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UAS BVLOS Operations Aviation Rulemaking Committee Report: Part 2

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1. Introduction

The titled study was published in March 2022 by the UAS BVLOS Operations Aviation Rulemaking Committee (BVLOS ARC) which was established by the FAA in June 2021.[1]

The study's background is described in an earlier report.[2] In addition, as explained in the previous report, the study organizes specific recommendations into the following seven fields, enumerating a total of 70 recommendations.[3]

(1) Air & Ground Risk Recommendations: 9
(2) Flight Rules Recommendations: 9
(3) Aircraft and Systems Recommendations: 10
(4) Operator Qualifications Recommendations: 20
(5) Third-Party Services Recommendations: 2
(6) Environmental Recommendations: 5
(7) General & Procedural Recommendations: 15

The previous report covered the specific recommendations outlined in the first three fields listed above. In this report, the details of the specific recommendations in fields 4-6 will be explained.

2. Specific Recommendations

2.1 Operator Qualifications Recommendations (OQ)

・Recommendation OQ 2.1: *The FAA should create a new 14 CFR Part that governs UAS BVLOS Pilot and Operator certification requirements and operating rules.*

There are many newcomers to the UAS industry, and subjecting them to the existing crewed aircraft regulations (which contain many requirements that do not apply to UAS), is seen as a major barrier to entry. For this reason, new regulations consisting of flight rules, remote pilot certification, operator certification, aircraft qualification and operating requirements should be formulated to cover all aspects of BVLOS operations.

・Recommendation OQ 2.2: *The FAA adopt the categories defined in the Automation Matrix for BVLOS training and qualification requirements.*

As the automation of UAS operations progresses, the number and types of operations performed by humans will decrease, as will the level and depth of training required for safe operations. It was therefore decided that pilot training programs should focus on the ability of pilots to operate and influence through the system.

The Automation Matrix defines four levels of Automated Flight Rules (AFR) that should determine the certification requirements for remote pilots and operators.

- AFR Level 1 : UAS that have some automated functions (auto-hovering, auto-return, etc.), but during all phases of flight, a remote pilot is directly controlling the UAS ("human-in-the-loop")
- AFR Level 2 : Remote pilots directly monitor the operation of automated UAS and direct the route, altitude, and respond to contingencies as necessary ("human-on-the-loop")
- AFR Level 3 : A state in which the operation of UAS is extensively automated and, in principle, does not require human intervention, but may require monitoring of the entire operating area and suspension of operations in response to changing conditions ("human-over-the-loop")
- AFR Level 4 : A state in which the operation of

UAS is fully automated and no human intervention is required during normal or abnormal times ("human-out-of-the-loop")

In the case of AFR Level 1, a single remote pilot is not permitted to operate multiple UAS. Also, it is assumed that AFR level 4 will exist in the future, but it is beyond the scope of concrete consideration currently.

・Recommendation OQ 2.3: *The FAA modify 14 CFR Part 107 to enable limited BVLOS operations under the existing Remote Pilot with Small UAS Rating certificate.*

For the limited BVLOS operations described below, the risks associated with general BVLOS operations are sufficiently reduced, so it should be possible to operate small UAS with remote pilots.

- Remote pilots cannot see the UAS, but visual assistants can see it (Extended Visual Line of Sight (EVLOS))
- The remote pilot confirms that there are no competing aircraft as a pre-flight procedure, and then flies behind buildings, etc.
- Shielded operations (operations within 100 feet of buildings, etc.)

・Recommendation OQ 2.4: *The FAA expand the knowledge test for the 14 CFR Part 107 Remote Pilot Certificate with Small UAS Rating to cover topics associated with EVLOS and shielded UAS operations.*

When it became possible to operate a small UAS at night or over a third party by a remote pilot, the content of those certification exams was updated. Similarly, in enabling limited BVLOS operations by remote pilots of small UAS, the content of the certification exam should include techniques for coordinating multiple visual assistants and tools and techniques for improving situational awareness in limited BVLOS operations.

・Recommendation OQ 2.5: *The FAA establish a new BVLOS rating for the Remote Pilot certificate under the new 14 CFR Part.*

Except for limited BVLOS operations, most or all of BVLOS operations are generally out of sight, and in unforeseen circumstances it is necessary to land the UAS in a location where there is no remote pilot or visual assistant; the use case and operational concept will be significantly different from those of limited BVLOS operations.

