BEFORE THE
DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
WASHINGTON, D.C.

IN THE MATTER OF

Request for Comments – UAS Beyond Visual Line-of-Sight Operations

Docket No. FAA-2023-1256

COMMENTS OF THE SMALL UAV COALITION

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June 14, 2023

Filed with www.regulations.gov

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The Small UAV Coalition[1] (the "Coalition") is pleased to provide its comments regarding the Federal Aviation Administration's ("FAA's") request for comments on the recommendations of the Beyond Visual Line-of-Sight ("BVLOS") Aviation Rulemaking Committee ("ARC"), FAA-2023-1256, 88 Fed. Reg. 33855 (May 25, 2023) (the "Notice"). The Small UAV Coalition welcomes any action such as this Notice that will hasten the publication of a proposed rule to authorize BVLOS operations. Many concepts contained in the Notice represent substantial steps toward streamlining how civil drones are regulated more effectively and efficiently without compromising safety.

The Coalition includes below answers to the specific questions posed in the Notice. At the outset, the Coalition wishes to emphasize the following points: [to be completed]

The Coalition's answers to the specific questions in the Notice follow.

A. Detect and Avoid Systems Performance Standards

The FAA is reviewing these standards, as well as ways for operators to demonstrate that their DAA system meets specific requirements in a combination of published standards. These include:

1. ASTM F3442/F3442M–23, Standard Specification for Detect and Avoid System Performance Requirements, dated February 28, 2023.
2. RTCA DO–381, Minimum Operational Performance Standards (MOPS) for Ground Based Surveillance Systems (GBSS) for Traffic Surveillance, dated March 26, 2020.
3. RTCA DO–365C, Minimum Operational Performance Standards (MOPS) for Detect and Avoid (DAA) Systems, dated September 15, 2022.

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[1] Members of the Small UAV Coalition are listed at www.smalluavcoalition.org.

4. RTCA DO–396, Minimum Operational Performance Standards for Airborne Collision Avoidance System sXu (ACAS sXu), dated December 15, 2022.

A1. In which circumstances or operating environments should the FAA allow this combination approach?

The primary challenge presented by this question, and by the standards it lists, is that both assume that a detect and avoid system ("DAA system") is solely responsible for all mitigations, and that the success of such a system is defined by metrics (such as a risk ratio) that use inappropriate and unaccepted definitions of traditional aviation terms as the basis for calculation. This thinking is out-of-date and contradicts more recent and robust approaches developed by industry and espoused in the BVLOS ARC Final Report; specifically, that drone traffic deconfliction is best accomplished through a layered set of both strategic (pre-launch) and tactical/technical (post launch) in appropriate combinations to achieve an acceptable level of risk.

The ASTM F3442/F3442M-23 standard is flawed in that it uses newfangled definitions of traditional aviation terms such as "well clear" and "near-midair collision" (NMAC) that are overly general, excessively conservative (without a demonstrable increase in safety as implemented). Neither of these definitions aligns with the corresponding FAA rules (14 C.F.R. 91.111 and 91.113, respectively), and neither enjoys concurrence by broad swaths of the drone industry, particularly those operators conducting (or intending to conduct) high-volume operations such as package delivery.

This ASTM F3442 standard uses a metric for "well clear" that is four times greater than the lateral separation specified for two crewed aircraft in many cases, even though the drone is not putting passengers or crew at risk. Application of such standards for higher-density applications is particularly unsuitable due to their inability to support scaled operations. The result, though unintended, disproportionately disrupts operations without a material safety benefit.

The FAA, to its credit, acknowledges in the Notice that the listed standards were selected primarily for their availability rather than their suitability or applicability for certain use cases. Therefore, in the interest of advancing an important and positive first step toward declarative compliance, the Coalition does not object to begin with the listed standards to enable this worthwhile approach, provided the FAA provide substantial latitude to proponents who offer alternative approaches, including replacing the "well clear" and NMAC definitions with distances more appropriate to the characteristics of their use case, aircraft performance and operational environment. We also believe that the FAA should share the concepts and frameworks used for these alternative approvals, so that they can be leveraged by others in streamlined applications that are eligible for summary grants.

