Whitepaper



VOTIX
Drone Orchestration and Automation

Beyond Visual Line of Sight **Ramping Up!**

By Dawn Zoldi

The commercial drone industry still refers to beyond visual line of sight (BVLOS) operations as the **"holy grail."** Recent activities, however, may indicate that drinking from the BVLOS cup may not be as elusive as some may think. **BVLOS operations appear to be ramping up and with it, so is the commercial drone industry.**



Why BVLOS Remains An Issue

BVLOS remains a challenge today because when the Federal Aviation Administration (FAA) published its Small Unmanned Aircraft Systems (sUAS) rule in Part 107 (Title 14 of the Code of Federal Regulations - CFR), it included several key operational constraints that continue to endure. Part 14 CFR § 107.31 contains one of these. It requires a remote pilot in charge (RPIC) to maintain visual line of sight (VLOS) for sUAS operations.

According to the VLOS requirement, the RPIC must know location of the sUAS, determine its attitude, altitude and direction of flight, be able to observe the airspace for other air traffic and hazards and determine that the sUAS does not endanger the life or property of another, throughout the duration of the entire flight. RPICs may use Visual Observers (VOs) to maintain VLOS. According to 14 CFR § 107.33(b) and (c) (2), these VOs must meet the same requirements as the RPIC under §107.31.

From a safety standpoint, the importance of these two rules cannot be understated. They emanate from both the pre-CFR Civil Air Regulations (CAR) and original CFR see-and-avoid provisions for general aviation written to prevent mid-air collisions. All of these assumed a pilot would be on board, to see hazards aloft and on the ground out of the aircraft window, and take necessary action to avoid hitting them. UAS' changed this paradigm because, by definition, an UAS is "...an aircraft operated without the possibility of direct human intervention from within or on the aircraft."

That said, 14 CFR § 107.205 lists the regulations subject to FAA waiver, or approval of certain aircraft operations of aircraft outside the limitations of a regulation. It lists both the VLOS and VO provisions, among others. While the FAA may waive these VLOS-related requirements, the critical historical context of the see-and-avoid requirement explains the agency's hesitancy to liberally grant these waivers...until recently.

Tech Fulfills the Safety Imperative

Over the past several years, advanced technologies have emerged that increasingly enable UAS to safely and reliably avoid collisions. On-board DAA systems, especially when combined with ground-based surveillance systems and integration software, have proven effective.

In fact, based on this, the March 2022 FAA's BVLOS Aviation Rulemaking Committee (ARC) final report recommended modifications to the existing right of way rules and new requirements mandating the use of detect-and-avoid (DAA) technologies for UAS. **It noted:**

> ...the FAA implemented § 107.37(a)(2), requiring UAS operators to always initiate an avoidance maneuver to avoid collision with any other user of the NAS. The FAA acknowledged, however, that technological solutions might one day exist that would solve the 'see and avoid' problem for UAS, but they were not yet sufficiently developed. Several years later, the technology has evolved as the FAA anticipated, allowing more effective sensing methodologies to be used safely. Amending the rules to allow greater use of this technology helps bridge the gap to the long-term goal of developing the policy, guidance, and operational procedures necessary to enable crewed and uncrewed aircraft to fly together. (pages 30-32).



That tech includes, for example, Iris Automation's Casia series of onboard integrated computer vision systems, which continues to evolve. It provides robust situational information and intelligent decision-making in real time to avoid mid-air collisions. Casia, a noncooperative sensor solution, detects vehicles and objects that do not "squawk" or emit signals to identify themselves.

Earlier this year, Iris launched its ground-based surveillance system, Casia G. Combining its onboard solution with fixed Casia G systems on the ground around work area perimeters can provide a large swath of sanitized airspace in which UAS can operate BVLOS missions at scale.

Iris Automation also partnered with Sagetech Avionics to integrate its Casia with Sagetech's TSO-approved MXS ADS-B transponder and Airborne Collision Avoidance System (ACAS) X sensor fusion and collision avoidance module. ACAS addresses cooperative, or "squawking" traffic. This partnership provides DAA capabilities for both cooperative and noncooperative airspace traffic.