Also, in the case of AFR levels 2-4 in the Automated Flight Rules, remote pilots have little or no opportunity to directly control the UAS.

For this reason, as a separate certificate from the small UAS remote pilot certificate in Part 107, a remote pilot certificate for BVLOS operations should be established under a new part, and the knowledge and tests required for such certification should be stipulated.

・Recommendation OQ 2.6: *The FAA's required UAS pilot knowledge areas and skills for the BVLOS rating should include the knowledge areas required by the FAA for the 14 CFR Part 107 Remote Pilot certificate.*

The range of basic pilot duties and knowledge required to operate UAS is included in the knowledge requirements for remote pilots of UAS in Part 107. Since there has been a clear track record of part 107 operations since the system's inception, this scope of knowledge should also be applied to remote pilots operating BVLOS.

・Recommendation OQ 2.7: *The BVLOS rating process should incorporate additional knowledge and examination areas to support advanced BVLOS and 1-to-many operations.*

Remote pilots conducting BVLOS are expected to have basic knowledge of the scope of Recommendation OQ 2.6, as well as the ability to conduct BVLOS operations individually and on certain levels of scale as well as have familiarity with the features and regulatory requirements of the systems that enable such operations. For this reason, certification knowledge for BVLOS remote pilots should include areas related to advanced BVLOS operations and 1-to-many operations.

・Recommendation OQ 2.8: *The FAA should provide both direct and progressive paths to achieving the Remote Pilot Certificate with BVLOS rating.*

When the new rule for BVLOS operations comes into

effect, it is expected that many certified remote pilots of small UAS will be qualified as remote pilots for BVLOS operations.

On the other hand, when commercial BVLOS operations expand in the future, it is expected that there will be a significant number of pilots specially trained for BVLOS operations. Since these pilots do not fly within visual line of sight, they do not need remote pilot certification for small UAS. Therefore, it would be appropriate for them to directly obtain remote pilot certification for BVLOS operations.

Thus, if a pilot is already certified as a remote pilot for small UAS, there should be a written exam centered on the knowledge areas outlined in Recommendation OQ 2.7. If a pilot does not have this certification, there should be a written exam with knowledge areas outlined in both Recommendation OQ 2.6 and OQ 2.7, with a focus on situations and cases pertaining to BVLOS operations.

・Recommendation OQ 2.9: *Remote Pilots certificated under Part 107 that have completed a BVLOS training program certified by a public aircraft operator entity (as defined in 14 CFR Part 1) should be able to receive their BVLOS rating via online training, similar to the existing Part 107 certification pathway for current Part 61 pilots.*

Based on the current Part 107, there are two ways to obtain small UAS remote pilot certification: pass a paper test at an FAA-approved test facility, or crewed aircraft pilots certified under Part 61 complete online training and a knowledge test.

Some public agencies, such as the U.S. military, now conduct training for UAS pilots, including BVLOS operations, which is accredited by the agency and includes extensive practical training and assessment. For this reason, as with the latter method above, for those who have completed UAS training programs which include BVLOS operations, and are certified by public agencies, it should be possible for them to acquire remote pilot certification for BVLOS operations through online training and a knowledge test.

・Recommendation OQ 2.10: *UAS BVLOS guidance and advisory materials should establish a clear and traceable path for operational control and specific training/qualification/currency requirements.*

In regards to operational control and ultimate responsibility, it should be assigned to one of the following two parties, who have direct responsibility and ultimate authority over the operations of the aircraft they manage:

- Remote Flight Operations Supervisor (RFOS): For operations by operators with a Remote Air Carrier certificate or Remote Operating certificate outlined in Recommendation OQ 2.11, the operator may appoint an RFOS to supervise the operations. In this case, the designated RFOS has ultimate authority and responsibility for the operations of the UAS under their supervision.
- Remote Pilot: The remote pilot has ultimate responsibility for the operation of the UAS and is not under the supervision of an RFOS.

In addition, the guidance and reference materials for BVLOS operations should clearly define the requirements that the above two parties must meet in order to obtain certification.