Most importantly, we recommend that the FAA move quickly and in parallel to develop and implement a BVLOS approval framework that supports a combination of strategic and technical mitigations to achieve an acceptable level of risk. To maximize the safety potential of BVLOS operations, it's important to include the full range of mitigations, both strategic (such as area and time restrictions, flow control, and temporal "ground holds") and technical. A robust BVLOS collision avoidance approach involves more than a DAA system, and it should be evaluated

accordingly. Such an approach would fully align with the AG 2.1 (acceptable level of risk) and AG 2.2 (strategic and technical mitigations) recommendations of the BVLOS ARC Final Report and can be developed quickly to replace these outdated standards as the declarative basis for compliance.

A2. Conversely, are there circumstances or operating environments where no combination of current standards would provide an acceptable level of safety?

No, in fact the opposite is true: the approaches, assumptions and resultant metrics associated with the listed standards are highly generalized and excessively conservative to the point of unviability for certain use cases. Their application, alone or in combination, would result in excessive separation distances that, once mitigations are incorporated, do not provide an appreciable contribution to safety over more reasonable metrics. In particular, the separation minima associated with the listed standards essentially render drone operations at scale (such as package delivery in urban areas) inefficient to the point of economic unviability.

For each specific use case, the FAA must consider alternative approaches and metrics that are more robust than DAA alone and that incorporate multiple types and levels of mitigations to achieve an acceptable level of risk. Some alternatives to consider for acceptance do not necessarily require new standards development. As above in answer to question A1, the Coalition recommends that the FAA develop a BVLOS approval framework that accommodates approaches that combine strategic and technical mitigations to achieve an acceptable level of risk, in alignment with the recommendations of the BVLOS ARC Final Report, particularly recommendations AG 2.1 (acceptable level of risk) and AG 2.2 (strategic and technical mitigations).

Where standards are considered necessary, the FAA should urge appropriate standards organization(s) to quickly develop and approve specific standards that are:

1. Aligned with the recommendations of the BVLOS ARC;
2. Performance-based;
3. Sufficiently tailored to leverage and accommodate the key safety characteristics of a variety of use cases.
4. Vetted against the target use case(s) before publishing.

B. Declarations of Compliance for Detect and Avoid

As the FAA is contemplating operations beyond visual line of sight, the FAA is considering allowing operators to declare that they are utilizing DAA systems that meet the DAA standard(s) referenced above.

B1. In which circumstances or operating environments should the FAA allow this declaration approach? What supporting documentation or data should the FAA require prior to authorization to operating under an exemption?

A declarative approach that is tailored to use cases and operational environments is highly appropriate for approving BVLOS operations in virtually all environments. The FAA's question, however, focuses too narrowly on the DAA system, which excludes more robust layered

approaches to BVLOS operations. As previously stated, the most effective mitigation approaches for low-altitude operations go beyond the DAA system to employ a combination of strategic and technical mitigations to achieve a target or acceptable level of safety.

The supporting documentation that should be required as part of an authorization under exemption is the evidence and metrics that quantify the contribution of the mitigation layers (strategic and/or technical) toward achieving the target level of safety.

We recommend that the FAA's proposed declarative approach quickly move beyond the first step of compliance with existing (and in some cases, outdated) standards to the logical additional step of developing an approval framework for multi-layered BVLOS mitigation approaches that align with the BVLOS ARC Final Report recommendations AG 2.1 (acceptable level of risk) and AG 2.2 (strategic and technical mitigations). As that framework is developed and adopted in whole or in part, the methodology and metrics for early approvals can be leveraged and shared to provide examples for subsequent summary approvals, further accelerating the pace and progress of BVLOS operations nationwide.

B2. Conversely, are there circumstances or operating environments in which the FAA should require operators to submit details of their DAA system for approval and validation prior to operation?

