Ohio Advance Air Mobility (AAM) Testing Capabilities

Springfield-Beckley Operations

Springfield BECKLEY
AIRPORT · BUSINESS PARK · AAM FACILITIES

Disclaimer

This document is For Official Use Only (FOUO) and intended solely for the use of the individual or entity to whom it was given, any personally identifiable information including phone numbers and emails are not to be shared, distributed, or given to third parties without the written consent of the DriveOhio UAS Test Center or AFRL DO Directorate.

Contents

Overview

FlyOhio

FlyOhio, an initiative of the Ohio UAS Center and DriveOhio, seeks to address this gap by coordinating ongoing UAS research throughout Ohio, while identifying and pursuing future research opportunities, to make Ohio airspace among the first in the nation ready to fly beyond line of sight. The UAS Center will work with public, private and research partners on the technology needed to allow numerous drones, operated remotely, to fly safely over longer distances without fear they will collide with other aircraft, ground-based objects or pose a threat to humans. Unmanned Aircraft Systems (UAS), Non-human piloted or remotely piloted aircraft continue to advance in the U.S. and around the world. DriveOhio's UAS Center (UASC) has already started to invest in the tools and expertise to provide cutting edge services like Ohio's Ground Based Detect and Avoid System (GBDAA), named SkyVision, which is in Springfield, Ohio to support this emerging technology. The UASC has a full-time staff dedicated to unmanned aircraft systems (UAS) operations to support Advance Autonomous Mobility (AAM) technologies such as package delivery and Automated Air Taxi (AAT) services through planning and research.

Ohio UAS Center

Unmanned aircraft systems (UAS) technology, known commonly as drone technology, is fast transforming industries while creating new ones in virtually every sector of our economy: industrial production, agriculture, commerce, transportation, retail and logistics. Ohio understands that a state willing to invest in the research and infrastructure needed to take part in this transformation will see those investments rewarded with jobs, business investment and economic growth. DriveOhio's UAS Centers mission is to lead the future of transportation with the research, development, testing and deployment of smart mobility technologies by creating pathways for these alternative transportation methods that will improve transportation system reliability, increase system resiliency, and improve highway capacity in critical corridors.

Air Force Research Labs

The Air Force Research Laboratory (AFRL) is a scientific research organization operated by the United States Air Force Materiel Command dedicated to leading the discovery, development, and integration of affordable aerospace warfighting technologies, planning and executing the Air Force science and technology program, and providing warfighting capabilities to United States air, space, and cyberspace forces.

A critical subset of the AFRL mission is to lead in the development of new Remotely Piloted Aircraft (RPA) systems, integrate new capabilities into existing airframes, and develop new concepts of employment. In order to accomplish this mission, there is need for airspace within an hour's driving distance of AFRL that can support Visual-Line-of-Sight (VLOS) and Beyond-Visual-Line-of-Sight (BVLOS) operations for RPAs.

SkyVision

A new means to meet the "see and avoid" requirement was developed and fielded at Springfield-Beckley Municipal Airport (KSGH) near Springfield, Ohio, known as *SkyVision*. *SkyVision* is a Ground Based Detect and Avoid (GBDAA) capability that leverages the proven and trusted STARS ELITE system that undergirds the Federal Aviation Administration's (FAA) Air Traffic Control (ATC) network. The three independent FAA radar sites allow for entities who wish to fly at Springfield an additional risk mitigation by utilizing an air traffic management system to test and train on new UAS platforms in the NAS with the potential to operate Beyond Visible Line of Sight (BVLOS).

The STARS ELITE system within *SkyVision* works by fusing local ATC radar, transponder, and self-reported UAS data to create the situational awareness necessary for the UAS operator(s) to exercise the “see and avoid” function. AFRL was granted permission to conduct UAS BVLOS operations using *SkyVision* through issuance of a Certificate of Waiver or Authorization (COA) by the FAA.

SkyVision airspace provide our teammates a variety of diverse, variable-altitude, over-land interactions to increase knowledge and confidence in UAS operations. The intent is to provide users a path to test operations based on performance-based standards to support advanced missions such as: night, over humans, and/or “beyond visual line of sight” (BVLOS). The airspaces integrate advanced technologies, personnel, and processes following a linked maturity-complexity and risk model that ties data and demonstrated performance to the minimum operational performance requirements and operating environment for emerging operations.

The Ohio UAS Center manages SkyVision and supports the research and development, testing, certification, and commercialization of UAS systems.

