Suzanne Lemieux
Voting Member Organization	API

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

1. Concur with the Final Document as written

Voting Member Signature: _____ Date: 3/2/22

2. Concur with the Final Document as written with the following exception(s): **(Fully explain the areas of exception below, providing specific page and line number. Submission of separate paper is acceptable).**

Voting Member Signature: _____ Date: _____

3. Non-Concur with the Final Document as written. Letter of Dissent must be provided.

Voting Member Signature: _____ Date: _____

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)
Statement of Concurrence / Non-Concurrence

Voting Member Name	Terrence M. Hicks
Voting Member Organization	Conference of Minority Transportation Officials

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

1. Concur with the Final Document as written

Voting Member Signature: _____ Date: _____

2. Concur with the Final Document as written with the following exception(s): (Fully explain the areas of exception below, providing specific page and line number. Submission of separate paper is acceptable).

We concur with the line items including on page 144, line items 4374, 4375 and 4376: The DOT and FAA should consider these benefits in their 4375 procurement programs, particularly those focused on disadvantaged communities (such as 4376 Disadvantaged Business Enterprise programs).

However, we also encourage the Minority Business Enterprise (MBE) and the Women Business Enterprise (WBE) certifications

Voting Member Signature: _____ Date: _____

3. Non-Concur with the Final Document as written. Letter of Dissent must be provided.

Voting Member Signature: _____ Date: _____

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)
Statement of Concurrence / Non-Concurrence

Voting Member Name	Todd Binion
Voting Member Organization	State Farm Mutual Automobile Insurance Company

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

1. Concur with the Final Document as written

Voting Member Signature: _____ Date: __03/03/2022____

2. Concur with the Final Document as written with the following exception(s): (Fully explain the areas of exception below, providing specific page and line number. Submission of separate paper is acceptable).

Voting Member Signature: _____ Date: _____

3. Non-Concur with the Final Document as written. Letter of Dissent must be provided.

Voting Member Signature: _____ Date: _____

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)
Statement of Concurrence / Non-Concurrence

Voting Member Name	Todd Graetz – Co-Chair, ARC Working Group 2.5 (Flight Rules)
Voting Member Organization	BNSF Railway / BNSF Railway UAS Program

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

1. Concur with the Final Document as written

Voting Member Signature: Todd Graetz Date: March 3rd, 2022

2. Concur with the Final Document as written with the following exception(s): (Fully explain the areas of exception below, providing specific page and line number. Submission of separate paper is acceptable).

Voting Member Signature: _____ Date: _____

3. Non-Concur with the Final Document as written. Letter of Dissent must be provided.

Voting Member Signature: _____ Date: _____

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)
Statement of Concurrence / Non-Concurrence

MID-ATLANTIC AVIATION PARTNERSHIP
VIRGINIA TECH

Voting Member Name	Tombo Jones
Voting Member Organization	Virginia Tech Mid Atlantic Aviation Partnership An Faa Designated UAS Test Site

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

1. Concur with the Final Document as written

Voting Member Signature: Tombo Jones Date: March 3, 2022

2. Concur with the Final Document as written with the following exception(s): (Fully explain the areas of exception below, providing specific page and line number. Submission of separate paper is acceptable).

Voting Member Signature: _____ Date: _____

3. Non-Concur with the Final Document as written. Letter of Dissent must be provided.

Voting Member Signature: _____ Date: _____

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)
Statement of Concurrence / Non-Concurrence

Voting Member Name	Vaslav Patterson
Voting Member Organization	Air Line Pilot Association (ALPA)

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

1. Concur with the Final Document as written

Voting Member Signature: _____ Date:

2. Concur with the Final Document as written with the following exception(s): **(Fully explain the areas of exception below, providing specific page and line number. Submission of separate paper is acceptable).**

Voting Member Signature: _____ Date: _____

3. Non-Concur with the Final Document as written. Letter of Dissent must be provided.

Voting Member Signature: _____ Date: March 3, 2021

AIR LINE PILOTS ASSOCIATION, INTERNATIONAL
7950 Jones Branch Drive, Suite 400S | McLean, VA 22102 | 703-689-2270 | 888-FLY-ALPA
THE WORLD'S LARGEST PILOTS UNION | WWW.ALPA.ORG

March 3, 2022

Federal Aviation Administration
Beyond Visual Line of Sight Aviation Rulemaking Committee

ATTN: Designated Federal Official: Jay Merkel

Action: Non-Concur with BVLOS ARC report.

Dear Mr. Merkel and BVLOS ARC leadership,

The Air Line Pilots Association, International (ALPA), represents the safety interests of more than 62,000 professional airline pilots flying for 38 airlines in the United States and Canada. ALPA's long-held position is that all operations in the National Airspace System (NAS) must be conducted to a level of safety that does not reduce the level of safety of other NAS users, including airline operations. Based on that position, ALPA cannot support the Beyond Visual Line of Sight Aviation Rulemaking Committee (BVLOS ARC) report and specific recommendations contained within sections VII (Qualification Standards, VIII (Automation/Automated Risk Matrix), and Section X (ARC Recommendations). These specific recommendations and recommended amendments to 14 CFRs to enable BVLOS operation in the National Airspace System (NAS), will reduce safety levels of the public and other NAS users.

ALPA appreciates the opportunity to comment on the BVLOS ARC work groups (WG) and ARC Report(s). ALPA has at every opportunity afforded, repeatedly (10/12/21 v1, 10/21/21 v2, 11/10/21 v3, 1/3/22 and 1/21/22, v4, and 2/17/22 Draft Final report) submitted our highest-level concerns and opposition ("showstoppers") to the referenced recommendations. ALPA and several other ARC members have also repeatedly recommended specific changes to unacceptable recommendations that were not reflected in the ARC report. We have also requested that the main body of the report document the many areas where consensus by the ARC could not be reached. The ARC leadership rejected those recommendations.

When adjudicated comments were distributed for review, ALPA comments were repeatedly noted in the resolution column with: "The existing recommendation language represents the general consensus of the ARC." Offering ALPA no opportunity to resolve the comment further or have a differing opinion entered into the main body of the ARC report.

ALPA continues to request that the following statement be placed after the sections where "exceptions" or "dissenting comments" have been submitted: ***The above recommendation(s)***

were not fully supported by all BVLOS ARC members. Please see appendix (TBD) for statements of exceptions or dissent to this recommendation.

ALPA has been fully engaged in each BVLOS ARC WG and plenary to the extent allowed. Due to the structure of the BVLOS ARC and the limitations put in place by ARC leadership, ARC members had limited access to the segregated WG(s). For example, each ARC member was limited (by assignment) to participation/membership in only one WG. ALPA and other ARC members, thus had limited access to developmental discussions, reviews and comments to all WG developmental products and positions. Those WG leaders also failed to engage ALPA in attempting to resolve our concerns or to document a dissenting view in the main body of the report.

Specific Concerns by ALPA:

ALPA is concerned that the report does not clearly identify the class of airspace where the proposed BVLOS operations will be authorized to take place. Without this foundational information, it could be concluded that BVLOS operations as described within the report, will be conducted in controlled airspace, "which Air Traffic Services (ATS) are being provided"[1], near crewed commercial operations being conducted throughout the NAS. ALPA opposes the report's recommendations for BVLOS UAS operations in controlled airspace (i.e., Class B, C, D, and E airspace.)

The BVLOS ARC recommendations do not require a drone (UAS) to be able to be surveilled by other aircraft or ATC. Further, there is no requirement for communication with proximate aircraft or ATC. The lack of surveillance and communications requirements creates a new unmitigated risk to the NAS when operating in controlled airspace. The ARC recommendation only requires that BVLOS operations arrange "coordination with ATC for operations in controlled airspace (e.g., Low Altitude Authorization and Notification Capability (LAANC)." Under a LAANC authorization, ATC can neither surveil nor communicate with the drone (UAS), thus removing ATC from their normal role as a safety mitigation to other aircraft operating in the airspace.

In addition, ALPA has concerns and opposes the proposed changes to Part 91.113 to enable operational safety case(s) to transfer the responsibility of "*see and avoid*"[2] to manned aircraft under certain conditions. Additionally, the report recommends rulemaking activity, including the modification to 14 CFR Parts 61, 91, 107, 135, and the creation of "new parts" for BVLOS operations and certification of aircraft and pilots. While we do agree that each part may need

[1] BVLOS ARC Charter
[2] 14 CFR Part 91.113(b) Right-of-way rules

some modification and that there is a need for a new part of the CFR's, we take exception to the recommendations for regulations that erode the current safety levels. As written, the recommendations overtly favor the drone industry by recommending reduced requirements for entry into the NAS for commercial BVLOS drone operators (companies), including lower standards for required key management personal, aircraft (certification) and pilots (no practical flight test), when compared to traditional commercial aviation.

ALPA is concerned and opposes the ARC report recommendations that the maximum mass (weight/size/speed) of uncrewed aircraft (UA) be limited to the capability to transfer up to 800,000 ft. lbs. of kinetic energy[3]. The report references Light Sport Aircraft (LSA) under 14 CFR 21.190 as comparable precedent, that would allow a BVLOS drone weighing up to approximately 1,320 lbs. However, ALPA believes that drones of this size and kinetic energy level would create a significant safety risk to both the public and other NAS users. ALPA has recommended on multiple occasions that the ARC recommendations should limit the mass, weight or Kinetic Energy (KE) of drones/small unmanned aircraft to less than 55 lbs. or 25,000 ft. lbs. KE.

ALPA also opposes the recommendation to create a new "Remote Air Carrier certificate." This recommendation "divorces"[4] the FAA framework from the issuance and oversight needed to safely operate or engage in "air commerce or common carriage" (i.e., 14 CFR 119, 121, 135, 137), and allows for foreign ownership of U.S. air carriers (i.e., 119.53). Instead, the air carrier certificate process used today should be the foundation for a remotely piloted BVLOS air carrier operation. The ARC report fails to provide a roadmap to this strategy and instead is recommending that the FAA implement a watered-down air carrier certification process that, if initiated, cannot be relied upon to ensure safety levels remain the same, or higher.

Finally, with regards to the applicability of hazardous materials regulations and guidance, ALPA disagrees with the ARC recommendation (AG 2.5 and OQ 2.20) on the need to develop new performance-based industry standards that are de-facto exceptions to the current restrictions and requirements for carriage of hazardous materials. ALPA believes that the existing HAZMAT framework (i.e., 49 CFR Part 175) for regulating hazardous material and quantities being carried should be applied. The ARC has not provided any substantive data or risk mitigation justification, merely opinion. However, we do recognize that under current regulations, UAS might be classified as cargo-only aircraft, and some of the current regulations, guidance, and policies may need modifications before they can be fully applied to UAS.

[3] Recommendation A5 2.1
[4] ARC Recommendation OQ 2.12 Line 3782

AIR LINE PILOTS ASSOCIATION, INTERNATIONAL
7950 Jones Branch Drive, Suite 400S | McLean, VA 22102 | 703-689-2270 | 888-FLY-ALPA
THE WORLD'S LARGEST PILOTS UNION | WWW.ALPA.ORG

Please find attached our final comments and recommendations on the attached pages to the BVLOS ARC final report.

If you have any questions, please do not hesitate to contact Mark Reed, Engineering and Air Safety Department, at 703-689-4231 or Mark.Reed@alpa.org.