Yes, when the proponent is presenting a safety case that does not rely upon previously-accepted mitigation approaches (through standard or previous approval) or includes a change to the underlying components of the acceptability metric.

C. Well-Clear Boundary

ASTM F3442/F3442M–23, Standard Specification for Detect and Avoid System Performance Requirements, referenced previously, suggests maintaining a horizontal distance of 2,000 feet and a vertical distance of 250 feet between a small UAS and crewed aircraft, described as a ''hockey-puck- shaped'' area of airspace surrounding the small UAS.

C1. In which circumstances or operating environments would this standard be appropriate?

The ASTM F3442/F3442M DAA System Performance Standard is inappropriate for use as a broad-based threshold metric for well-clear acceptability, as it relies upon not one, but two excessively-conservative components as the basis for acceptability metric calculation.

The first is the use of an anecdotal and excessively conservative definition of near-midair collision (NMAC) as within 500' lateral and 100' vertical separation. The use of the same 500' lateral threshold as for crewed aircraft (per AIM 7-7-3) is patently extreme for most small drones, as the likelihood of a drone collision within these parameters is significantly lower due to 1) the reduced combined wingspan; and, in most cases, 2) substantially higher maneuverability of most small drones when compared to traditional aircraft; and 3) the fact that fewer persons are exposed to collision risk since there are no people aboard the drone.

The second is the use of the 2018 Federal UAS Science and Research Panel (SARP)/Massachusetts Institute of Technology - Lincoln Laboratory (MIT-LL) recommendation for "well clear," which imposes a lateral separation minima that is four times the broadly accepted minima for two crewed aircraft, despite the reduced likelihood of collision and severity referenced above. An analysis of the Well Clear recommendation finds that while the approach and methods (particularly the use of substantial modeling and simulation as a basis) are sound, the recommendation is crippled by the condition that the metric be applicable to all use cases, all drones, and all operating environments/airspace classes. This condition required using broad ranges of assumptions for aircraft characteristics, aircraft performance, and operational environments that result in overly broad calculations that are unable to be optimized for any specific application. It also considers only unmitigated collision risk, ignoring the contribution of both strategic and tactical mitigations to reducing the well clear volume.

C2. If not this standard, what well-clear boundary should the FAA consider for operations under an exemption, and under what circumstances or operating environments?

With the laws in both definitions in mind, the Coalition recommends that the terms "NMAC" and "well clear" remain undefined for drone applications, which aligns with decades of rule practice in the traditional aviation community. Instead, we submit that proponents be allowed to propose and substantiate definitions of acceptable separation that are appropriate for their use case, operating environments and mitigations while achieving an acceptable level of risk. This approach aligns with recommendations AG 2.1 and FR 2.1 of the BVLOS ARC Final Report.

That said, the Coalition sees the value in using computational analysis to create "bands" of acceptable separation for use by proponents either in lower-risk environments or as rule-of-thumb guidance when sufficient substantiation presents challenges–such as in the case of smaller companies with limited resources.

D. DAA Systems That Include Third-Party Services/Associated Elements (AE)

D1. The FAA is considering separating the UTM service provider approval from the exemption for relief from parts 91 and 61. In order to operate, the UTM service provider would need to receive its approval, and the applicant's exemption would be contingent on use of an approved service. Other operators seeking to use that same service would present their specific use case with the approved UTM service. Should the FAA separate the approval of the UTM service provider from the exemption? Why or why not?

We strongly concur with the approach of separating the service provider approval from the associated operator approvals and/or exemption(s). Operators also should have the opportunity to demonstrate and validate UTM system capabilities as an interim measure or for applications requiring differing performance; this can be a steppingstone to a separate UTM service provider approval. Once service providers demonstrate the requisite level of acceptability (e.g., performance, reliability), associated operator approvals should only need to incorporate the approved service provider's contribution via reference. We suggest, for Part 135 operators, this could be incorporated via operations specifications. For other operators, this could be incorporated in their accepted operations manuals or provisions under applicable waivers.