Springfield-Beckley Airport

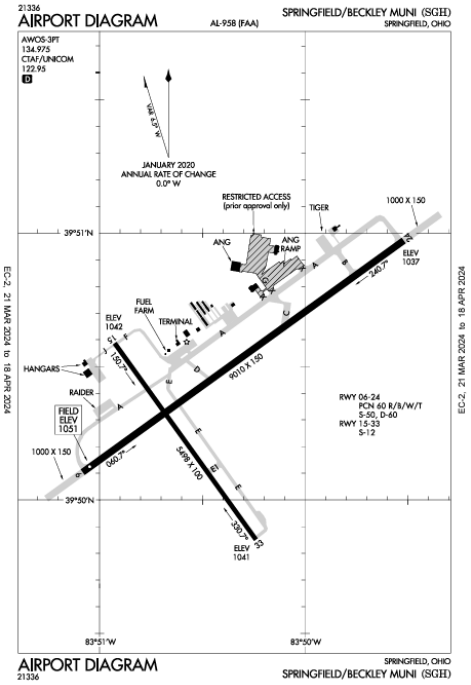
National Advanced Air Mobility Center of Excellence (NAAMCE)

NAAMCE’s 30,000ft office facility houses administrative, laboratory, meeting, and collaboration space, with an additional 25,000ft aircraft hangar space for the US Air Force and private industry. The center supports the expanding work of manufacturers and operators of electric vertical takeoff and landing vehicles (eVTOL) and other vehicles used for advanced air mobility (AAM).

Airfield Infrastructure

The KSGH airfield elevation is 1,051 feet Mean Sea Level (MSL) and consists of two runways: 15/33 and 6/24. Runway 24 is deemed the preferred runway when the wind is less than 10 Knots (KTS). KSGH is a non-towered airport and is contained within Class G airspace up to but not including 700’ AGL.

Class E surface airspace is effective by Notice to Airman (NOTAM). Radar service is provided by Columbus Approach. The KSGH Airport Diagram is provided in Figure 1 and a satellite view is provided in Figure 2. Runway 6/24 can accommodate large UAS Groups 3-5. The runway surface is asphalt, concrete, grooved and is in fair condition and the field elevation is 1051 feet MSL. KSGH is Class “G” airspace and traffic advisories are provided via Common Traffic Advisory Frequency (CTAF) 122.95 MHz Columbus TRACON provides air traffic services from 3000 MSL to 13000 feet MSL and is a 24-hour facility. Meteorological data is provided via an Automated Weather Observing Systems (AWOS) on 134.975 or (937-324-4532). Small-scale UAS work area depicted in Figure 3 on the airfield layout is intended primarily to accommodate small UAS in local tests.



Infrastructure

As a major military unit and vital component of the area’s economy, the Springfield-Beckley Municipal Airport provides air travel and cargo needs for both citizen and business activities in the Springfield region.

- Air traffic control tower (Inactive)
    - Available for observation / office space
- RNP/GPS approached to 06/24
- HIRL / SSALR Rwy 6/24 and weather sensors
- Ample airspace for UAS test operations
- Wi-Fi & High-speed internet

Command and Control (C2)
AURA Network Systems Infrastructure

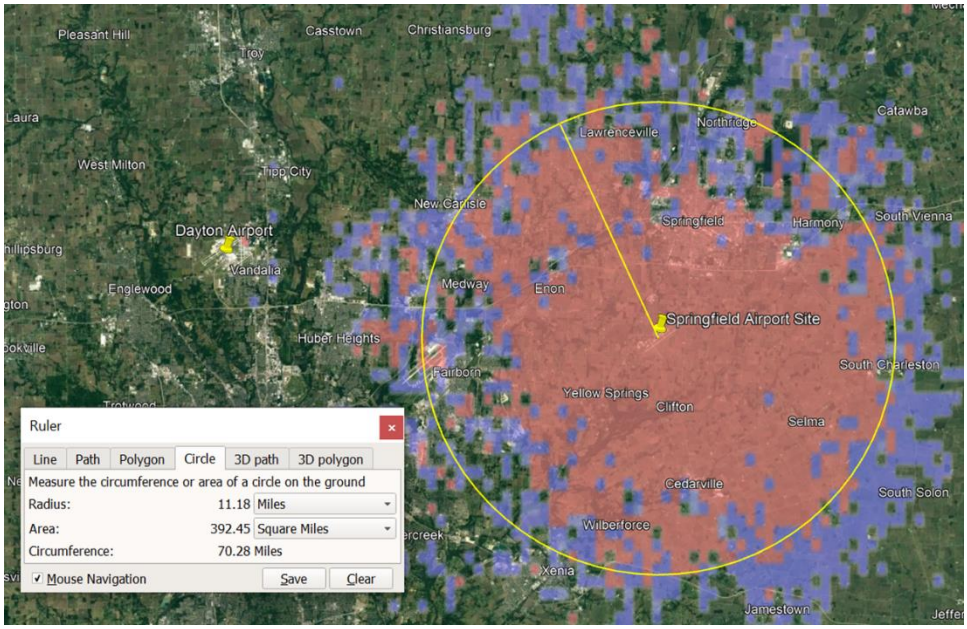
AURA's network utilizes licensed, aviation-dedicated spectrum to deliver ultra-reliable communications – including command-and-control voice and data solutions necessary to test and operate larger aircraft at higher altitudes beyond visual line of sight.