Sincerely,

First Officer Vaslav (Vas) Patterson
Air Line Pilots Association, International

ALPA offers the following comments to critical safety concerns of the BVLOS ARC Report:

1. **Airspace Limitations**:
   Issue: The FAA BVLOS ARC Charter and the BVLOS ARC report do not clearly establish the operational airspace framework for BVLOS operations recommendations. Without this crucial information, it could be concluded that BVLOS operations, as described within the report, will be conducted in controlled airspace, near manned commercial operations, including airliners.

   ALPA Recommendation: Clearly identify early in the recommendations, the limited airspace class for application of BVLOS recommendations and operations. ALPA recommends limiting the airspace scope of these recommendations to Class G airspace, below 400 feet above ground level (AGL). ALPA opposes BVLOS UAS operations in controlled airspace (i.e., Class B, C, D, and E airspace).

   Discussion: This report is merely the first set of recommendations to enable "normalized BVLOS" operations in a limited fashion as outlined by the BVLOS Charter as a minimum for long-line linear infrastructure inspections, industrial aerial data gathering, small package delivery, and precision agriculture operations, including crop spraying. The ARC was specifically instructed not to address aircraft or operations carrying passengers or crew, nor will it address the integration of operations for **which Air Traffic Services (ATS) are being provided**. Therefore, it is appropriate to limit BVLOS operations to airspace not currently served by air traffic services.

   ALPA and several other ARC members have repeatedly recommended documenting the airspace areas to be used as part of the recommendations within the ARC report. ALPA recommends limiting the airspace scope of these recommendations to: Class G only as limited by Part 107.41: *No person may operate a small, unmanned aircraft in Class B, Class C, or Class D airspace or within the lateral boundaries of the surface area of Class E airspace*. Additionally, ALPA recommends limiting BVLOS operations near airports, per Part 107.43 (Vicinity of airports): *No person may operate a small unmanned aircraft in a manner that interferes with operations and traffic patterns at any airport, heliport, or seaplane base*. As well as in airspace restricted by notices to airmen per Part 107.47: *Flight*

restrictions in the proximity of certain areas designated by notice to airmen. Additionally, 91.137 through 91.145 and 99.7 of this chapter. 107.51 Operational limitations: (b) *The altitude of the small-unmanned aircraft cannot be higher than 400 feet above ground level.*

2. Modify 14 CFR 91.113

Location: Page(s) 77 FR 2.1, page 78 FR 2.2, Page 79 FR 2.3

Issue: The ARC proposes in recommendation FR 2.1 (page 77), to amend Part 91.113(b) to require all operators, whether under IFR, VFR or Automated Flight Rules (AFR), to '*detect and avoid*' other aircraft, changing the word "see" to "detect". Recommendation FR 2.2: "*The ARC recommends that UA operations in* ***Non-Shielded Low Altitude Areas*** *(i.e., below 400') have right of way over crewed aircraft that are* ***not*** *equipped with an ADS-B out system as specified in 14 CFR § 91.225."*

ALPA Recommendation: Remove the recommendation to transfer collision avoidance to manned/crewed aircraft from the ARC report. ALPA opposes any recommendations to make changes to Part 91.113 that allow BVLOS operations to transfer the responsibility to "see and avoid"[5] or detect and avoid a manned aircraft, including times when the manned aircraft is in compliance with the airspace equipage rules (i.e., 14 CFR 91.225 (ADS-B Out)) for the airspace it is operating in.

Discussion: ALPA and several other ARC members have continued to provide written objections to the transferring of responsibility for see and avoid (91.113) to manned aircraft. Additionally, ALPA supports the requirement that all "BVLOS Operational Level" (1-4) must be equipped with a collision avoidance system (capability) to detect all aircraft, and not be limited to "cooperative" (ADS-B or TABS equipped) aircraft only, as noted in the "Operational Risk Matrix," line 751 of the report. ALPA supports the FAA's requirements for technical standards developed by RTCA SC-228 for Detect and Avoid (DAA) DO-365[6], this technical standard requires that drones/UAS be capable of detecting and avoiding both cooperative and non-cooperative aircraft.

We note that research on the capability of a manned aircraft "seeing" a drone at low altitude was conducted by Embry-Riddle Aeronautical University. The findings were

[5] 14 CFR Part 91.113(b) Right-of-way rules

[6] FAA Technical Standard Orders (TSOs) as the certification basis for DAA: TSO-C211

published in the 2019 paper, **"Cleared to Land**: **Pilot Visual Detection of Small Unmanned Aircraft During Final Approach[7]"** (attached). The paper discusses the issues of "seeing a drone from a manned aircraft during the approach phase." The research determined that an "overall detection rate of only 30% of encounters with UAS were detected by the manned aircraft." Thus, demonstrating that a) manned aircraft are challenged (30% observation) to see a drone/UA, and b) there is a need for a UAS based FAA approved Detect and Avoid (DAA) system for all potential drone/aircraft encounters.

3. **800,000 ft. Lbs. of Kinetic Energy**
   Location: Page 86, Recommendation: **AS 2.1**

Issue: ARC Report: There was agreement to set the maximum for operations within the scope of this ARC at no more than 800,000 ft-lbs. of kinetic energy, which is analogous to a lower performance, light sport aircraft based on weight and max speed… Therefore, 800,000 ft-lbs. is the maximum UA size contemplated for these proposed rules.

- **AS 2.1:** The FAA should establish a new 'BVLOS' Rule which includes a process for qualification of uncrewed aircraft and systems. The rule should be applicable to uncrewed aircraft up to 800,000 ft-lb of transferred kinetic energy in accordance with the operating environment Relative Risk Matrix.

ALPA Recommendation: Limiting the mass, weight or Kinetic Energy (KE) of drones/small unmanned aircraft to less than 55 lbs.[8] or 25,000 ft. lbs. KE.

Discussion: There was no agreement within the ARC at a plenary level, to this recommendation. ALPA and several other ARC members have repeatedly provided written objections to the recommendation of 800,000 ft-lbs. kinetic energy (KE). Kinetic energy is directly proportionate to the mass of the object and to the square of its velocity: (K.E. = 1/2 m v2) as the upper bounds of a drone operating BVLOS. During the development of this recommendation, when challenged, the ARC WG did not produce any studies or safety data to justify this recommendation. There have been limited studies conducted to date on the effects of a small drone striking a manned aircraft. In these limited studies only 2.7 lb. small drones were used in the simulated collision with an aircraft. The University of Dayton Research Institute (UDRI)[9] impact physics group launched a 2.1 lb. DJI Phantom 2 quadcopter at the wing of a Mooney M20 aircraft. The

[7] https://commons.erau.edu/ijaaa/vol6/iss5/12/
[8] 14 CFR 107.3 "Small unmanned aircraft"
[9] https://udayton.edu/udri/news/18-09-13-risk-in-the-sky.php

drone did not shatter on impact but tore open the leading edge of the wing as it bore into the structure, damaging its main spar. Studies by The Alliance for System Safety of UAS Through Research Excellence (ASSURE) reports[10] that drones that collide with large, manned aircraft can cause more structural damage than birds of the same weight for a given impact speed[11]. ARC proponents who are recommending an increase from Part 107 limits of 55 lbs. to a Kinetic Energy (KE) of 800,000 ft-lbs. (app., 1,320 Lbs.@115 Mph.) have presented no data to the ARC to justify this increase, only a desire to enable larger aircraft/drone to perform BVLOS operations.

4. **Remote Air Carrier Certificate**
   Location: Page 123, Line 3667 & 3703

   Issues: Establish a set of operating requirements in the new rule that delineates specific requirements for commercial air carrier operations under the respective operating certificates.

   ARC Recommendation: OQ 2.11, create operating requirements that govern Remote Air Carrier, and OQ 2.12 threshold for Remote Air Carrier or Remote Operating Certificate.

   ALPA Recommendation: The FAA should establish an aviation rulemaking committee (ARC) specifically to address the needed FAA framework for the issuance and oversight to certify new operators to safely operate or engage in "air commerce or common carriage" (i.e., 14 CFR Part 119, 121, 135, and 137). These recommendations should not allow for foreign ownership of U.S. air carriers or commercial operators.

   Discussion: In traditional aviation the FAA exercises certification and oversight of commercial operations that are conducted under Parts 119, 121, 135, 137 etc. The FAA has established minimum requirements and qualifications for ownership of flight-related management and operational responsibilities that are shared across several designated positions that are authorized under Part 119 and which hold appropriate certificates. It is this level of qualification and oversight that is needed in the emerging drone industry, which lacks historical experience in commercial aviation.

   The recommendations contained within this report and sample new Part (108) are crafted to lower the bar of entry and minimalize the FAA certification and oversight levels.

[10] ASSURE: https://www.assureuas.org/faa-grants-5-8-million-to-center-of-excellence-assure-led-by-mississippi-state-university/
[11] https://www.faa.gov/newsroom/researchers-release-report-drone-airborne-collisions

The FAA should continue to ensure that new and emerging commercial drone applications and operations are thoroughly reviewed during the certification process. This should also include that no foreign owner of U.S. air carriers (i.e., 119.53) is allowed, with continuous high levels of observation/oversight of new commercial BVLOS operations.

5. **Hazmat**
Location: Page 135, Line 4081:

Issue: The ARC recommends developing HAZMAT rules that reflect the specific characteristics of BVLOS operations, including factors that mitigate overall risk, such as the relatively low quantities of HAZMAT that UAs can carry, and the absence of humans onboard, while incorporating sufficient protections to guard against relevant risks.

AG 2.5 and OQ 2.20: The rule should allow carriage of limited quantities of certain hazardous materials via UA by holders of a Remote Air Carrier or Remote Operating Certificate. AG 2.5: "Carriage of hazardous materials beyond the specified quantities of OQ 2.20 shall have appropriate mitigations, as established via a performance-based industry consensus standard that is proportionate to the risk of the operation."

ALPA Recommendation: **Remove current text and replace with the following: "**The existing HAZMAT framework was designed for either cargo only or passenger aircraft based on the type of hazard and/or quantities being carried. Under current regulations, UAS might be classified as cargo-only aircraft, and some of the current regulations (14 CFR Part 175) may need modifications before they can be fully applied to UAS."

Discussion: ALPA does not agree with the recommendation to develop a performance-based industry consensus standard for exception to the restrictions and requirements for carriage of specified quantities of hazardous materials for delivery by holders of a Remote Air Carrier or Remote Operating Certificate. The FAA should use existing DOT PHMSA Hazardous Materials Regulations (HMRs), as amended for UAS operations. They should apply when "will carry" HAZMAT requests are made, and used, if approved, via this regulatory framework.

Additionally, we do not support the use of 49 CFR Part 175.10, "Exceptions for passengers, crewmembers, and air operators," as a rationale for the proposed recommendation in the BVLOS ARC, AG 2.5 and OQ 2.20. If the current rules need to be adjusted to reflect the unique characteristics of UAS operations, they still will need to include a risk assessment

on the types of cargo carried, and also include safety risk mitigations for persons on the ground. Based on ALPA's review, the following areas of the regulations need modification or consideration for UAS operations: cargo accessibility requirements, means to notify first responders and Aircraft Rescue and Fire Fighting (ARFF) personnel of HAZMAT onboard an incident aircraft, emergency response guidance to the pilot in the event of an inflight spill, and whether a means to detect an inflight HAZMAT release is needed. Employees handling HAZMAT for UAS operations will also be required to obtain the same type of training as existing "will carry" air carrier operations employees.