In approving UTM services or UTM service providers, the FAA should endeavor to preserve maximum flexibility when considering how those services may represent varying degrees of importance depending on the concept of operations to which they are applied.

The FAA should review international approvals for UTM service providers for their suitability in the U.S. regulatory and commercial markets.

D2. Conversely, the FAA is also considering including the approval of the UTM service within the exemption, similar to how the FAA has implemented 49 U.S.C. 44807 to date. Should the FAA consolidate these approvals? Why or why not?

We believe that incorporating approvals of the UTM service (other than by reference) into the exemption creates multiple issues that are best avoided. There are several points to consider here: First, separating approvals is essential to sustaining a UTM service provider market, as stand-alone UTM service providers will need to support multiple operators for business viability. Separate approvals should facilitate both portability of services and regulatory predictability for UTM service providers.

Second, many UTM service providers are undergoing certification of services in other markets that establishes a mechanism for the service provider to bear the responsibility for the digital service with tailored oversight and integration;

Third, incorporating the service provider approval in the exemption, other than to address any non-standard uses of the service provider's capabilities, is inefficient and would be difficult to manage over time. If such approvals are incorporated into the exemption, potentially dozens of exemptions might have to be updated when the service provider's solution is updated or altered in any way, even when the base functionality is still sufficient for the intended purpose. This could also lead to challenges with configuration management and version control that would otherwise be handled in the service provider's approval.

We understand and appreciate that while the FAA is developing and implementing the process for service provider compliance and approval, some exemption-based approvals may be necessary in the interim. For the reasons explained above, this practice, if necessary, should be abandoned as soon as a process for service provider approval is available.

E. Use of UTM Services for Strategic Deconfliction

E1. One proposal the FAA is considering would be to require all BVLOS operations in controlled airspace or within the lateral limits of a Mode C Veil under an exemption to use a strategic deconfliction and conformance monitoring capability (both terms as described in FAA's UTM Concept of Operations v2.0). This could be fulfilled if the operator [provides]their own capability that meets the requirements of a published standard; or by using a UTM service. Should the FAA impose this requirement? Why or why not?

The Coalition believes that the combination of strategic deconfliction and associated conformance monitoring (as described in the UTM CONOPS v 2.0) provides the optimum combination of performance, reliability, efficiency and safety. While any potential requirement should be carefully considered with consultation with industry before implementation, in the specific case of operations within the Mode C veil we generally agree with this proposal, subject to an exception for shielded operations, where strategic deconfliction and conformance monitoring are not necessary. The characteristics of Mode C veil airspace (largely over well-populated areas, potential for high-volume and/or high-density drone operations) are substantially favorable for interoperable strategic deconfliction methods as the primary mode of separation IAW the UTM CONOPS 2.0.

Beyond the Mode C veil, strategic deconfliction and conformance monitoring should apply when they result in safety benefits and stakeholder engagement, particularly in potentially high-volume operations such as package delivery where higher density of flights are driven by flights to and within congested areas. We support the use of digital means for coordination between complex operations where practical.

E2. Alternatively, the FAA is considering requiring all BVLOS operations under an exemption, including in Class G airspace, to use a strategic deconfliction and conformance monitoring capability. Should the FAA impose this requirement? Why or why not?

As stated above, we recognize that there are certain environments and use cases that are best supported by strategic deconfliction with conformance monitoring and encourage the use of these methods in compliance with applicable standards wherever it would deliver a material safety benefit. We believe that there is great benefit to applying such methods where there is a credible risk to the overflown population regardless of airspace designation. (i.e., for package delivery over congested areas but perhaps not, for example, for linear inspections over utility right of way).