- The AURA equipment delivers a reliable radio link throughout the Springfield-Beckley Municipal Airport area via a Ground Radio System (GRS) with diverse antennas on the roof of the Springfield-Beckley Airport ATC Tower. The GRS can access the building's commercial power, conditioned by a UPS with backup emergency generator. The site has redundant fiber connectivity ensuring a reliable backhaul link from the GRS to carry user and maintenance data.

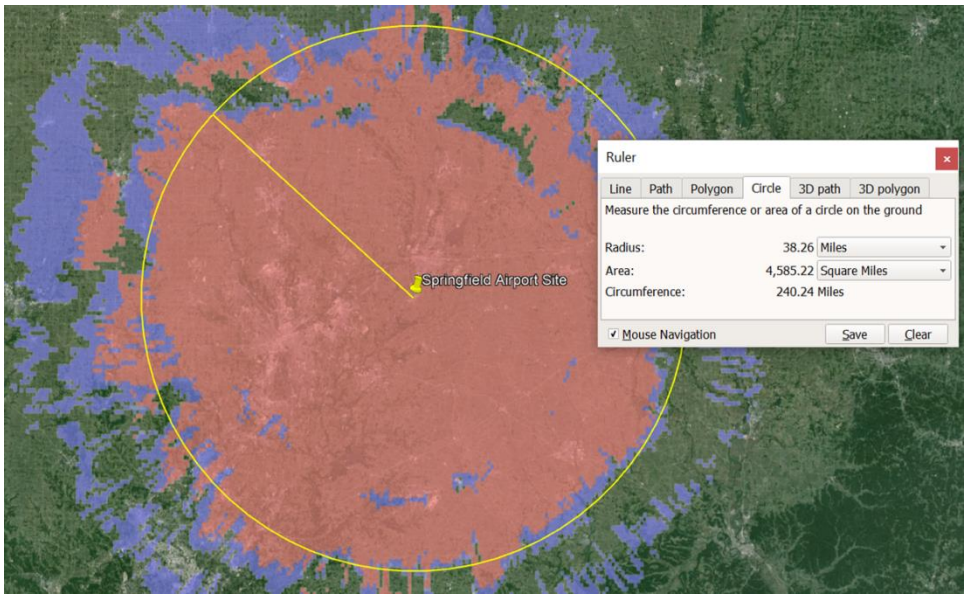
- The AURA radio service configured in Springfield provides reliable data rates between 5 kbps and 250 kbps. The service area for the site depends on the elevation of the aircraft with the Airborne Radio Systems (ARS) and the installed onboard-antenna systems – enabling a range beyond 100 miles. AURA flight testing confirmed connectivity just over 110 miles at an elevation of 8,000 feet before losing any data packets.

- Interested parties may engage with AURA by providing both desired aircraft and CONOPS. Following identification of the necessary equipment SWAP, aircraft capabilities, desired coverage area, data rate, ground station location, and timeframe to operate, plans for delivering the service can be developed. Please contact inquiries@auranetworksystems.com with questions or requests for additional information.