6. **Multiple UA by one pilot:**
Location: Page 129, Line 3858

Issue: The ARC recommends the development of rules that are proportionate to the level of automation in the UA system and the pilot's ability to exercise operational control. For UAS Operating Certificate holders, the ARC recommends a new designated position authorized under the new rule part that exercises operational control and ultimate responsibility for 1-to-many BVLOS flights conducted under their supervision.

ARC Recommendation: OQ 2.15 For UAS Operating Certificate holders, create a designated position authorized under the new part that exercises operational control and ultimate responsibility for 1-to-many BVLOS flights conducted under their supervision.

ALPA Recommendation: The ARC should not recommend a rule for this new type of operation and certificate (UAS Operating Certificate). Instead, the ARC could potentially recommend studies on this concept. Research studies should include multiple UA operations by a single pilot to establish a baseline understanding of the feasibility of a single UA pilot flying multiple small UA's (sUA) using a highly automated system.

Discussion: The operational concept discussed in the ARC report requires a single pilot to divide their attention from controlling one aircraft at a time to controlling many aircraft simultaneously. The pilot must now manage the safe operation of multiple aircraft, including their flight path, aircraft systems, integration with traffic, obstacles, and other hazards during normal, abnormal, and emergency states.

The current requirements for the safe operation of aircraft in the NAS is one pilot in command (PIC) to each aircraft. It is unclear how many UAs an operator/pilot can operate at the same time (i.e., 2/1, 4/1, 8/1, etc.) safely. Additionally, having the pilots in a centralized operating facility and only "monitoring" the "drones as they fly" adds further

complexity to the operation as there is a greater reliance on the VO and the latency of communication when operating beyond visual line of sight (BVLOS) of the pilot.

International Journal of Aviation, Aeronautics, and Aerospace

Volume 6 | Issue 5 Article 12

10-30-2019

Cleared to Land: Pilot Visual Detection of Small Unmanned Aircraft During Final Approach

Ryan J. Wallace
Embry-Riddle Aeronautical University, ryan.wallace@erau.edu
Samuel M. Vance
Oklahoma State University - Main Campus, matt.vance@okstate.edu
Jon M. Loffi
Oklahoma State University - Main Campus, jon.loffi@okstate.edu
Jamey Jacob
Oklahoma State University - Main Campus, jdjacob@okstate.edu
Jared C. Dunlap
Oklahoma State University - Main Campus, jared.dunlap@okstate.edu
See next page for additional authors

Cleared to Land: Pilot Visual Detection of Small Unmanned Aircraft During Final Approach

Authors

Ryan J. Wallace, Samuel M. Vance, Jon M. Loffi, Jamey Jacob, Jared C. Dunlap, Taylor A. Mitchell, Robert Thomas, and Seabrook R. Whyte

The number of pilot-reported encounters with unmanned aircraft has been on the rise, since 2014 when the Federal Aviation Administration (FAA) first starting recording UAS encounter data. In 2018, UAS sightings climbed to 2,308 nationwide, a 90.7% uptick from just three years earlier (see Figure 1). The Aviation Safety Reporting System (ASRS), a self-reporting medium for pilots and other aviation professionals, recorded a similar rise in UAS-reported incidents (ASRS, 2019). Prior to 2014, UAS incident reports were relatively rare, however, in recent years ASRS reports involving unmanned aircraft have climbed to more than 100 reports annually (ASRS, 2019).

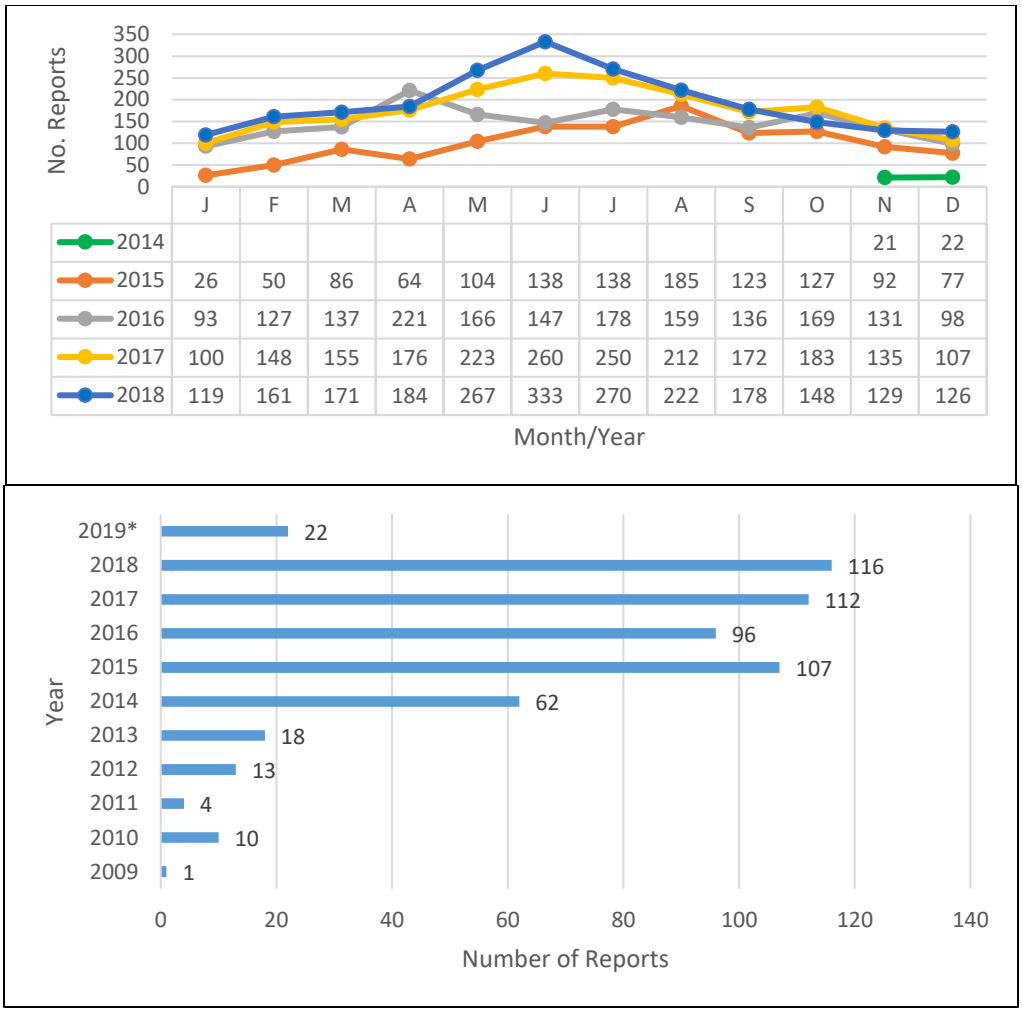


Figure 1. [Top] UAS Sighting Reports (U.S. only, November 2014 – December 2018). Derived from (FAA, 2019b). [Bottom] Aviation Safety Reporting System UAV Reports, March 2009-March 20, 2019. Derived from (ASRS, 2019).

UAS Encounters During Final Approach

Perhaps more concerning is the number of reported UAS encounters during the final approach phase of flight. A report by Gettinger and Michel (2015) highlighted 17 reported incidents in which pilots encountered unmanned aircraft while on approach to Los Angeles International Airport (KLAX) between December 8, 2015 and August 15, 2015 (see Figure 2).

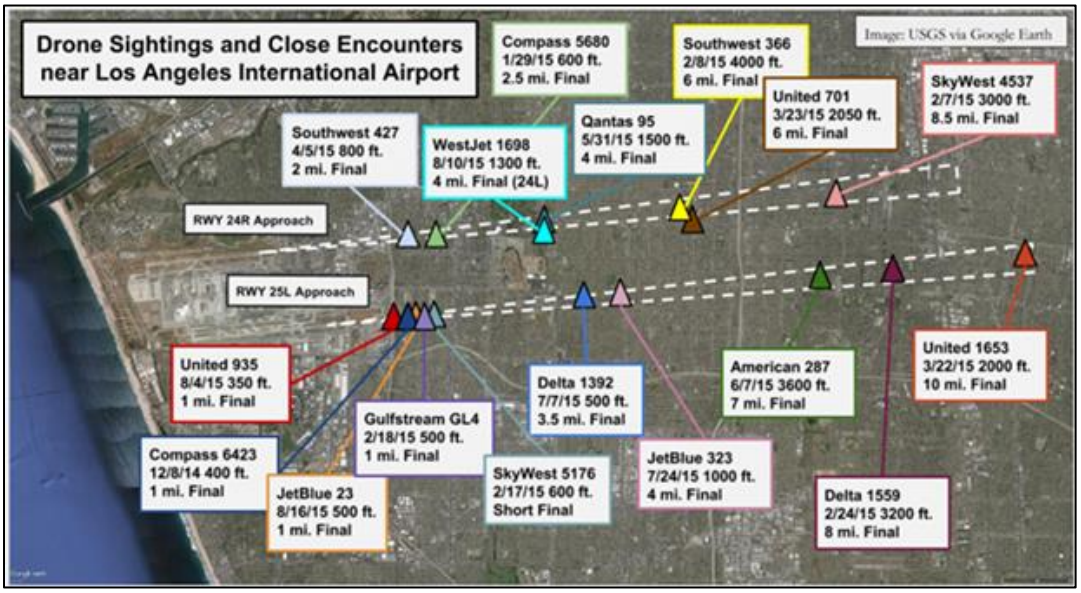


Figure 2. Drone Sightings and Close Encounters Around Los Angeles International Airport (LAX), December 8, 2015-August 15, 2015 (Gettinger & Michel, 2015). Reprinted with permission.

In 2018, UAS sightings encountered during the final approach phase of flight ballooned to 526 a year, representing nearly 22.8% of all UAS sighting reports (see Figure 3). Moreover, unmanned aircraft are being encountered at distances and altitudes all along the approach corridor to airfields (see Figure 3).