However, we submit that with the exceptions noted in E1, the substantial variety of use cases, operational environments, and alternative deconfliction methods, the need to require mitigation through strategic deconfliction and conformance monitoring outside of the above-noted areas is questionable. This is particularly true in areas, such as shielded operations, where a given proponent is not likely to need this service to reach an acceptable level of safety and performance. We recommend that the FAA encourage the use of strategic deconfliction in any class of airspace, and continually monitor the state of the industry and the capabilities of both proponents and service providers to identify future moments when a requirement may become necessary or particularly advantageous.

For shielded operations, given the low density of operations in Class G airspace, requiring a strategic deconfliction and conformance monitoring capability is unnecessary. Such a requirement would impose a significant burden, with no meaningful safety benefit, for very low altitude (less than 100 or 200 ft AGL) operations conducted by very small (often 2-3 lb.) drones overflying closed-access critical infrastructure sites. A universal requirement to leverage real-time UTM services in those settings is not warranted on safety grounds.

Given the scale of these shielded operations over closed-access sites, requiring real-time UTM in those settings could produce information overload and result in alert fatigue. Moreover, drones are

increasingly able to operate in GPS-denied environments. In the same mission, critical infrastructure owners may fly BVLOS operations at very low altitudes within feet of their infrastructure, even flying inside parts of infrastructure. During those missions, the aircraft may lose GPS but be able to operate safely by relying on computer vision, LIDAR or other safety technology. Drones without GPS may be unable to transmit real-time UTM information. If a UTM requirement will ultimately apply even to those types of low-altitude, lower risk operations, the requirement would need to permit "file-and-fly" services that note the volume in which the drone will be operating during a certain timeframe.

E3. The FAA is aware of one published standard that could be used to meet a requirement to have a strategic deconfliction and conformance monitoring capability. It is referenced as ASTM F3548–21, Standard Specification for UAS Traffic Management (UTM) UAS Service Supplier (USS) Interoperability, dated March 8, 2022. What alternative means exist, preferably using published standards, that the FAA should consider? What evidence exists for the safety benefit and operational efficiency of any alternative means?

We believe that ASTM F3548-21 is the most appropriate means for implementation today. It has been fully coordinated with industry, proven in field demonstrations in concert with NASA and the FAA, has widespread industry support and has been applied in other major markets including EU's U-space certification. It has also already been *de facto* adopted by a number of industry-leading companies and would provide the simplest and fastest ramp-up to implementation. Should the FAA decide to impose a requirement for strategic deconfliction and conformance, it is our recommendation that the ASTM F3548-21 be adopted as the reference means of compliance.

Key to the importance of the ASTM F3548-21 standard is the interoperability paradigm that supports sharing drone information. Interoperability is paramount to delivering drone safety services and should be required for any instances of strategic deconfliction.

In addition, the FAA should incorporate the results of efforts to voluntarily govern the sharing of drone information as provided during the recent UTM Field Test. Industry governance of these data exchanges is elemental to the effective delivery of UTM safety services, and particularly strategic deconfliction.

F. Detect and Avoid Between Unmanned Aircraft

F1. One proposal would be to use the ACAS sXu standard (RTCA DO– 396). What communications method should be used in conjunction with this approach? Should the FAA impose this requirement, including use of a specific communications method? Why or why not?

The Coalition strongly disagrees with requiring the use of the ACAS sXu standard as a method of deconfliction, particularly in concert with a yet-to-be-developed V2V communications method. The algorithm is not harmonized with traffic flow management algorithms, meaning an ACAS sXu maneuver has the potential to disrupt (including creating new conflicts with) other aircraft that are otherwise strategically-separated via UTM or operator algorithm. The effect of such disruption cannot be overstated for low altitude/high-volume operations over congested areas.

The ACAS sXu algorithm is complex and computationally intensive, requiring substantial computing resources. For on-board implementations, the SWAP penalty associated with this standard, combined with a V2V communications system, can add several pounds of mass penalty to each aircraft, not only in communications and computing equipment but in additional battery capacity and required cooling systems.

The additional mass associated with such a system potentially increases the severity of a collision in the air or on the ground. In the case of aircraft that are lightweight and/or highly frangible, this can result in a net negative effect on overall safety when considering both air risk and ground risk.