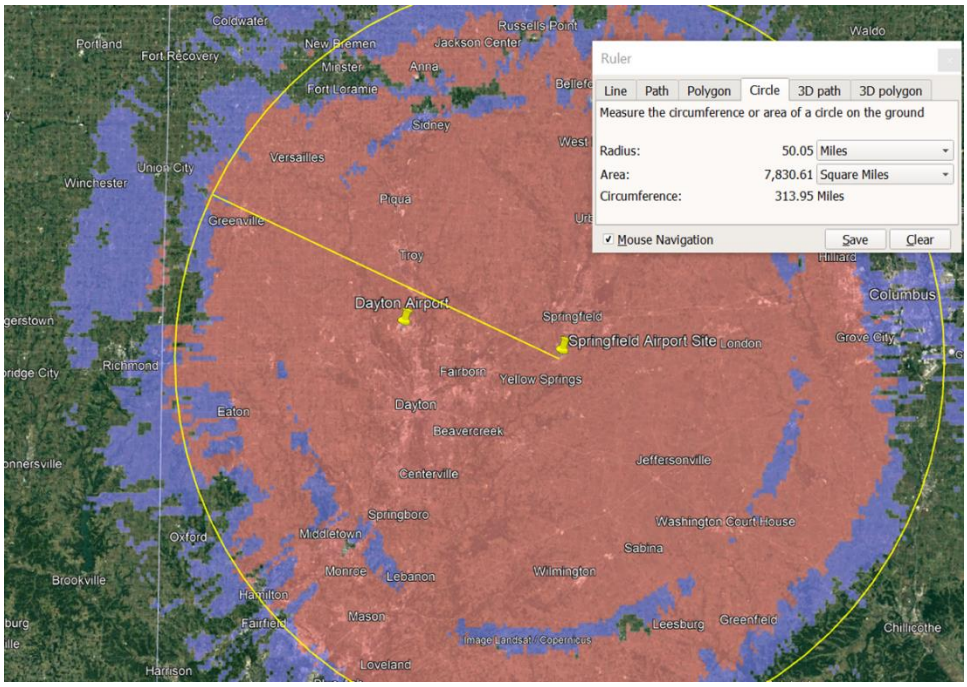
AURA Springfield, OH Ground Coverage Map



AURA Springfield, OH Coverage Map at 2000' AMSL



AURA Springfield, OH coverage Map at 2500' AMSL



Air Force Research Labs

Cooperative Research and Development Agreement (CRDA)

A Cooperative Research and Development Agreement (CRADA) is a written agreement between a private company and a government agency to cooperatively work on a project. Created as a result of federal legislation, a CRADA allows the Federal government and non-Federal partners to optimize their resources, share technical expertise in a protected environment, share intellectual property emerging from the effort, and speed the commercialization of federally developed technology.


UNITED STATES AIR FORCE

COOPERATIVE RESEARCH AND DEVELOPMENT AGREEMENT

(CRADA)

between

AIR FORCE RESEARCH LABORATORY
OPERATIONS DIRECTORATE

and

OHIO DEPARTMENT OF TRANSPORTATION
DriveOhio/Ohio Unmanned Aerial Systems Group

INDEX

SECTION I (Standard Terms and Conditions) 2

SECTION II (Joint Work Plan) 17

SECTION III (Signatures) 21

AFRL
THE AIR FORCE RESEARCH LABORATORY
LEAD | DISCOVER | DEVELOP | DELIVER

UAS
OHIO UNMANNED AIRCRAFT SYSTEMS
C E N T E R

AFRL Certificate of Authorization (COA)

RPAs have their own inherent set of operating requirements, Operations Manuals, and Standard Operating Practices. The RPA PIC and all other participants in the GBDAA system will be qualified to operate in the airspace in which they intend to operate and will follow DoD flight regulations and procedures. AFRL has a proven process and regulatory guidance to enforce these requirements.

Airspace Authorizations

KSGH can accommodate all anticipated UAS flight profiles for UAS Groups 1-5 as a launch and recovery site and allows for simultaneous manned and unmanned operations into the airport traffic pattern.

Ground Based Detect and Avoid Description (GBDAA)

The GBDAA system is composed of the Ground Control Station (GCS) that controls the RPA(s), the radars that monitor the airspace, the hardware and software that build the displays and warning logic, and the operators that command the aircraft and resolve the conflicts. Figure 1 is an overview of how information flows from the radars to the GBDAA System and finally to the operators.

Ground Control Station

The GCS is used for aircraft command and control throughout the RPA mission profile and is part of the overall vehicle's airworthiness certification. The PIC commands the RPA via the GCS controls, giving the PIC the ability to change heading, altitude, and/or airspeed to resolve potential conflicts. The GCS also sends RPA position information to the GBDAA system. The position data from the GCS is processed and then displayed as a track on the GBDAA displays.