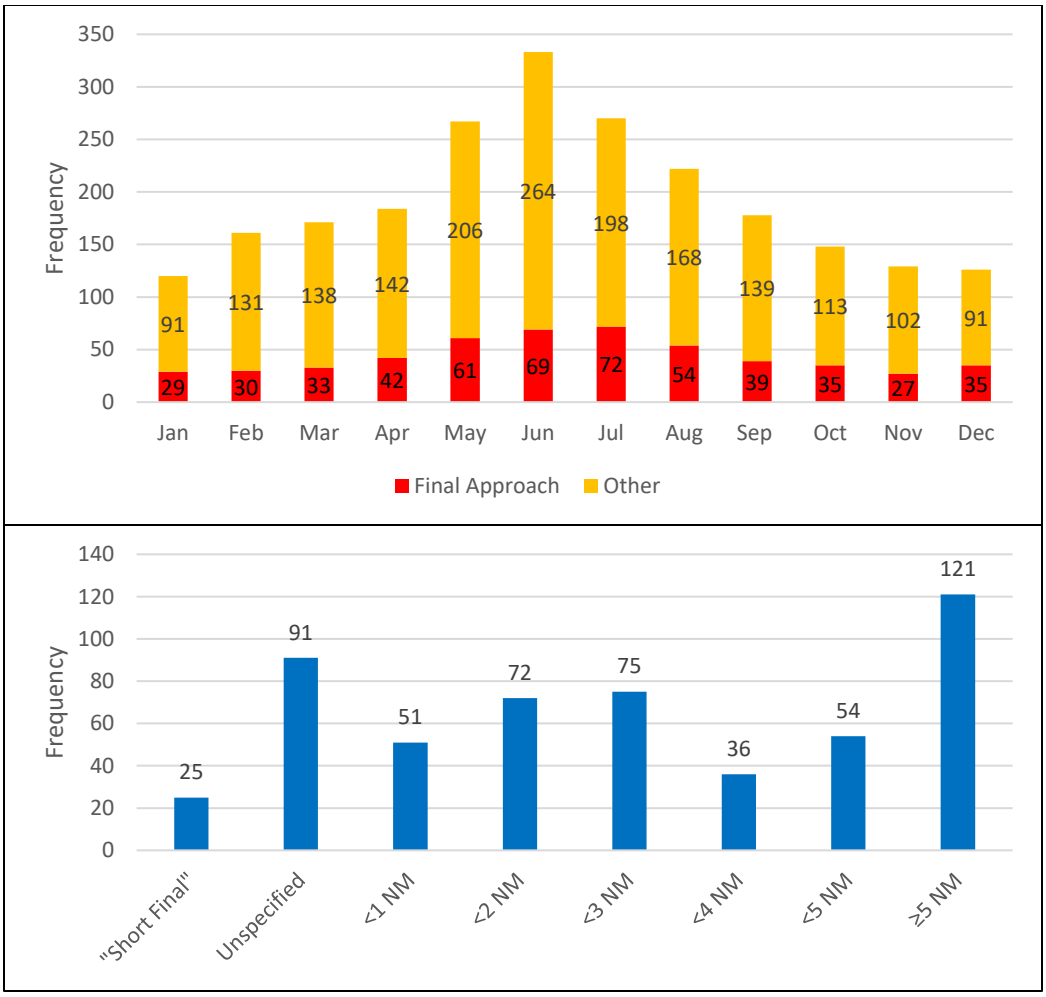


Figure 3. [Top] UAS Sighting Reports (U.S. only, CY 2018), with proportion of pilots reporting UAS encounters on final approach colored in red. [Bottom] UAS sightings reported while on final approach (U.S. only, CY 2018), based on distance from airfield. Derived from (FAA, 2019b).

Flight Deck Dynamics During Final Approach Phase of Flight

Final approach would typically be defined as the last segment of flight, generally extending 5 NM (or more, platform dependent) from the airport to touchdown. In this phase of flight, a pilot's sole objective is to establish a stabilized, constant airspeed speed descent, constant rate of descent, minimizing aircraft configuration changes, and visual acquisition of the runway-end-environment to facilitate a safe visual landing. In Visual Meteorological Conditions (VMC), these objectives are generally easier to meet than in Instrument Meteorological Conditions (IMC). Flight during IMC demands a

precise balance of aircraft control and visual scrutiny of the outside world. During an IMC approach most airlines or professional, multi-crewed aircraft require the Pilot Flying to control the aircraft solely by reference to internal cockpit instruments, while the Pilot Monitoring would maintain responsibility for looking outside the cockpit for visual reference to the runway or other external hazards. As soon as this visual reference is gained, the Pilot Flying refocuses to the visual view to complete the landing.

In either the VMC or IMC environments, a pilot's attention would be focused straight ahead in the forward field of view. The ability to detect a conflicting sUAS would be hampered by any occlusion to vision, which could include a) the current inflight visibility, b) moisture, dirt, smoke or any other atmospheric occlusion, c) the sun positioning, especially at a low grazing angle to the horizon, or d) the aircraft cockpit window field of view (which may impede vision by the occluding strut structure).

Simply due to the small size, sUAS movement would most likely be necessary for visual detection. In IMC, if the approach is necessary to precision approach minima (typically no higher than 200' AGL), the amount of time available for a visual contact is measured in seconds and the sUAS would have to be similarly low to the ground, and moving. It is highly unlikely that at the bottom end of an IMC approach to minimums in the transition to VMC flight, that any visual sighting of a sUAS would occur, unless the sUAS were directly in front of the aircraft. In this case, an inflight collision would be imminent and likely unavoidable.

The FAA sightings reports show a disturbing and increasing volume of sightings both around and in the vicinity of the final approach corridor. This could be the result of more complete reporting, a true increase in unauthorized sUAS activity around airports, or both. To combat the inappropriate placement and use of sUAS, a NPRM was enacted early in 2019 for comment on, *Safe and Secure Operations of Small Unmanned Aircraft Systems* (FAA, 2019a); however, this rule effort did not specifically address the sUAS threat to landing aircraft or the final approach corridor. The collision threat to an aircraft on final approach—particularly, less-maneuverable, transport-category aircraft—is significant and could be exponentially more dangerous than light aircraft because of the higher mass and speed of the aircraft involved.

Additional Challenges

Aside from pilot-reported sightings, there is currently no reliable method for tracking UAS flights within the U.S. While the National Aeronautics and Space Administration (NASA) and the FAA are working to establish an unmanned traffic management solution to enable civil low-altitude UAS operations, such infrastructure is not yet in place (NASA, 2019).

Complicating this issue is the current lack of standardization for remote identification and tracking. In June 2017, the FAA's UAS Identification and Tracking Aviation Rulemaking Committee (UAS ID ARC) released its report recommending the agency consider implementation of both *direct broadcast* and *network publishing* of UAS operations. Of the UAS ID ARC's 74 members, 8 did not concur with the report's findings, 20 concurred with exceptions, and 12 gave no response (UAS ID ARC, 2017). As of October 2019, the UAS ID ARC has not published further guidance.

While the FAA has made strides to secure controlled airspace from UAS incursions, their efforts have been met with mixed results.

Problem

The threat of a midair collision between a sUAS and manned aircraft is heightened during the final approach phase of flight, as aircraft transition from higher-altitude airspace into the low altitude arena now populated by small unmanned aircraft. Absent benchmarks for electronic detection and sense and avoid systems, pilots rely primarily on visual senses and proper visual scanning techniques to ensure a positive separation and collision avoidance from sUAS platforms during this segment of flight. Past studies have been inconclusive regarding the efficacy of visual methods for avoiding, reacting to, and maintaining separation from sUAS in the NAS.

Purpose

The purpose of this research was to evaluate the effectiveness of pilot visual detection of unmanned aircraft during an instrument approach to landing scenario. This research serves to better understand the human factors implications for pilots in detecting and avoiding potential collision conflicts with small unmanned aircraft systems in the approach and landing environment. The authors sought to examine pilot mean visual detection distances to a sUAS craft that would pose a potential collision risk during the visual portion of a simulated instrument approach. This research represents the third in a series of related field experiments regarding sUAS detection, visibility, and collision avoidance (Loffi, Wallace, Jacob, & Dunlap, 2016; Wallace, Loffi, Vance, Jacob, Dunlap, & Mitchell, 2018). The authors sought to codify operational strategies for pilots to improve visibility, detection, and collision avoidance of small unmanned aircraft operating in the National Airspace System.

Research Questions

The authors sought to answer the following research questions:

- What is the visual detection rate for a small unmanned aircraft system by an aware pilot when transitioning from an instrument approach to visual landing?
- What is the mean distance at which a small unmanned aircraft system can be detected by an aware pilot when transitioning from an instrument approach to visual landing?
- What factors affect visual detection of small unmanned aircraft systems by pilots?

Literature Review

Several prior studies evaluated the complex problems associated with pilot spotting of small unmanned aircraft systems.

Ohio University Study

In an experimental study conducted at Ohio University, Kephart and Braasch (2010) compared UAS visual detection success rates from both human participants and a mounted sense-and-avoid camera system. Participants flew aboard a Piper Saratoga and attempted to spot a Piper Warrior III aircraft, designed to simulate an unmanned aircraft system. The researchers created a series of head-on and intersecting conflict encounters between the two craft and measured the detection range for both the participants and electronic sense-and-avoid system. The study sample of seven pilots were able to detect the conflict aircraft at a mean range of 1.275 SM. Head-on aircraft encounters were detected at a mean range of 1.038 SM and intersecting aircraft encounters were detected at a mean range of 1.511 SM. Since the study utilized a full-size aircraft target, the findings have limited applicability to small UAS detection, however, this initial research formulated the basis of many of the methodological and procedural elements used in the current study.

Colorado Agricultural Aviation Association Case Study

Maddocks and Griffitt (2015) conducted a field test on behalf of the Colorado Agricultural Aviation Association evaluating pilot visibility of small unmanned aircraft systems operating in proximity to agricultural application operations. During the test, participants flying four fixed-wing aircraft (2 x Cessna T188C; 2 x AT402B) and one Robinson R44 helicopter were instructed to fly overhead five private fields and conduct a visual survey for obstacles and other hazards. One field did not contain any hazards, two fields contained an Agribotix Enduro (6 lb. quadrotor sUAS) inflight, and the final two fields contained marked ground tarps indicating the presence of UAS activity. While all pilots noted the ground markings, only one fixed-wing pilot briefly spotted a sUAS inflight, when the sun momentarily reflected off the aerial vehicle. The R44

pilot was able to successfully spot the sUAS in both test fields. Participants suggested that the sUAS craft were significantly more difficult to see than anticipated. While these results did not provide useful quantitative data, the qualitative findings validate subsequent research codifying the difficulties in spotting unmanned aircraft inflight. Additionally, the authors adapted selected methodological elements from this study—particularly the inclusion of a control pass, in which no sUAS was inflight, to ensure validity of the pilot-reported sightings.

Oklahoma State University Studies

The authors initiated a series of sUAS visibility studies beginning in 2016. The initial research project evaluated the adequacy of vision for detection, identification, collision recognition, and evasion decision-making (Loffi et al., 2016). Using a mixed methods field experiment, the researchers assessed the ability of 20 pilot participants flying a C-172 to spot a fixed-wing Anaconda sUAS and Iris quadrotor sUAS on predefined intercept courses during daylight VMC. Participants successfully detected the Anaconda sUAS during 84.2% of the intercepts at a mean range of .49 SM: the Iris sUAS was detected during 36.8% of intercepts at a mean range of less than .05 SM. The study concluded that based on the sighting distances, coupled with the speed of most general aviation aircraft, most pilots would be unable to successfully perform an evasive maneuver to avoid a collision, based on the FAA's Aircraft Identification and Reaction Time Chart (FAA, 2016).

In a subsequent study, the authors assessed the effectiveness of pilot visual detection of sUAS equipped with high-intensity strobe lighting during daylight VMC (Wallace et al., 2018). Using similar methodology to the Loffi et al. (2016) study, the authors conducted a visibility field experiment with sample of 10 pilots who encountered a series of strobe light-equipped quadrotor sUAS on intercept courses. The sUAS was successfully detected during 3 of the 39 completed intercepts (n = 7.7%), with the detection distance highly variable ranging from .15 SM to 2.42 SM. The authors reported the findings were inconclusive, and not able to definitively support that strobe lighting improved sUAS visibility during daylight visual meteorological conditions.