The RTCA DO-396 standard is one of the most complex to implement in the entire industry, containing over sixteen hundred pages of material. Implementing this standard is likely beyond the capabilities of many small drone companies creating an extremely high and expensive bar for compliance and opportunity for errors in implementation. The range of drone designs, materials, construction, and configurations makes integration of generic third-party solutions problematic and potentially inadequate due to the need for custom fit and integration.

The benefits are predominately for drones that are not already participating in a UTM traffic deconfliction environment. Requiring such equipment is incompatible with established and proven UTM traffic flow control methods. A single drone using dynamic deconfliction as a sole mitigation method has the potential to disrupt dozens, potentially hundreds, of strategically separated drones operating in a UTM environment. Should dynamic deconfliction approaches such as ACAS sXu be considered, we suggest limiting their application to non-UTM environments.

When considering such potentially burdensome requirements, it is important for the FAA to be mindful of the relative value of this third layer compared with the addition of any required technical implementation. In a recent analysis that examined the impact of strategic mitigations, researchers concluded that strategic deconfliction and conformance monitoring can reduce mid-air collisions by more than 98% from an already low level. Thus, any additional vehicle-to-vehicle communications mandated by the FAA would theoretically address a less than 2% potential residual improvement in collision rate where strategic deconfliction and conformance monitoring are already in use. Additionally, it is uncertain how V2V methods would function in dense low altitude operations and if the onboard active deconfliction would actually negate some of those strategic deconfliction benefits.

F2. What evidence exists that the requirement in the above question would sufficiently manage the risk of collision between UA? Should such a requirement be in addition to, or in lieu of, any requirement to use strategic deconfliction and conformance monitoring?

The challenge for any V2V-based solution is the same as with other cooperative methods: until a high degree of compliance is reached, it's difficult to achieve a credible risk reduction. The V2V aspect would be applied only to intentional BVLOS operators, which is a low percentage of the overall drone population. This calls into question the benefit of V2V-based solutions even at full compliance for that population. Meanwhile, the US is now 3.5 years into the ADS-B mandate in the airspace surrounding Class B airports, and only now has confidence levels in adoption/compliance reached a point where ADS-B based separation solutions are being seriously considered for acceptability.

We note that the FAA is appropriately cautious about implementing new equipage mandates for traditional aviation, as they are mindful of the impacts upon the industry of such factors as:

- Lead time for development, comment and adjudication of rulemaking;
- Lead time for standards and MOC development;
- Equipment and installation costs;
- Equipment availability and installation lead times;
- Phase-in of compliance deadlines and enforcement; and
- Resulting equipped and unequipped population.

With the limited additive safety benefit of V2V (see response to question F1 above), we respectfully ask that the FAA use the same level of thoughtful consideration, deliberation and restraint that the FAA would use for any far-reaching equipage mandate for traditional aviation. Once that process is complete, we are confident that a far-reaching V2V mandate will not clear the bar of sufficient safety benefit to justify the substantial cost and extended implementation times.

F3. If the FAA imposes a requirement for UA-to-UA DAA, should it also prescribe technical requirements to ensure interoperability of the solution across all BVLOS UAS? Why or why not?

See our response to question F2. While the Coalition believes that interoperability is a cornerstone of safety for aviation automation, we also believe that the best and most implementable interoperability solutions are driven by industry. In this specific case, we believe that industry has proposed a robust, cooperative and interoperable framework for drone separation that is standards-compliant and safe without the use of costly and complex V2V technology.

G. Beyond Visual Line of Sight Shielded Operations

G1. In which circumstances or operating environments should the FAA authorize shielded operations? The 42 U.S.C. 5195(c) definition of critical infrastructure has a broad applicability. Should the FAA further limit or expand the applicability?

The Coalition believes that shielding should be applied as broadly as possible, with very limited exceptions. Shielding not only provides the opportunity for drones to operate safely in proximity to obstacles and critical infrastructure; it also improves overall aviation safety by reinforcing the importance of established minimum safe altitudes to the traditional aviation community.