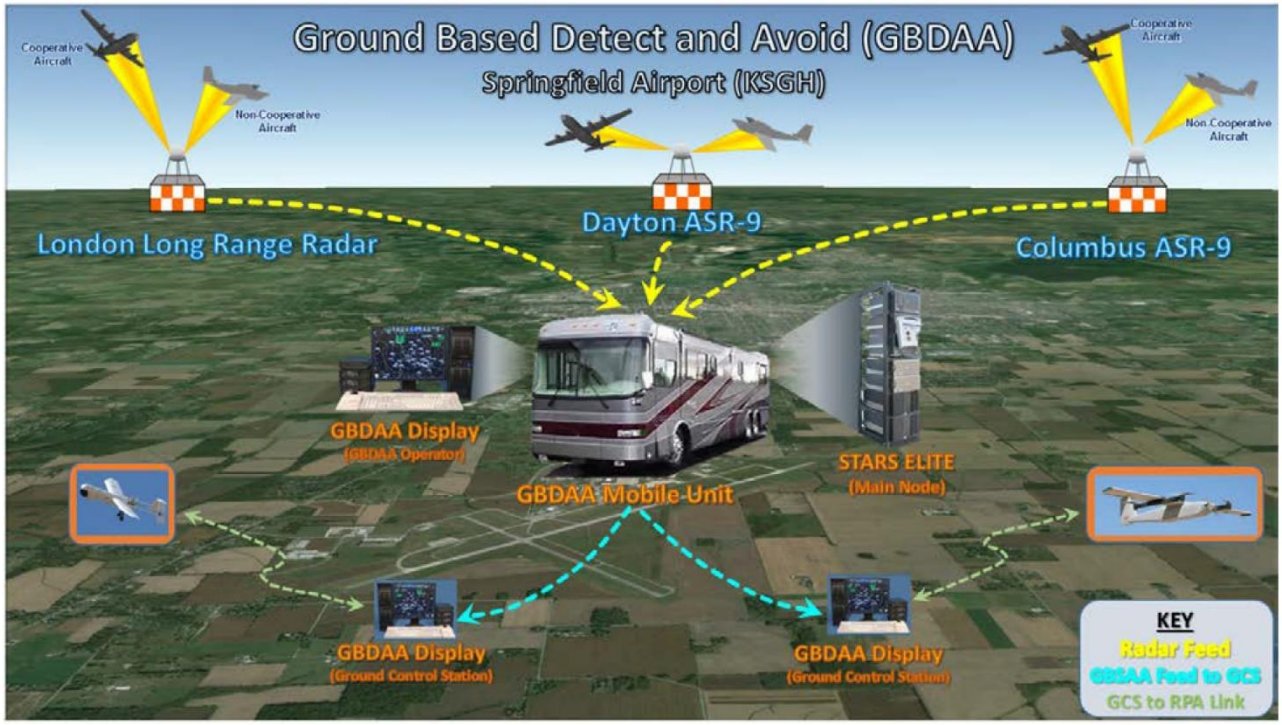


Figure 1

GBDAA System Displays

Data from the local radar systems and RPA track datalink will be correlated and displayed on a fourth generation (G4) STARS ELITE system configured as a stand-alone GBDAA system. This system operates independently and does not provide any feedback to the Columbus TRACON. The RPA PIC and the GBDAA Operator each have a display in order to build common situational awareness of the surveillance airspace. The displays have both visual and audio alerting capabilities to indicate when an aircraft has entered the Threat Volume of airspace.

GBDAA Mobile Unit

The GBDAA Mobile Unit houses the GBDAA system and the GBDAA Operator. The processing system (rack mounted equipment) receives the radar data from the three radars and the RPA position data from the GCS. The data is processed, compiled and sent to the appropriate displays where the GBDAA Operator and the RPA PIC work together to ensure the RPAs remain well clear of each other and other aircraft depicted on the display. The RPA PIC and the GBDAA Operator will be fully trained on the system and deconfliction procedures. As a safety mitigation, the initial GBDAA Operators will be previously trained and qualified Air Traffic Control (ATC) Controllers.

- Cooperative & non-cooperative aircraft tracking using 3 FAA certified radars
- FAA STARS Elite with Static and Dynamic Protection Zones
- Universal translator for autopilots
- Secure data collection & analysis
- Micro-weather forecasting
- High-speed fiber network

Operational Volume

The Operational Volume is the airspace where the RPA will be conducting operations and is referred to as the RPA Operating Area (ROA). The airspace for this operation is composed of two types of airspace. The first is the Visual-Line-of-Sight (VLOS) airspace which is designed for the RPA PIC to get the RPA airborne and prepare for Beyond-Visual-Line-of-Sight (BVLOS) operations. The second type of airspace is the BVLOS airspace where the RPA PIC will be conducting the mission utilizing the GBDAA system.