Methodology

This study used a mixed methods research approach, with qualitative and quantitative elements. This research methodology was adapted, with only minor changes based on Loffi et al. (2016) and Wallace et al. (2018). Participants were purposefully sampled from certificated pilots recruited from a Part 141 collegiate flight training program in the Midwestern U.S. This research was approved by the

Oklahoma State University Institutional Review Board on April 15, 2019, Protocol #ED-18-68.

Procedure

Participants were asked to perform a simulated instrument approach in a C-172S equipped with a G-1000 avionics suite, flown inbound to the Unmanned Systems Research Institute airfield, a UAS test site with a fabric surface runway. The approach was designed to emulate a standard 3˚ precision-approach glide path starting at the Final Approach Fix (FAF), 5 NM north of the airfield at 2,700 feet MSL (1,700 feet AGL), with a Decision Height of 1,250 feet MSL (250 feet AGL). The Minimum Safe Altitude (MSA) was also 250 feet AGL.

The test site was located within Class G airspace, and operating under a COA for UAS operations within a 1 NM radius from the surface to 2,500 ft AGL from the facility (see Figure 4). Each participant flew five approaches, in succession. All flights were to be conducted during daylight hours, during visual meteorological conditions.

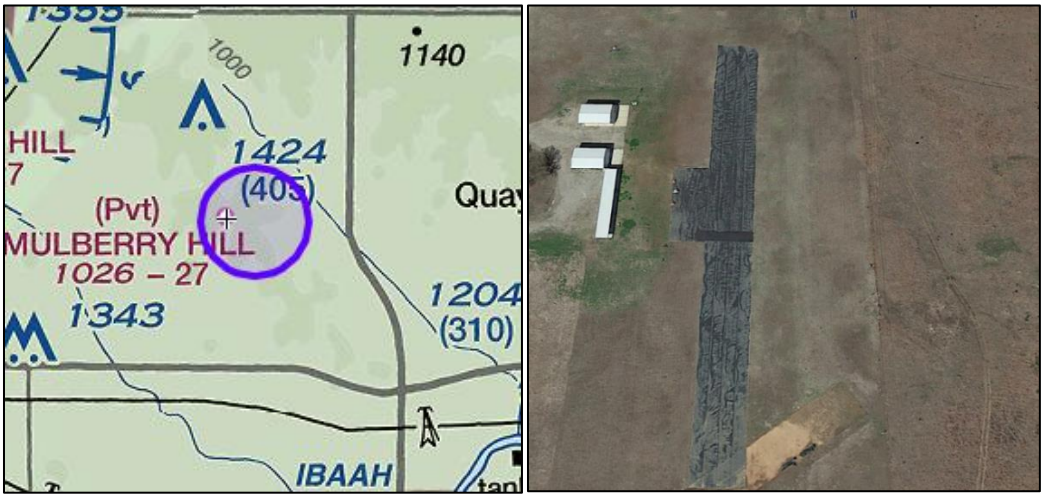


Figure 4. [Left] Unmanned Systems Research Institute COA and surrounding airspace (Excerpt from Dallas Sectional aeronautical chart). [Right] Aerial depiction of Unmanned Systems Research Institute airfield (derived from Google Earth; view looking from South to North).

During each approach a small unmanned aircraft system performed scripted maneuvers on a perpendicular axis at a distance of 1,000 ft from airfield along the approach corridor. All UAS flights were conducted at 50 ft AGL. The approach MSA afforded a 200-ft safety margin between the unmanned aircraft and manned aircraft, however, pilots were advised they could execute a go-around or other evasive maneuver, if they felt safety had been compromised.

The airfield approach setup was purposefully designed to replicate a standard U.S. precision final approach path of 3˚ from the FAF, 5 NM from the touchdown point. The methodology was designed to have the participants execute a safe, familiar profile in visual conditions starting at the FAF. This 3˚ FAF 5 NM standard applies to all U.S. ILS, GPS, PAPI and VASI vertical guidance system, unless otherwise noted in the FAA's Digital Chart Supplements or IFR Approach plates. While very much an IFR-sounding methodology, the design was not intended to replicate restricted IFR visibilities typically encountered when needing a precision approach. The design was intended to stabilize the aircraft on approach and allow the participant to concentrate on the forward-view sight picture of the runway all the way to the simulated Decision Height (Missed Approach Point) altitude.

When executed properly, the visual sight picture of the participant would immobilize the runway in the aircraft windshield. The only change in the sight picture the participant was designed to see during the execution of the visual approach was the increasing size of the immobilized runway.

An airborne researcher accompanied each flight, stationed in the aft seat. This individual was responsible for recording pilot sighting times, reported verbally on the intercom. Upon conclusion of each pass, the researcher would also document participant qualitative observations, comments, or impressions.

UAS Procedure

Researchers elected to use a DJI Phantom IV (white quadrotor) UAS for the experiment. This selection was made due to the ubiquitous nature of DJI platforms operating within the NAS, as well as UAS fleet availability. It is estimated that DJI platforms comprise approximately 74% of the market share for consumer UAS within the United States (Skylogic Research, 2018).

The researchers included the following UAS maneuvers, implemented randomly to ensure reliability (Note: all aircraft approaches were conducted along a southbound trajectory):

- **Control Pass**--No UAS in flight (implemented to screen false positive sightings)
- **Static-Starboard**—UAS flew out to a distance of 1,000 feet north of the airfield and performed a stationary, hovering maneuver orientated 100 feet east of the approach course.
- **Static-Port**-- UAS flew out to a distance of 1,000 feet north of the airfield and performed a stationary, hovering maneuver orientated 100 feet west of the approach course.
- **Maneuvering**—UAS flew out to a distance of 1,000 feet north of the airfield and transitioned laterally crossing back and forth up to 200 feet left and right of the approach course

Safety Protocols

To further ensure safety during the experiment, a safety pilot was stationed in the co-pilot's seat and instructed to assume command of the aircraft if he determined flight safety had been compromised. Safety pilots were all experienced Certified Flight Instructors and were considered non-participants for experimental purposes. Safety pilots were also provided a sequential list of the UAS maneuver sets, and furnished access to an isolated radio to perform safety coordination with UAS operators on the ground. The pre-planned response to a UAS flyaway, potential real-world collision threat, or other unforeseen emergency was for the initiating individual (any individual that noticed the safety issue) to call a "knock it off" over the radio and the safety pilot to initiate a climbing evasive maneuver to exit the UAS operating area.

Assumptions

The researchers presumed the following conditions during the experiment (as adapted from Wallace et al., 2018):

- The skill and experience of participants was reasonably representative of general aviation pilots of equivalent certificate levels.
- Participants honestly and accurately self-reported visual acuity.
- Positional and altitude data from the C-172/S avionics suite and Phantom IV telemetry were assumed to be accurate.
- Participants reported sUAS sightings honestly, accurately, and without substantive delay. (Note: honest reporting was also validated through the use of a random control intercept.)

Limitations

The researchers were constrained by the following limitations (also adapted from Wallace et al., 2018).

- The high cost of conducting flight experiments rather than simulation limited the scope and number of participants. The limited number of participants prevented collection of adequate data points to conduct statistical inference or generalizability testing.
- The experiment was supposed to include two maneuvering passes, with one originating from the port side of the aircraft, and the other from the starboard side. Unfortunately, an execution error resulted in the one of these pass types being randomly selected. This explains the inconsistency in the number of pass types for each participant. The authors reported this

inconsistency in the dataset by describing this intercept as the *random pass*.

Findings and Discussion

The study was carried out from July 8-11, 2019, with 10 pilots participating. Pilot demographic information and self-reported visual acuity are presented in Table 1. The researchers loosely associated advanced pilot certificates with participants' experience in see and avoid procedures.

Table 1
Participant Aeronautical Demographics

Participant	FAA Pilot Certificate(s)	Medical Certificate	Reported Vision
1	CP, IR	1st Class	20/20
2	CP, IR, CFI	1st Class	20/20
3	CP, IR, CFI	1st Class	20/20*
4	PP, IR	1st Class	20/20
5	CP, IR, CFI	3rd Class	20/20
6	PP, IR	1st Class	20/20
7	PP, IR	1st Class	20/20
8	CP, IR, CFI	1st Class	20/20
9	CP, IR, CFI	1st Class	20/20
10	CP, IR	1st Class	20/20

Note. (PP = Private Pilot; IR = Instrument Rating; CP = Commercial Pilot; CFI = Certified Flight Instructor). * Indicates with corrective lenses.

Flights were conducted between the hours of 7:30 AM-12:30 PM, local time in VMC. Weather data was collected to determine possible environmental impacts to visibility (see Table 2).

The airborne researcher reported that low-lying haze decreased visual clarity during the July 8-10 flights. This condition was reportedly not present on July 11, which may have contributed to improved sighting rates.

Table 2
Local Weather Information at Onset of Participant Flights

P#	METAR Observation
1	KSWO 081300Z AUTO 23004KT 10SM CLR 25/21 A2995 RMK T02500210 MADISHF
2	KSWO 081430Z AUTO 00000KT 10SM CLR 29/20 A2997 RMK T02900200 MADISHF
3	KSWO 081625Z AUTO 19011KT 10SM FEW100 32/20 A2996 RMK T03200200 MADISHF
4	KSWO 090753Z AUTO 17006KT 10SM CLR 24/22 A2988 RMK AO2 SLP103 T02440217
5	KSWO 091435Z AUTO 17010KT 10SM CLR 28/21 A2993 RMK T02800210 MADISHF
6	KSWO 101300Z 19005KT 2SM HZ CLR 28/24 A3000 RMK AO2 VIS 1V4 T02830239
7	KSWO 101430Z AUTO 19005KT 10SM CLR 31/23 A3002 RMK T03100230 MADISHF
8	KSWO 111253Z 01005KT 10SM SCT065 24/18 A3013 RMK AO2 SLP187 T02440178
9	KSWO 111430Z AUTO 05011KT 10SM CLR 28/17 A3012 RMK T02800170 MADISHF
10	KSWO 111605Z AUTO 05009KT 10SM CLR 31/16 A3011 RMK T03100160 MADISHF

Note. Data derived from archival Oklahoma ASOS data obtained from Iowa State University, Iowa Environmental Mesonet, https://mesonet.agron.iastate.edu/

Quantitative Data

Table 3
Sighting Ranges by Intercept Type (feet)

Participant	Control	Static-SB	Static-P	Moving	Random Pass	Random Pass Type
P1	0	0	0	0	0	Moving
P2	0	0	0	1086	0	Static-P
P3	0	0	0	0	0	Moving
P4	0	0	0	0	0	Moving
P5	0	0	0	0	1585	Moving
P6	0	0	0	0	0	Static-P
P7	0	0	0	0	2219	Moving
P8	0	0	1077	842	1781	Moving
P9	0	950	0	1400	1615	Moving
P10	0	0	213	1488	2324	Moving

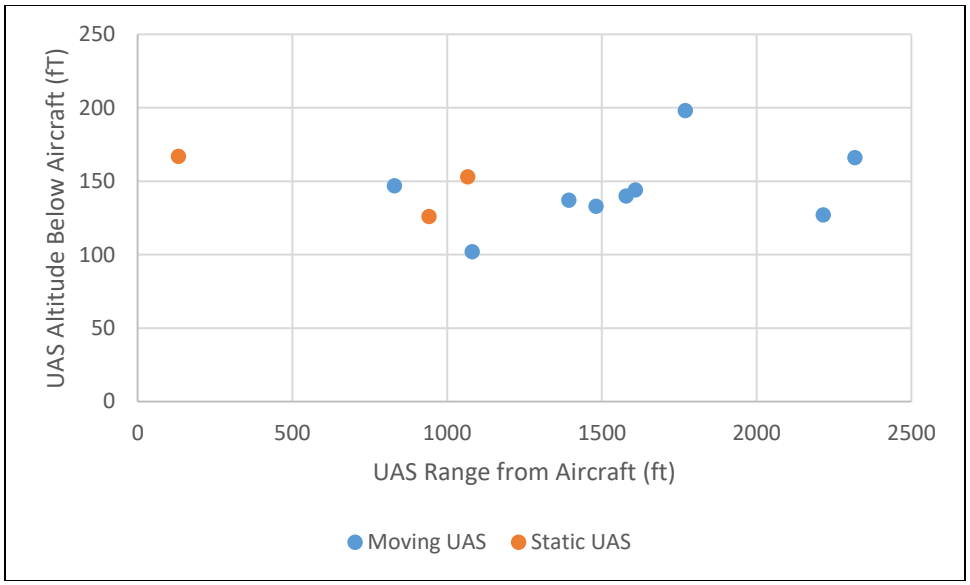


Figure 5. UAS Sightings by Range and Altitude (measured in feet).

