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Ground-Based Sense and Avoid with RPAs

Years ago, flying without a human in the cockpit seemed like an impossible notion, especially in the eyes of the Federal Aviation Administration, but recent technology has allowed these ideas to jump from concept to a reality. An innovative method that allows aircraft to sense their way while flying has helped bring remotely piloted aircraft into the National Airspace System.

Ground Based Sense and Avoid is a system that fulfills the FAA's See and Avoid requirement. Before the GBSAA concept, all participants who wanted to fly an RPA into the NAS were required to have a chase aircraft to accompany the RPA in the air, or a ground-based observer to follow the aircraft on the ground. The FAA in many cases also issues a temporary flight restriction during RPA operations to notify other aviators and mitigate midair collision hazards.

RPA systems are a key part of U.S. Department of Defense operations, yet they face significant challenges in operating in the NAS since there are limited official guidance and processes. Currently, the DOD is allowed to fly in military operating areas (MOAs) and restricted areas (RAs) airspace, but RPAs might have to travel through the NAS to conduct their missions. To accomplish this task, the DOD works with the FAA to receive a Certificate of Authorization/Waiver, an FAA-written approval to fly with certain limitations outlined in the COA and set ground rules for flight operations.

GBSAA systems consist of ground-based radar infrastructures, such as ASR-9, that work with other ground-based radars, like LSTAR to provide operational personnel with better situational awareness of the airspace. The ASR system allows operators to detect positions of cooperative aircraft, or aircraft with transponders. LSTAR and Sentinel systems allow operators to filter the airspace and detect non-cooperative aircraft, or aircraft without transponders. This increases the safety of RPA operations in the NAS and allows the RPA crew to avoid air traffic that may not be flying under instrument flight rules.

To date, there is one GBSAA system in the Air Force that obtained both an FAA COA and an Airworthiness Military Flight Release which allowed RPAs to transit to RAs through the NAS. From this case, many lessons were learned as to how to create and gain the rigorous approval from both the FAA and the Air Force. Since then, additional Air Force bases have initiated the process for establishing GBSAA systems. Overall, GBSAA provides bases the means to operate their RPAs without the need for visual observers, chase aircraft or TFRs for operations, and provides a cost-effective process to maximize RPA missions while flying safely in the NAS.


LSTAR Radar


ASR-11 Radar


Common Air route Surveillance Radar (CARSR)

MQ-9