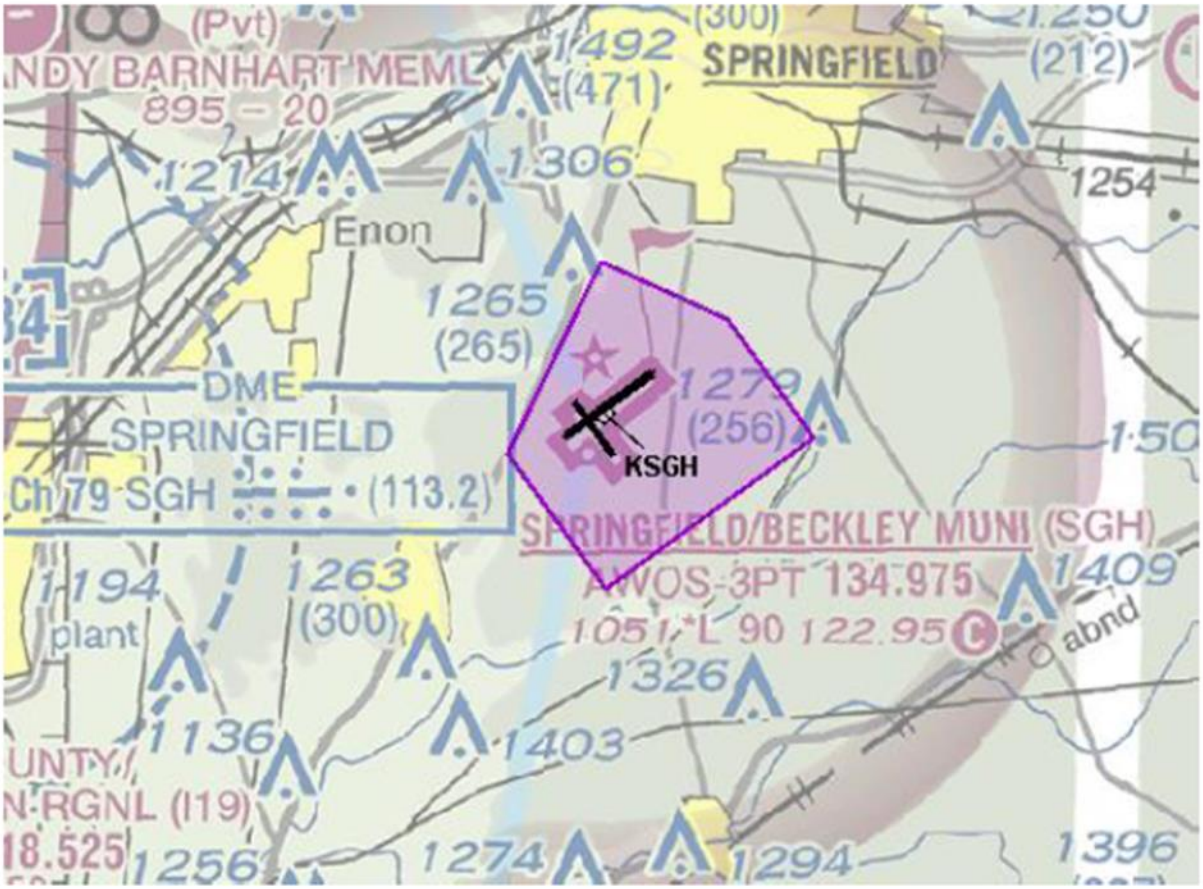
Visual Line of Sight Airspace (VLOS) Remote Pilot Operating Area

The VLOS airspace volume is similar to the COA that AFRL re-established in August 2018 (COA 2022-CSA-11472-COA). This separate COA was created in order to accomplish a build-up approach to operating under the GBDAA system for BVLOS operations. Operations in this COA continue to inform the GBDAA system CONEMP and planned operations. Attachment 2-1 shows the VLOS airspace (north bottom to south top view). Figure 2 lists the corner coordinates. As evident in the graphic, the COA includes the crossing runway (RWY 15/33). The crossing runway will not be closed for the RPA BVLOS operations; however, partial taxiway closures are expected, dependent on launch and recovery requirements of the RPA.

Figure 2 shows the complete VLOS Operating Area and coordinates.