Shielded operations should be defined to include the volume of airspace around any natural or artificial (man-made) obstacles/structures and critical infrastructure defined in 42 U.S.C. 5195c. We generally support the BVLOS ARC Final Report's recommendation FR 2.4, which defines shielded area as "a volume of airspace that includes 100' above the vertical extent of an obstacle or critical infrastructure and is within 100 feet of the lateral extent of the same obstacle or critical infrastructure as defined in 42 U.S.C. § 5195c (Critical Infrastructures Protection Act of 2001)." As discussed below, there may be situations where 100 feet may not be sufficient. We also appreciate the FAA's extension of the lateral shielded area around certain critical infrastructure up to 400 feet in some waiver approvals.

Ultimately, what matters from an airspace risk perspective is that the structure or obstacle involved serves as a natural deterrent for the vast majority of crewed traffic, enabling UAS to operate with a much lower risk of incursions.

Except for crewed aircraft takeoff and landing areas and for specialized operations performed by highly skilled crew (ex. transmission line repair, aerial firefighting, forestry, agriculture application), the volume of airspace surrounding terrain and structures is hazardous to crewed aircraft as the presence of these obstacles to safe air navigation pose a collision risk. In contrast, small UAS, particularly those with vision-based navigation systems with advanced collision avoidance capabilities, can safely fly in close proximity to terrain and structures.

The FAA is considering a framework based on safety analysis and some ability to detect and avoid crewed aircraft operations. If the FAA requires the ability to detect and avoid crewed aircraft even in shielded settings, ADS-B In should be sufficient to satisfy that requirement. To that end, the FAA has recently granted a number of advanced approvals enabling remote, shielded BVLOS operations that require ADS-B in, but do not require other forms of DAA technology.

Some types of shielded operations may necessitate ADS-B In as a requirement, such as the inspection of long-linear infrastructure. There are other forms of shielded operations that may not require ADS-B. Very low-altitude shielded operations over closed-access, critical infrastructure sites whose high points are charted, for instance, may present sufficiently low levels of risk to crewed operations that ADS-B is not necessary. If operations in those settings are limited to within 50' or 100' of infrastructure, ADS-B may present very limited value.

Current regulations mandate that small UAS yield the right of way to all crewed aircraft (107.37a). For shielded operations, safety is often maintained by *remaining within the shielded volume* rather than by maneuvering. As demonstrated in the Exemptions, shielded operations can be deconflicted from specialized crewed operations--especially those used to inspect long-linear infrastructure--through basic processes and procedures that are already generally required by property and infrastructure owners.

One potentially new recommendation for shielding is momentary descents into a shielded volume specifically to achieve acceptable separation for the purposes of detect and avoid. The FAA should consider approving the use of the ground as a shield below altitudes of 50' AGL within the Mode C Veil and away from areas of known agricultural activity. This will allow drones to avoid conflict with crewed aircraft by rapid descent into the shielded volume until the conflict is resolved.

G2. Conversely, are there circumstances or operating environments in which the FAA should not authorize shielded operations?

We see limited potential for restrictions associated with FAA-designated areas associated with routine and sustained very-low-level aviation activity by traditional aircraft (such as military low-level routes). We otherwise support and encourage a cooperative communication approach across the very-low-altitude aviation community–in particular, between helicopter, drone and agricultural operators–to ensure that low-level airspace is available to everyone and above all, safe. We believe

that shielded drone operations need not provide a disruption to traditional aviation if appropriate communication protocols are established and followed.

Toward this end, our industry's various associations stand ready to convene discussions on protocol development, procedures and toolsets that facilitate reliable deconfliction through communication and coordination.

G3. The ARC report describes the appropriate offset as 100' above, and 100' lateral. Is this the appropriate standard? Why or why not? If not, what other standard should be used, and what evidence exists for the appropriateness and safety of an alternative standard?