Sightings by Intercept Type. Table 3 and Figure 5 present UAS sighting data. Overall, participants spotted the unmanned aircraft on 12 occasions out of a total of 40 possible events (n = 30% detection rate). There were no false positive reports during the control pass, indicating participants were likely honest in reporting visual acquisition of the unmanned aircraft. Detections ranged in distance from a minimum of 213 feet to a maximum of 2,324 feet (see Figure 6).

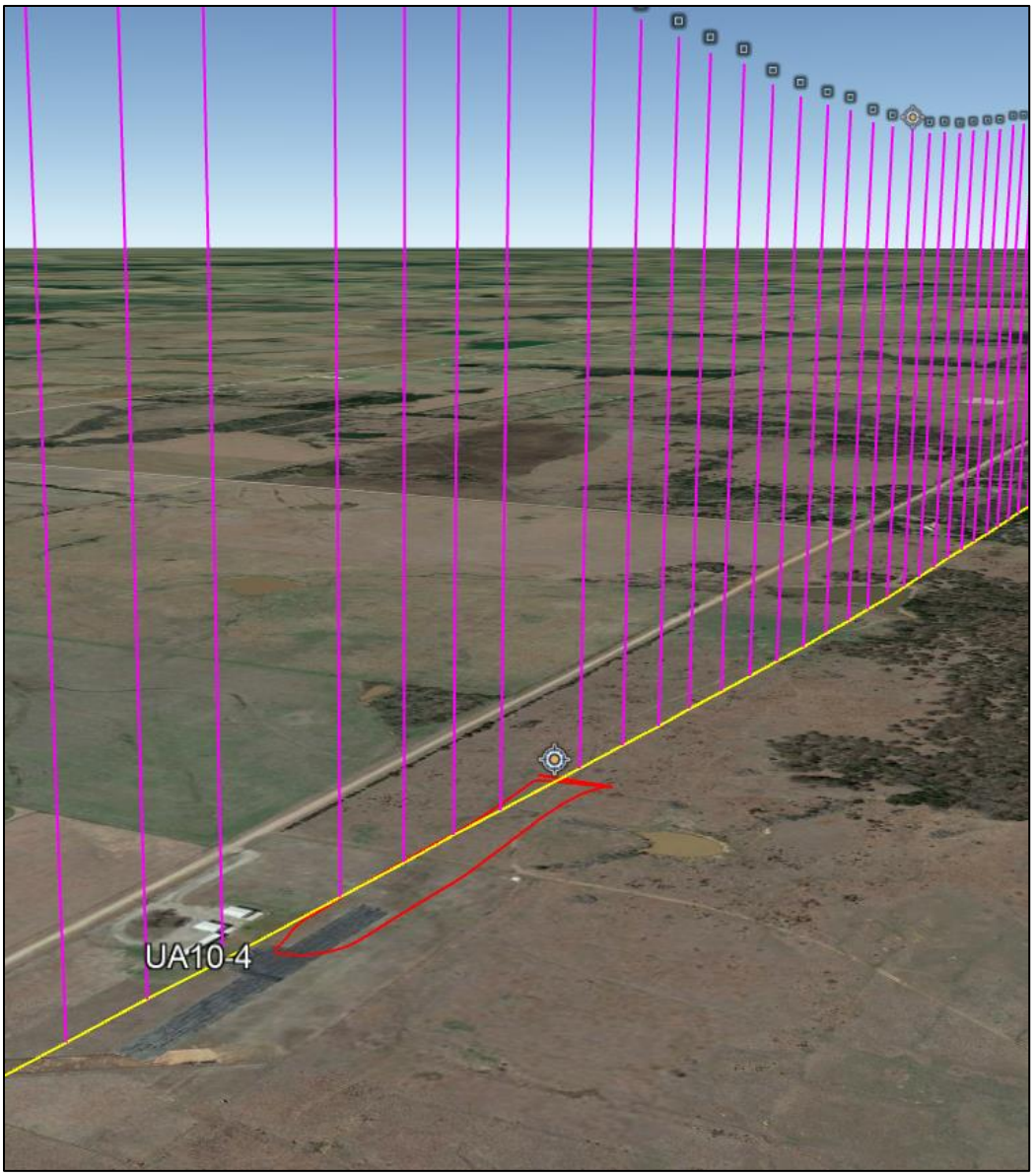


Figure 6. Telemetry plot of UAS sighting by Participant 10. This intercept depicts the maximum sUAS sighting distance recorded during the experiment, with a detection range of 2,324 feet. Initial detection locations for both the aircraft and sUAS are depicted by the target reticule icon. The sUAS was maneuvering laterally at the time of detection.

The largest proportion of sightings occurred during sUAS moving passes, with 9 sightings out of a total of 18 possible events (n = 50%). The mean detection range for moving sUAS (excluding null sightings) was 1,593.3 feet.

This leaves very little margin for a pilot to detect a sUAS, recognize the collision threat, make an evasion decision, and successfully execute an evasive maneuver.

The detection rate for static passes was much lower, with only 3 detections out of 22 possible events, representing a detection rate of 13.6%. Static detections were slightly higher when the sUAS was positioned on the port side of the aircraft. This makes logical sense, due to the fact that the participant was positioned in the left seat of the aircraft, giving them easier access to view the left portion of the windscreen, as well as out the left pilot window. Nevertheless, the lack of additional data makes this observation anecdotal rather than conclusive. The mean detection distance for static sUAS targets was 746.7 feet, nearly half the distance of moving sUAS detections.

Ground haze during the July 8-10 flights may have played a significant role in obscuring sUAS detection, which may explain the uptick in participant sightings that occurred on July 11.

Researchers evaluated the vectors at which pilots made successful sightings. Moving sUAS sightings were exclusively detected within a small visual cone extending 0˚-5˚ right of center and 5˚-10˚ downward from the horizon. Static sUAS targets were detected more peripherally. Results are presented in Table 4 and Figure 7.

Table 4
Successful sUAS Sightings Data

Part / Intercept	Intercept Type	Altitude ▲ (ft)	Lateral Dist (ft)	Slant Range (ft)	Horizontal Aspect Angle (˚)	Vertical Aspect Angle (-˚)
P2-4	Moving	102	1081	1086	5	5
P5-5	Moving	140	1579	1585	0	5
P7-4	Moving	127	2216	2219	3	5
P8-3	Moving	147	829	842	1	10
P8-4	Static	153	1066	1077	-4	8
P8-5	Moving	198	1770	1781	4	6
P9-2	Moving	137	1393	1400	1	6
P9-3	Static	126	942	950	8	8
P9-5	Moving	144	1608	1615	4	5
P10-1	Moving	133	1482	1488	1	5
P10-2	Static	167	132	213	-44	52
P10-4	Moving	166	2318	2324	3	4

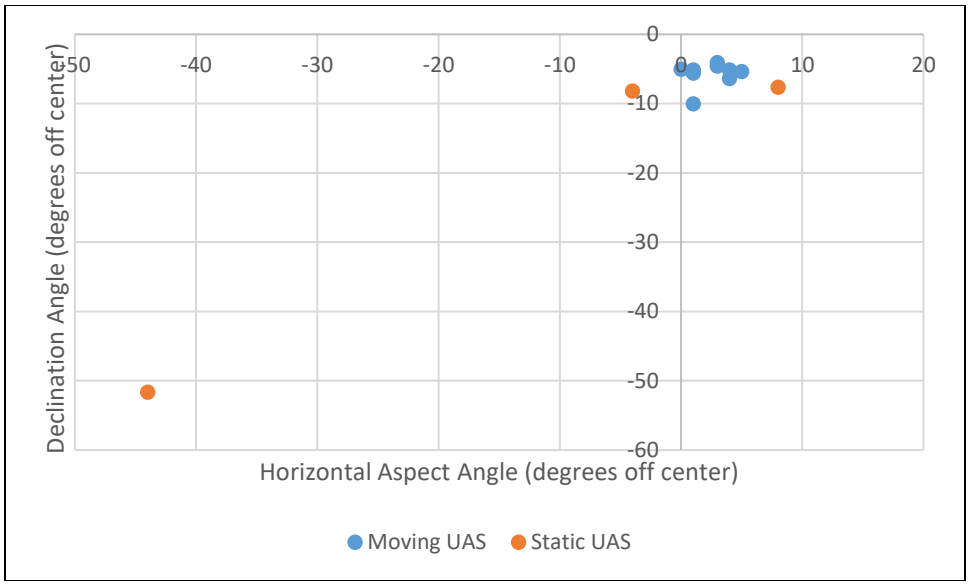


Figure 7. Pilot Visual Aspect at Time of Sighting.

Qualitative Data

The participants provided a plethora of observations, comments, and impressions from their experience. An evaluation of participant comments revealed several trends.

Spotting the sUAS was difficult. Six of the 10 participants commented about how difficult it was to detect the sUAS. Participant #2 called it a "very small speck moving left to right in the glidepath." Participant #3 suggested, "you won't see it unless you look at the right spot at the right time." According to participant #5, "I feel I have good vision. If there is a UAS there, it is very hard to see." Participant #7 commented, "it makes me kind of nervous knowing it [sUAS] is there but not seeing it." Participant #8 alluded, "in a faster airplane it would be hard to spot, if not alerted…would not be easy to see. Being hyper alert contributed to seeing the UAV." Participant #9 stated "[the UAS was] difficult to see…" Participant #10 confirmed, "It was a lot harder [to spot] than first thought. If not alerted as in the research, it would have been harder still."

These observations are also supported by the quantitative data. The conditions of the experiment likely improved sightings beyond what would normally be realized in operational settings. First, participants were made aware of the presence of a sUAS, encouraging greater situational awareness and focus outside the aircraft. Additionally, atmospheric conditions—with the exception of the aforementioned haze—were generally favorable with a reported visibility of 10 SM during all but one pass (see Table 2). Finally, the experiment was

conducted in uncongested Class G airspace, inducing very few operational distractions for the pilot participant.