According to Jonathan Daniels, the CEO of Praxis Aerospace Concepts International, a Nevada-based company provides multi-modal ground-air-sea-industrial response robot systems and infrastructure solutions, the ideal BVLOS tech solution would provide for unified surveillance. He explained, "Unified surveillance would integrate all sources of information, such as radar, acoustic, ADS-B, with different protocols, such as vehicle-to-vehicle or and vehicle-to-infrastructure, to create a seamless collaborative environment."

Votix, an American robotics company leader in software for drone automation, has created "drone orchestration" software for this purpose. Its revolutionary cloud platform connects and integrates all the moving parts of a complex drone operation, enabling BVLOS remote operations and other autonomous operations.

The Votix product suite includes a drone-agnostic software-as-a-service which allows operators to safely and securely fly one to many drones, regardless of operator location, using internet-based command and control (C2) and ultra-low latency HD video streaming. Votix integrates in real-time with many detect-and-avoid and collision avoidance solutions and leverages its artificial intelligence for automated conflict resolution. It also has visual-based artificial intelligence to enhance drone capabilities, including video analytics and precision landing. Votix links drones to WiFi or cellular through the cloud, using Votix's proprietary mobile app (Votix VXC) or SBC (Votix VXG), a small, baked-in or plug-on lightweight device for on-board data processing with a built-in 4G LTE plus WiFi connectivity stack.

These are just a few of the companies on the leading edge of BVLOS-enabling technology. As a result of their successes, and those of others, the FAA has opened up the BVLOS waiver spigot a bit more lately.



And Now The Waivers Are Flying!

From 2019 to 2021 (3 years), the FAA had issued only about 54 BVLOS waivers (§ 107.31). Most of these involved research and development, as part of its Integration Pilot Program (IPP) and subsequent BEYOND program. The agency issued the majority of these in that same year. In 2022 alone (1 year), the FAA has issued approximately 90 such waivers, a major increase over the last three years.

Relatedly, to date, the agency has approved multiple VLOS waivers under § 107.31 in combination with waivers of the VO requirement under § 107.33. This equates to about 70% of these advanced operations involving BVLOS without VOs. A glance at the FAA's Part 107 waiver list appears to indicate that these operations involved either inspection, asset protection or even R&D.

Although the certificates of waiver incorporate the waiver applications by reference, they are not included on the FAA's public website. While the specifics of these non-R&D operations are not obvious, the list includes several state-level Departments of Transportation, academic institutions and infrastructure-focused companies.

Listed among these, drone inspection company AviSight, using Votix's software platform, obtained a ground-breaking waiver this July for recurrent BVLOS inspections over several miles of Shell pipelines in the United States using Harris Aerial drones. The certificate of waiver, effective through May 31, 2026, which includes BVLOS flights without VOs, is pioneering as it involves using cellular connectivity to safely and securely fly the drones recurrently over the internet with ultra-low latency from anywhere with full command and control and high-definition video streaming through Votix Fly and Votix VXG.

Perhaps the most fascinating aspect about this approval is that after Votix was installed on the drones and AviSight performed the FAA-required flights over Shell pipelines, FAA approved the waivers in just 9 business days.

"Votix is absolutely disrupting drone operations. We allow any drone to be operated remotely through the cloud using cellular connectivity on the drone and in compliance with FAA regulations," said Ed Boucas, Chief Executive Officer of Votix. "This AviSight example is one of many that illustrates how Votix can convert any drone into an automated platform capable of rapidly deploying drone programs at scale at the safety levels required by regulators. Votix unlocks the full potential of drones, so you can go beyond." he said.

What's Next?

Over the past few months, the FAA has held two public listening sessions and collected written comments on the ARC report recommendations. Rumor has it that the agency may roll out interim BVLOS guidance, taking smaller bites out of the 400 plus pages of issues in the ARC Report that ranged from acceptable level of risk, to flight rules changes, to aircraft systems, operator qualifications and third-party UAS service provider requirements.

For now, let's hope the BVLOS waivers will fly even faster and more frequently than ever before!

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