・Recommendation OQ 2.11: *Create two levels of Operating Certificates for commercial UAS operations: a Remote Air Carrier Certificate and a Remote Commercial Operating Certificate.*

There are two types of certificates for crewed aircraft business: an Air Carrier Certificate (a company that performs general transportation for a fee) and an Operating Certificate (a company that performs other operations for a fee). The requirements for these are laid out in Parts 119, 121 and 135. However, since these requirements assume a crewed aircraft, it was deemed inappropriate to apply them to low-risk UAS, and it was decided that a new operating permit for BVLOS UAS should be created.

For this reason, two operating certificates—a Remote Air Carrier Certificate and a Remote Commercial Operating Certificate— should be created in a manner corresponding to the two types of licenses for crewed aircraft.

・Recommendation OQ 2.12: *Set threshold requirements for certain UAS BVLOS operations beyond which a Remote Air Carrier Certificate or Remote Operating Certificate is required.*

The process of obtaining a Remote Air Carrier Certificate or Remote Operating Certificate will involve stricter requirements for operating procedures, record keeping, training and qualifications than would otherwise be the case, but is considered appropriate for targeting specific complicated BVLOS operations and large-scale BVLOS operations.

The ratio of remote pilots (or RFOS) to UAS was determined to be the most relevant information when it comes to operational complexity. In addition, since the complexity of operations depends on the AFR level in the automated flight rules, thresholds for requiring operational clearance based on the kinetic energy of the aircraft are proposed, as shown in the table below.

	Kinetic energy less than 25,000 ft-lbs	**Kinetic Engery no less than 25,000 ftlbs and less than 800,000 ft-lbs**
AFR Level 2	A remote pilot to UA ratio greater than 1:5	A remote pilot to UA ratio greater than 1:1
AFRLevel 3	A remote pilot to UA ratio greater than 1:20	(Same as AFR Level 2)

・Recommendation OQ 2.13: *Create Operating Requirements that govern Remote Air Carrier and Remote Operating certificate holders.*

For crewed operations, certification matters are covered in Part 119, and operating requirements are covered in Parts 121 and 135.

With this structure as a reference, it is logical that the new part for UAS should include matters related to certification in Subpart E and matters related to operational requirements in Subpart F.

This should exempt UAS from the scope of Part 135, which includes many requirements that do not apply to UAS (such as seatbelts, emergency equipment, and emergency exits), thereby simplifying compliance and enforcement of the rule.

・Recommendation OQ 2.14: *Create Certification and Operating Requirements that govern Agricultural Remote Aircraft Operations.*

Certification for crewed agricultural operations are regulated in Part 137, and about 50 certificates have already been issued under Part 137 for agricultural operations by UAS.

In response to this current situation, considering the unique systems and operational characteristics of UAS, and making appropriate modifications to Part 137, Subpart G of the new regulation part for UAS should provide authorization and operational requirements for remote agricultural operations.

・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.*

For crewed aircraft, management and responsibilities for operations under Part 121 or 135 are shared or distributed among multiple designated positions (such as Director of Operations, Director of Maintenance, etc.) certified under Part 119. Also, as the operation of UAS becomes highly automated, remote pilots will no longer be able to directly control the aircraft, so it was deemed inappropriate to place ultimate responsibility on remote pilots.

Therefore, for UAS Operation Certificate holders, the position of RFOS should be established and an appropriate scope of management and responsibilities should be defined. This RFOS is qualified as a remote pilot to operate BVLOS, and will assume responsibility for all operations that are highly automated (AFR level 3 or higher in Automated Flight Rules).

In the AFR level 2 of the Automated Flight Rules, when one person operates multiple aircraft, it is considered appropriate to have a remote pilot that operates BVLOS, and UAS Operating Certificate holders may also appoint an RFOS to supervise several remote pilots. In this case,

the remote pilot is responsible for the operation management of the specific UAS to be monitored, and the RFOS is responsible for the safe execution of the operations under supervision.

・Recommendation OQ 2.16: *The FAA should develop tailored medical qualifications for UAS pilots and other crew positions that consider greater accessibility and redundancy options available to UAS.*

Since the operating environments of crewed aircraft and uncrewed aircraft are significantly different, it was determined that there are some conditions which could hinder the safe operation of crewed aircraft but should not prevent the operation of UAS, as in the examples below.

- Since there are no foot controls (rudder pedals, etc.) in UAS, even amputees may qualify as remote pilots without special consideration.
- While in flight, crewed aircraft pilots do not have ready access to quality medical care, but UAS pilots and operating crews have easy access to both primary and emergency medical care.