Wallace et al. (2018) reflected these same findings in a similar, prior experiment where "90% [of participants] indicated the sUAS was 'difficult' or 'very difficult' to see. Forty percent of participants stated they had 'low' or 'no' confidence in their ability to detect the sUAS" (pp. 64-5).

Contrast. Half of the participants commented about the importance of contrast between the sUAS and background. Participant #4, "If you have blue behind objects [sky] it is much easier to see than if you have green [ground]." Conversely, Participant #8 disagreed stating, "the contrast of the white UAV to the green grass…brought my attention to the UAV. Participant #9 also commented about the white UAV color having strong contrast with the green background. Participant #10 agreed stating, "I was attracted by the white color against the green grass and movement." Participant #6 suggested the addition of lights or high-visibility coloration to improve contrast. The recommendations for high contrast was also a finding reflected in Loffi et al. (2016).

Moving sUAS are easier to spot. Four of the 10 participants indicated that when the sUAS was in motion it became slightly easier to spot. Participant #7 stated, "[sUAS] motion helped to detect. If sitting still it would be hard to see." Participant #8 observed, "movement first brought my attention to the UAV." Participant #9 indicated, "It was difficult to see except for movement." Participant #10 echoed these observations, saying, "The way the UAV moved confirmed it was not a bird...movement attracted attention." This finding is notable since in the Loffi et al. (2016) study, researchers recorded improved visual detection of fixed wing sUAS platform over rotorcraft sUAS. This was initially thought to be attributed to the high-visibility *wing-flash* produced when the fixed-wing craft maneuvered, however, this effect may actually be more resultant of the relative motion of the sUAS to the observer.

Misidentification. Two participants indicated that despite being aware of the presence of a sUAS, they did not initially identify the spotted object correctly. Participant #9 identified the sUAS as a possible fixed-wing aircraft, "it appeared to have a solid wing as it moved left to right…glancing at the UAV and flying the airplane gave me the impression the UAV was a fixed-wing." Participant #10 similarly stated, "it took a few moments to recognize what I was looking at, which was somewhat surprising."

UAS more likely to be seen from front and left aspects. Researchers anticipated more comments about the positioning of the participant in the aircraft relative to the sUAS aspect, however, only one comment was recorded. Participant #1 said, "If it's off to the side I will not see it. I am concentrating straight ahead. Left is easier, since looking right requires me to see up and over the dash." Nevertheless, the earlier-presented quantitative data suggests higher

successful detections within a 12˚ lateral and 5˚ vertical wedge of center. Loffi et al. (2016) also identified the tendency of participants to centrally focus scanning efforts, with 10% of the participants not performing full-range visual scanning and instead focusing between the "11:00-2:00 positions" (p. 18).

Image/Video Data

The researchers collected a number of images and videos from the experiment that highlight various findings and reported concepts. While not all elements fall within the direct scope of the study, the exploratory nature of the research made a compelling case for reporting these observations.

Several images of the various intercepts were taken from the ground perspective. It is notable that in several cases these images generated the illusion that the aircraft was much closer in proximity and altitude than reality (see Figure 8). In these cases, the ground observer's visual angle and perception places the closer sUAS in direct visual line with the aircraft. An optical illusion is created due to the tendency of observers to subconsciously compare the objects as relatively comparable in size. This finding was also noted in Vance et al. (2017). The size of the sUAS (excluding propellers) measures a width of 289.5mm (.95 ft) and height of 196mm (.64 ft), whereas the C-172/S measures approximately 36 ft wide and 9 ft high, respectively (Cessna, 2012; DJI, 2019). This effect is modeled in Figure 8.

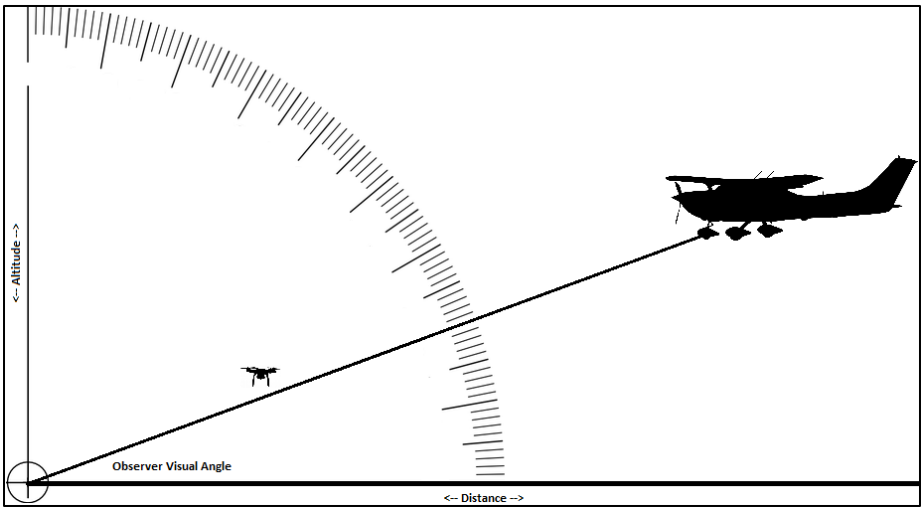


Figure 8. [Top] Image of sUAS approach encounter (ground perspective). This view is comparable to what a Remote Pilot or Visual Observer would perceive. [Bottom] Note the size differential between the aircraft and sUAS. Because the sUAS is closer to the observer, it appears larger and thus seems perceptively closer to the aircraft. Additionally, because the sUAS and the aircraft are along the same visual plane relative to the observer, the sUAS appears to present collision threat, whereas, there is clearly an altitude separation between the two.

Data was also collected from the Phantom IV to better understand the Remote Pilot's perspective with regard to aircraft collision avoidance. Figure 9 depicts time-delayed screen captures from the Phantom IV's electro-optical camera taken at 30-, 10-, and 2-seconds prior to the aircraft intercepting the sUAS. These images correspond to lateral ranges of approximately 5,063 ft; 1,688 ft; and 338 ft, respectively. The aircraft was extremely difficult to detect at long range. The experimental aircraft was equipped with wig-wag LED landing lights, which were activated during the experiment. Observation of the alternating flash pattern was only faintly recognizable; and, the aircraft is almost indiscernible at the 30-second interval. At the 10-second interval, the wig-wag lights are fairly obvious and the aircraft form is generally discernable. Two seconds prior to intercept, the aircraft's individual structural elements are easily spotted; and, wig-wag light pattern becomes more difficult to see as the aircraft transitions overhead.

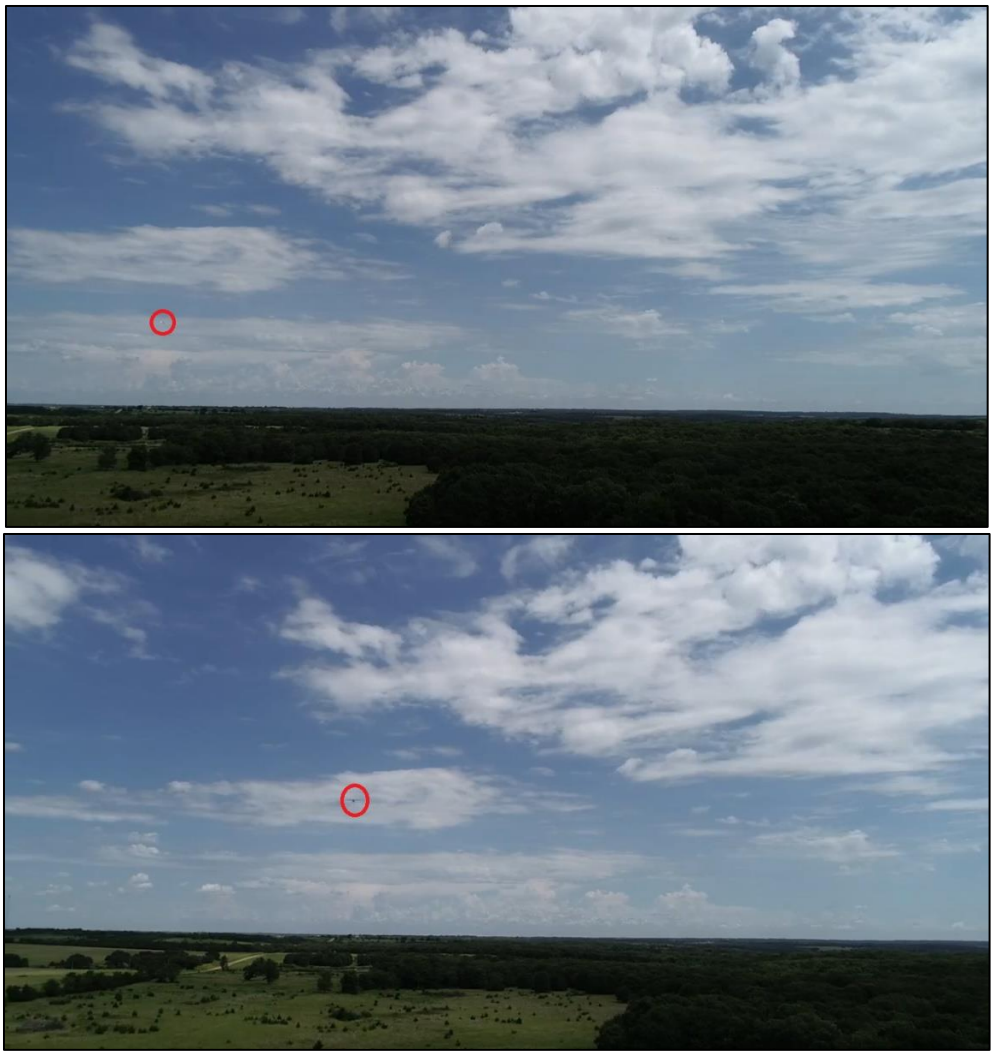


Figure 9. Excerpts from sUAS video taken prior to aircraft overflight of sUAS with aircraft highlighted in red: (Top) 30 seconds prior; (Middle) 10 seconds prior; (Bottom) 2 seconds prior. Long-range identification was nearly impossible without relying on spotting the aircraft's wig-wag LED landing lights. Full video available at: https://commons.erau.edu/ijaaa/vol6/iss5/12/

Video from a camera mounted on the aircraft's tie-down ring captures an approximation of the pilot's visual perspective of a sUAS encounter. It should be noted that a pilot's view is likely to be obscured by obstacles such as the instrument panel, aircraft structure, or even an unclean windscreen—these conditions all make sUAS detection more difficult than presented in the video. Time-capture images from the external camera shown in Figure 10 reveal the relatively small size of the sUAS and accompanying difficulty in successfully detecting the sUAS. The video from Figure 9 corresponds to aircraft and sUAS telemetry presented in Figure 11.