As a general matter, the Coalition believes that the BVLOS ARC's recommendation of 100 feet provides the optimum compromise between a robust buffer from traditional aviation traffic and proximity to the structure. Maintaining 50 feet of separation, while achievable in the right conditions, encourages flying too closely to the structure and increases the potential for a drone/structure collision. This is particularly true in situations such as long-linear infrastructure inspection, where wind currents can vary significantly due to changes in surrounding terrain. In the usual case, 100 feet provides the optimum compromise between a robust buffer from traditional aviation traffic and proximity to the structure

The offset described in the BVLOS ARC report has precedent in FAA approvals and BVLOS frameworks used by other CAAs[2]. However, recent research suggests that cooperative crewed traffic fly much further away from artificial obstacles--such as bridges and towers--than the 100 feet offset proposed by the ARC.[3] Therefore, rather than having a single definition, the lateral and vertical offset of shielded volumes could be tailored to the type of obstacle or operating environment.

For example, because of the applicability of 14 C.F.R. 91.119 to congested areas and the applicability of FDC NOTAMs to critical infrastructure fixed-sites, the offset could be greater than 100 ft. The FAA has approved multiple Part 107 waivers with an offset of 200 ft over closed-access critical infrastructure sites. That practice strongly suggests the BVLOS ARC's recommendation of 100 feet x 100 feet may be generally appropriate. The Coalition encourages the FAA to continue to explore situations where offset standards can and should be increased.

G4. What type of notification (e.g., email/phone call, web portal, mobile phone application using UTM services, etc.) should operators conducting BVLOS shielded operations provide to the local aviation communities?

The impact of shielded operations on the local aviation community varies by operating area environment. For example, shielded operations over a power generation facility located far from airports have less impact on crewed aviation than a linear inspection operation passing close to an airport approach.

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[2] PDRA G-03 https://www.easa.europa.eu/en/domains/civil-drones-rpas/specific-category-civil-drones/predefined-risk-assessment-pdra

[3] Weinert, Andrew. (2021). Estimated stand-off distance between ADS-B equipped aircraft and obstacles (Version v1) [Data set]. Zenodo. https://doi.org/10.5281/zenodo.7741273

Currently, the means of notification is varied. Notification plans used in FAA Pathfinder, PSP, and other partnership programs generally involve proactive engagement to the community by drone operators via emails or phone calls to all known aviation communities in a large area. This effort is burdensome, and like the use of NOTAMs, the safety benefit is not readily quantified.

Inspection operations, which may be conducted by drones and crewed aircraft, are generally deconflicted by the infrastructure owner. This is also done for facilities with private helipads. These methods of deconfliction have been effective, perhaps due to the very strong incentives infrastructure owners--including helipad owners--have to ensure the safety of their aircraft and equipment.

A centralized system with information on all drone operations and wide awareness of such a system, could be beneficial for aviation communities. The potential exists for timely, highly accurate notifications that are easily accessed, constantly updated, and geographically precise. With the advent and widespread adoption of Electronic Flight Bag applications such as ForeFlight and Garmin Pilot, the potential for real-time digital notification, mapping and updates for low-level activity is well within reach using existing technology. However, until such a system is in place, a notification plan should only be required when operations are likely to have a significant impact on crewed aviation, such as operations on or near airports and heliports. In such situation, NOTAMs may be used.

Shielded operations take place in airspace with very limited, if any, crewed traffic. Forcibly sharing shielded operations to all airspace users could cause significant display clutter, which may conceal or obscure data that would alert a pilot to the presence of an actual risk.

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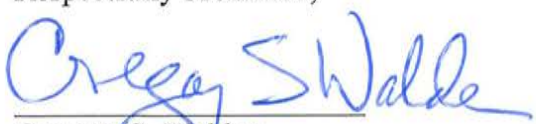
In sum, the Small UAV Coalition thanks the FAA for the opportunity to comment on this Notice, and for the agency's continued partnership with the drone industry.

Respectfully submitted,



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June 14, 2023