Attachment 2-1

Visual Line of Sight Operational Area
Surface – 3,500 AGL



Visual Line of Sight Points	
Latitude	**Longitude**
39°52'28" N	83°50'24" W
39°51'40" N	83°48'10" W
39°50'03" N	83°46'38" W
39°48'00" N	83°50'19" W
39°49'50" N	83°52'03" W

Figure 2

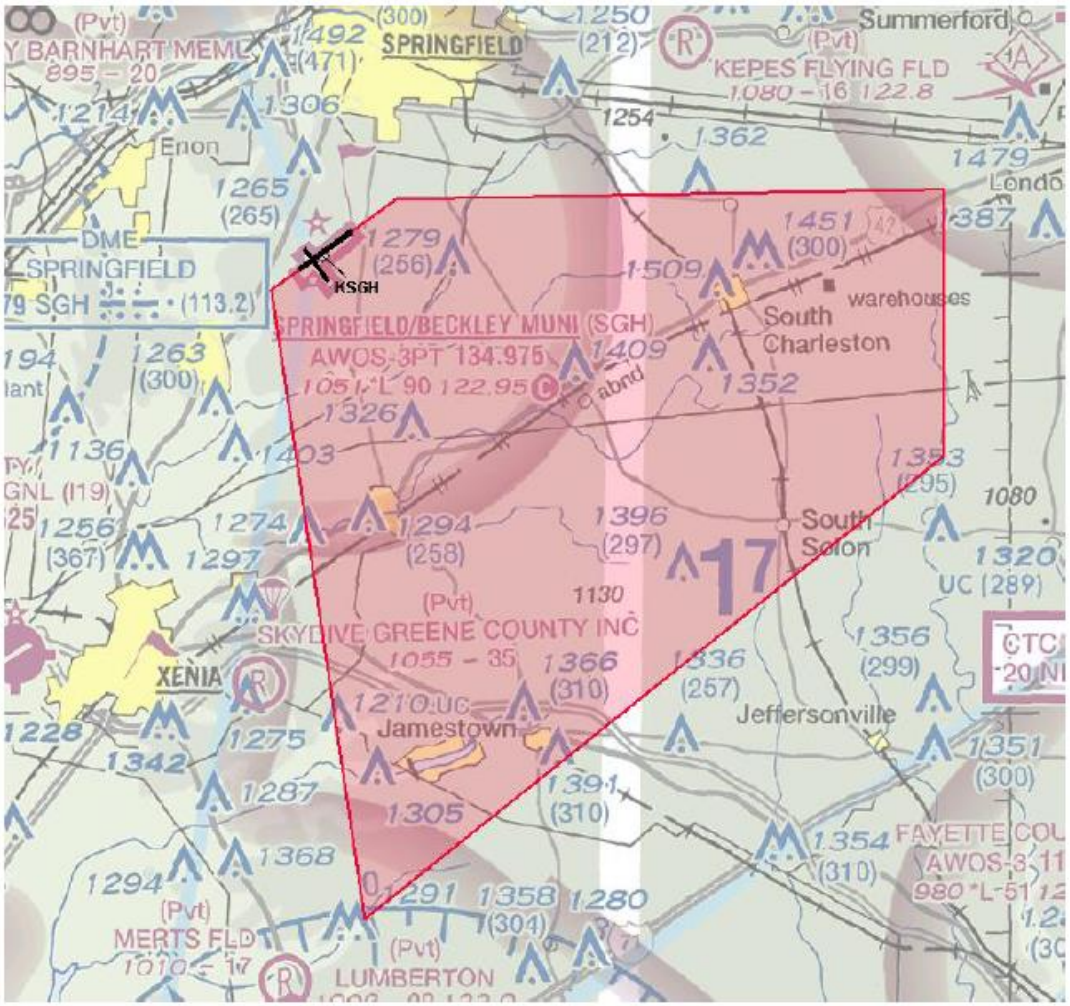
Beyond Visual Line of Sight Airspace (BVLOS) Remote Pilot Operating Area
The second type of airspace is used for BVLOS operations and requires the GBDAA system in order to satisfy “See and Avoid” requirements. This airspace, referred to as the RPA Operating Airspace (ROA), includes the VLOS airspace and extends to the southeast of the Springfield Airport. The altitude range for operating in this airspace is from approximately 2,000 MSL (1,000 AGL) to 18,000 MSL.

The lower limit of the airspace is defined as 500 feet above the minimum altitude of the Threat Volume Airspace (95% Pd). This provides a 500-foot buffer for aircraft penetrating from the bottom of the area into the ROA. This roughly equates to a full minute for the GBDAA system and operators to react to an aircraft climbing out at 500 feet per minute vertical velocity. This allows for the GBDAA system to pick up a track on the intruder and the RPA PIC and GO to perform the necessary maneuvers to avoid the conflict, if required.

Figure 3 shows the complete BVLOS operating area and the coordinates.