Figure 10. Excerpts from externally-mounted video camera taken during Participant 1, Intercept 2. Note the relatively small size makes the sUAS extremely difficult to detect. The participant did not detect the sUAS during this pass. Full video available at: https://commons.erau.edu/ijaaa/vol6/iss5/12/

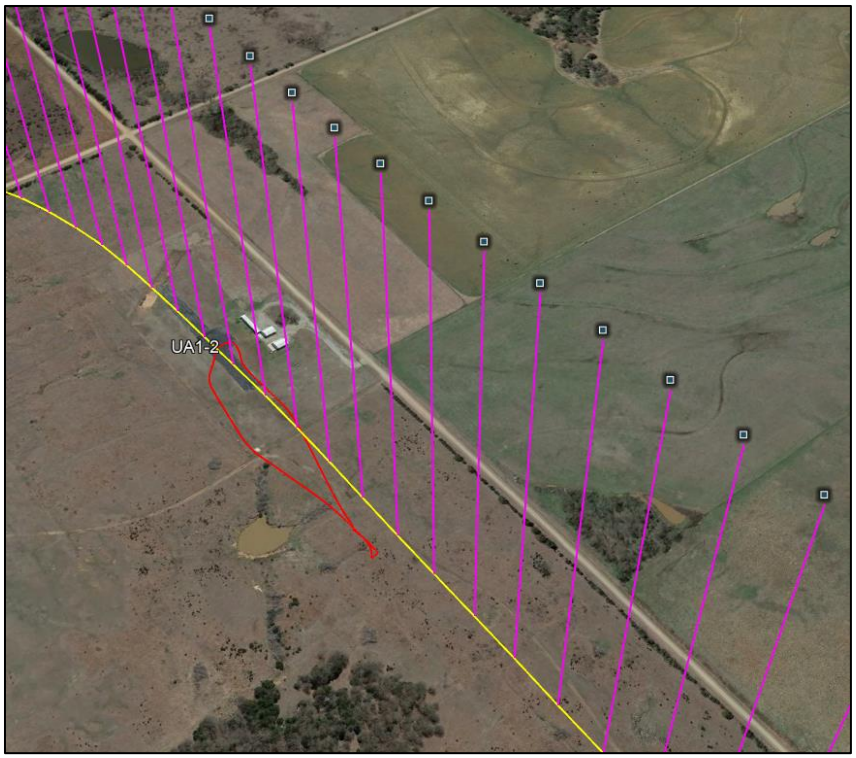


Figure 11. Aircraft/UAS telemetry overview presented in Google Earth. Aircraft ground track presented in yellow, with altitude indicated by raised plots; sUAS flight track depicted in red. The participant did not detect the sUAS during this pass. Data derived from Participant 1, Intercept 2. This telemetry corresponds to video data presented in Figure 9.

Conclusions and Recommendations

Visual Detection Rate

Participants detected the sUAS during 12 out of 40 possible events, resulting in an overall detection rate of 30.0%. Moving sUAS were detected during 9 out of 18 possible events, resulting in a detection rate of 50.0%. Static sUAS were detected during only 3 out of 22 possible events, yielding a detection rate of 13.6%. This data seems to indicate that detection rate is substantially improved when the sUAS is in motion.

Detection Distance

Overall, the mean detection distance for all passes (excluding failed sightings) was 1,382 ft. Mean detection distance for moving sUAS was 1,593 ft. The mean detection distance for static sUAS was 747 ft. Again, this data seems to suggest that moving sUAS are easier to spot than static ones.

Factors Affecting Visual Detection

Participants generally indicated that spotting the sUAS was much more difficult than originally anticipated. Despite favorable visual conditions, participants were still challenged to successfully spot airborne sUAS. While participants indicated that moving and high-contrast sUAS targets were easier to detect, efforts should be made to employ scanning strategies to spot static and low-contrast targets, as well. This suggests a possible need for emphasis in scanning training to adequately prepare pilots to employ proper techniques to maximize visual detection. This could also include an effort to make manned pilots more aware of the need for vigilant scanning to detect unmanned aircraft when flying at low altitude or in areas of known sUAS operations.

Small UAS operators should be cognizant of the challenges associated pilot detection of their platforms. Steps should be taken by the sUAS Remote Pilot to maximize the conspicuity of their platforms, such as using high-contrast UAS colors, performing regular maneuvers, or other strategies to make their operation as visible as possible.

Both the sightings data and participant comments suggest that pilot scanning tends to concentrate within the central rather than peripheral fields of view. Small UAS operating near the approach corridor, yet outside a pilot's field of view or concentration could easily and quickly penetrate the approach corridor, thereby posing an immediate and immutable collision threat. Pilots need to effectively scan the approach path to ensure clearance, but also should not forget to regularly check the periphery for possible airborne threats outside of the normal, centralized field of view.

Evasive Action Impact

This research highlights that the relatively high closure rate coupled with the short detection distances between the aircraft and sUAS leaves little (if any) margin for evasive action. Even when the aircraft is configured for its slowest approach speed (approximately 65 kts/74.8 mph) and the sUAS is static, the available response time would be approximately 14.5 seconds, based on the mean detection distance of 1,593 ft. This leaves a margin of only 2 seconds above the FAA's recommended minimum reaction time required for evasion (FAA, 2016). Even at the maximum detection range of 2,324 ft recorded during the experiment, the available response time would be only 21.2 seconds. The aforementioned condition is the *best case scenario.* A pilot's available reaction time would be considerably less if the aircraft approach speed were higher or the unmanned aircraft was closing on the aircraft's flight path. This finding is generally similar to the findings contained in Loffi et al. (2016). Succinctly, UAS sightings in the final moments of an approach present a significant risk to flight safety. An aircraft

on a stabilized approach to landing will be at low altitude, configured for a low airspeed. These conditions make abrupt, evasive maneuvers particularly hazardous.

Future Research

In a future research project, the authors intend to conduct an experiment attaching a UAvionics Ping—an ADS-B (out) device—to a sUAS to determine if pilots can effectively correlate, spot, and evade sUAS displayed on electronic situational awareness and collision avoidance equipment. The objective of this research is to determine how pilot access to real-time UAS Remote Identification data could improve pilot situational awareness and midair collision avoidance.

References

Aviation Safety Reporting System. (2019). *ASRS screening data: Unmanned aerial vehicle (UAV) reports (Search Request # 7283)*. Moffett Field, CA: Author.

Cessna Aircraft Company. (2012). *Skyhawk model 172S: Specification and description.* Wichita, KS: Author.

DJI. (2019). *Phantom 4 specs.* Retrieved from https://www.dji.com/phantom-4/info

Federal Aviation Administration. (2016). *Pilots' role in collision avoidance [Advisory Circular, AC 90-48D].* Retrieved from https://www.faa.gov/documentLibrary/media/Advisory_Circular/AC_90-48D.pdf

Federal Aviation Administration. (2019a). *Safe and secure operations of small unmanned aircraft systems.* Retrieved from https://www.regulations.gov/document?D=FAA-2018-1086-0001

Federal Aviation Administration. (2019b). *UAS sightings report [database].* Retrieved from https://www.faa.gov/uas/resources/public_records/uas_sightings_report/

Gettinger, D. & Michel, A.H. (2015). Drone sightings and close encounters: An analysis. *Center for the Study of the Drone at Bard College.* Retrieved from https://dronecenter.bard.edu/files/2015/12/12-11-Drone-Sightings-and-Close-Encounters.pdf

Kephart, R. J. & Braasch, M. S. (2010). Comparison of see-and-avoid performance in manned and remotely piloted aircraft. *IEEE Aerospace and Electronic Systems Magazine, 25*(5), 36-42. doi:10.1109/MAES.2010.5486540

Loffi, J. M., Wallace, R. J., Jacob, J. D., Dunlap, J. C. (2016). Seeing the threat: Pilot visual detection of small unmanned aircraft systems in visual meteorological conditions. *International Journal of Aviation, Aeronautics, and Aerospace,* 3(3). Retrieved from https://commons.erau.edu/ijaaa/vol3/iss3/13

Maddocks, J., & Griffitt, G. (2015). Qualitative evaluation of unmanned aircraft visibility during agricultural flight operations. *Avion.* Limited Access Report obtained from the Colorado Agricultural Aviation Association.

National Aeronautics and Space Administration. (2019). *Unmanned aircraft system (UAS) traffic management (UTM).* Retrieved from https://utm.arc.nasa.gov/index.shtml

Skylogic Research. (2018). 2018 *Drone market sector report.* Retrieved from http://droneanalyst.com/research/research-studies/2018-drone-market-sector-report-purchase

UAS Identification and Tracking Aviation Rulemaking Committee [UAS ID ARC]. (2017). ARC recommendations final Report. *Federal Aviation Administration.* Retrieved from https://www.faa.gov/regulations_policies/rulemaking/committees/documents/media/UAS%20ID%20ARC%20Final%20Report%20with%20Appendices.pdf

Vance, S. M., Wallace, R. J., Loffi, J. M., Jacob, J. D., Dunlap, J. C., & Mitchell, T. A. (2017). Detecting and assessing collision potential of aircraft and small unmanned aircraft systems (sUAS) by visual observers. *International Journal of Aviation, Aeronautics, and Aerospace*, 4(4). https://doi.org/10.15394/ijaaa.2017.1188

Wallace, R. J., Loffi, J. M., Vance, S. M., Jacob, J., Dunlap, J. C., & Mitchell, T.A. (2018). Pilot visual detection of small unmanned aircraft systems (sUAS) equipped with strobe lighting. *Journal of Aviation Technology and Engineering*, 7(2). doi:10.7771/2159-6670.1177

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)
Statement of Concurrence / Non-Concurrence

Voting Member Name	Vijay Somandepalli
Voting Member Organization	American Robotics, Inc.

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

1. Concur with the Final Document as written

Voting Member Signature: _____ Date: _____

2. Concur with the Final Document as written with the following exception(s): **(Fully explain the areas of exception below, providing specific page and line number. Submission of separate paper is acceptable).**

American Robotics appreciates the extensive effort put in by all members of the FAA BVLOS ARC towards the final ARC recommendations Report to enable scalable and effective BVLOS operations of UAS in the NAS. The ARC recommendations are built on solid safety and technology foundations which, if implemented expeditiously by the FAA, will restore American leadership in the commercial use of UAS technologies. American Robotics concurs with the recommendations made in the BVLOS ARC Recommendations Final Report.

American Robotics believes that the ARC recommendations are a strong first step towards expanded commercial UAS operations. By necessity, we recognize that this Report represents a compromise between the various stakeholders operating in the NAS. In the view of American Robotics, the Report could have gone further to ensure progress. The ARC could have, as one example, recommended to the FAA and DOT specific timeframes and deadlines to enable the various recommendations that the ARC makes.

American Robotics looks forward to continuing to work closely with the FAA and other stakeholders to educate, enable and operationalize safe, scalable and economically viable BVLOS operations of UAS in American skies.

Voting Member Signature: S. Vijay Date: 03/03/2022

3. Non-Concur with the Final Document as written. Letter of Dissent must be provided.

Voting Member Signature: _____ Date: _____

FAA BEYOND VISUAL LINE OF SIGHT (BVLOS) Aviation Rulemaking Committee (ARC)

Statement of Concurrence / Non-Concurrence

Voting Member Name	William E. Lovett
Voting Member Organization	Phoenix Air Unmanned, LLC

As a voting member and full participant of the FAA BVLOS ARC, I hereby acknowledge that I have reviewed the *BVLOS ARC Recommendations Final Report* and make the following declaration regarding the Report:

1. Concur with the Final Document as written

Voting Member Signature: _____ Date: **3/1/2022**

2. Concur with the Final Document as written with the following exception(s): (Fully explain the areas of exception below, providing specific page and line number. Submission of separate paper is acceptable).

Voting Member Signature: _____ Date: _____

3. Non-Concur with the Final Document as written. Letter of Dissent must be provided.

Voting Member Signature: _____ Date: _____