For these reasons, qualifications for unique physical examinations for UAS pilots and other operational crews reflecting the reduced physical requirements (while still ensuring the general physical examination standards necessary for the performance of duties by UAS crews) should be formulated.

In addition, holders of a crewed aircraft medical certificate (level 1, 2 or 3) should be able to work as a UAS crew using their certificate.

・Recommendation OQ 2.17: *Remote Pilots (regardless of rating) are expressly authorized to act as Remote Pilot in Command of an uncrewed aircraft operated for compensation or hire.*

Small UAS remote pilot certifications now routinely serve as remote pilots for UAS operations for compensation or hire, and holders of the new BVLOS remote pilot certificate should also be explicitly authorized to operate UAS for compensation.

・Recommendation OQ 2.18: *The intent of the ARC is that the privileges and limitations of the final BVLOS rule will be available to all aircraft operating under this rule, including public agency operations.*

It was believed that regulations targeting only civilian UAS could prevent official operators from using the capabilities afforded by the BVLOS rule. For this reason, public operators operating under the BVLOS rule should not be subject to restrictions that impair their ability to do so.

・Recommendation OQ 2.19: *Allow only appropriately vetted UAS operators that are approved by the relevant authority to conduct operations deemed to be a higher security risk.*

Currently, remote pilots of small UAS are subject to the same background screening by the Transportation Security Administration (TSA) as pilots of crewed aircraft.

However, it was considered necessary to apply more stringent screening criteria for operations close to security-critical infrastructure due to the high security risks involved.

For this reason, when the relevant authorities establish additional vetting standards for such operations, that vetting should be made a requirement for certification.

・Recommendation OQ 2.20: *The FAA provide an 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.*

Airline passengers are exempt from hazardous materials restrictions and requirements for carrying certain quantities of items containing hazardous materials. As a result, an airline aircraft may be carrying over 100 cell phones without complying with hazardous materials restrictions.

Since crewed aircraft operations allow for the risk of transporting a certain amount of hazardous materials, similar exemptions should apply to UAS Operating Certificate holders.

Exemptions include the same items as crewed aircraft: personal electronic devices, non-controlled medicines and

toiletry products, aerosols, lighters, perfumes and colognes, among others. It is assumed that the holder of the Operating Certificate would implement the safety controls, training and supervision for the excepted substances to be carried.

2.2 Third-Party Services Recommendations (TP)

・Recommendation TP 2.1: *The FAA should adopt a regulatory scheme for third-party services to be used in support of UAS BVLOS.*

A certification system for third-party services based on a declaration of compliance to industry standards and other FAA-approved certification methods should be developed, along with supervision of certificate holders and the suspension or revocation of their certificate in the event of non-compliance with requirements.

Specifically, when an operator uses third-party services as the primary means of risk mitigation, it is proposed that the third party should apply for certification, declare compliance with the FAA-approved certification method, and submit supporting materials based on analysis and testing, and then the FAA will review it and issue a certificate.

・Recommendation TP 2.2: *The FAA and NASA should conduct a study to determine what level of aircraft operations in a defined volume of the airspace would trigger the need for mandatory participation in federated or third-party services.*

In the future, it will be necessary for all operators in highly congested airspace to participate in services such as strategic deconfliction.

For this reason, there will be a research team consisting of members from the FAA, NASA, and industry, which will consider the mandatory participation in integrated services or services by third parties, and the regulatory framework for such services, based on cost-effectiveness data.

2.3 Environmental Recommendations (ER)

・Recommendation ER 2.1: *As the FAA reviews the BVLOS Rule, the ARC recommends the FAA determine that the BVLOS Rule is unlikely to result in significant impact to the environment.*

When the current Part 107 rule was developed, even with the loudest UAS, the noise impact would not exceed the threshold of land-use suitability unless the aircraft were flown more than 25,000 times a day. In addition, even when the rules for flying over third parties were developed, it was stated that the threshold would not be exceeded unless the number of flights was 28,000 times per year (77 times per day or more).

Although there is a possibility that UAS operations will expand due to the establishment of regulations related to BVLOS operations, it is not anticipated that the scale of operation would exceed the above threshold for the following reasons:

- Regulations on maintaining aircraft separation impose a physical limit on the maximum number of operations that can occur over a given point in a 24-hour period, but that figure is well below 77, and this limit shall not be changed in the rule for BVLOS operations.
- Due to commercial and investment realities, proposed UAS delivery business in the United States does not overlap in the scope of operations. Also, even if there is overlap, it would be necessary to have at least 10 companies operating simultaneously in the same area on the largest scale in order to reach the threshold.
- Except for light shows that use very small and silent UAS, it is technically impossible to operate many UAS over a single point due to operational and collision avoidance challenges.

For these reasons, it is proposed that BVLOS rule be categorically exempted from environmental reviews, and that reviews be streamlined for individual approvals

.・Recommendation ER 2.2: *NEPA review of the BVLOS rule must be timely and programmatic in scope.*

This topic had been thoroughly discussed by the ARC, including environmental protection groups, and it was decided that the formal review process should be efficient, effective and rational.

To ensure that the review is completed in a timely manner, the environmental review should begin prior to public comment on BVLOS rules. Additionally, the process

of individual approvals should be simplified by conducting comprehensive and systematic environmental reviews.

・Recommendation ER 2.3: *Environmental reviews should not be required for individual BVLOS operations enabled by the Rule.*

When conducting individual BVLOS reviews, particularly for environmental impact on a site-by-site basis, applicants must wait months to years for the review to be completed before undertaking any delivery or infrastructure inspections, thus hindering the industry's expansion.

For this reason, the appropriate environmental protection for the BVLOS operations rule will be reviewed, and such reviews should be made widely available for individual BVLOS operations under the rule.

・Recommendation ER 2.4: *The FAA should provide an interim pathway to enable BVLOS operations in the near term, pending finalization of the BVLOS Rule.*

As noted in Recommendation ER 2.1, there is a significant difference between the scale of UAS operations, which are expected to have a significant environmental impact, and the technical capabilities of the industry.

For this reason, until the rule for BVLOS operations is established, an interim, expedited method will be provided for small-scale BVLOS operations which do not have a large impact on the environment. In the meantime, data will be collected for formulating future regulations and environmental reviews.

・Recommendation ER 2.5: *The FAA interpret NEPA in a way that expedites the BVLOS rulemaking. If the FAA concludes that it is required to implement NEPA in such a way that would substantially delay either the BVLOS rulemaking or BVLOS 139 operations, the ARC recommends asking Congress to consider legislative actions.*

Legislative measures should be considered, where necessary, to ensure that sustainable and environmentally friendly means of transportation, inspection and surveillance by UAS are not hampered by the environmental review processes.

3. Summary

Section 2.1 of the Operator Qualifications Recommendations includes the formulation of a new part related to BVLOS operations (OQ 2.1), the establishment of a remote pilot certificate for BVLOS operations (OQ 2.5), and focus on creating two operating certificates for remote commercial operations (OQ 2.11). In addition, it features a proposal to make this operating certificate mandatory when the ratio of the number of remote pilots and UAS exceeds a certain value, depending on the level of automation of UAS operations (OQ 2.12).

Section 2.2 of the Third-Party Services Recommendations, explains that while a system for certification will be developed (TP 2.1), the obligatory use of such services will be defered and left as a task for the future (TP 2.2).

Section 2.3 of the Environmental Recommendations provides a comprehensive exemption for environmental reviews in the BVLOS rule (ER 2.1), and emphasizes that it should not require such reviews for individual BVLOS operations under the rule (ER 2.3).

Following the publication of this report by ARC, the FAA is currently conducting internal discussions on the formulation of the proposed rule, after which public comments will be made. At present, it is not clear when public comments will begin, but it is important to continue to pay attention and see to what extent the contents of this report will be influenced or revised.

References

1) FAA, UAS BVLOS ARC Final Report
https://www.faa.gov/regulations_policies/rulemaking/committees/documents/index.cfm/document/information/documentID/5424

2) Consideration Status for the Expansion of Unmanned Aircraft Systems BVLOS Operations and Participation Report from the 2022 FAA Drone Symposium
https://www.jittiusa.org/_files/ugd/af054c_8b69315c08d244

7a97e7deb209684e0e.pdf

3) UAS BVLOS Operations Aviation Rulemaking Committee Report: Part 1
https://www.jittiusa.org/_files/ugd/af054c_09dd8f1dca2240c6a3925b4fb2aa149e.pdf