Attachment 3-1

Beyond Visual Line of Sight Operational Area
1,000 AGL – 12,500 MSL



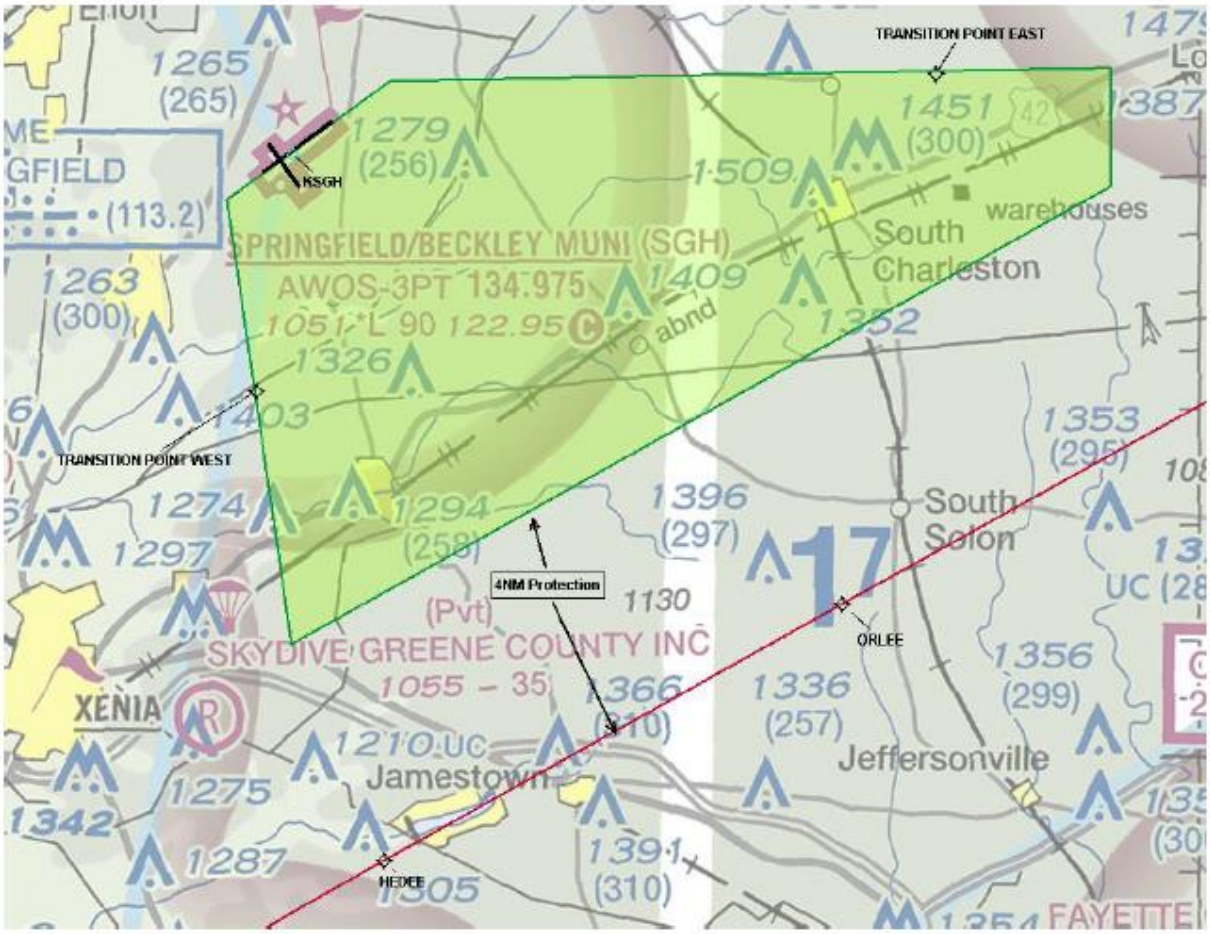
Beyond Visual Line of Sight Points	
Latitude	**Longitude**
39°51'40" N	83°48'10" W
39°51'53" N	83°31'57" W
39°45'51" N	83°31'04" W
39°35'18" N	83°49'07" W
39°49'37" N	83°51'51" W

Figure 3

Figure 4 shows the operating area up to 18,000MSL.

Attachment 4

Beyond Visual Line of Sight Operational Area
1,000 AGL – FL180



Beyond Visual Line of Sight Points	
Latitude	**Longitude**
39°49'37" N	83°51'51" W
39°51'40" N	83°48'10" W
39°51'53" N	83°31'57" W
39°49'51" N	83°31'57" W
39°41'58" N	83°50'24" W
39°49'37" N	83°51'51" W

Figure 4

Figure 5 shows both VLOS and BVLOS operating area and altitude shelves.

Attachment 1

Operational Area
Springfield/Beckley Municipal Airport Area

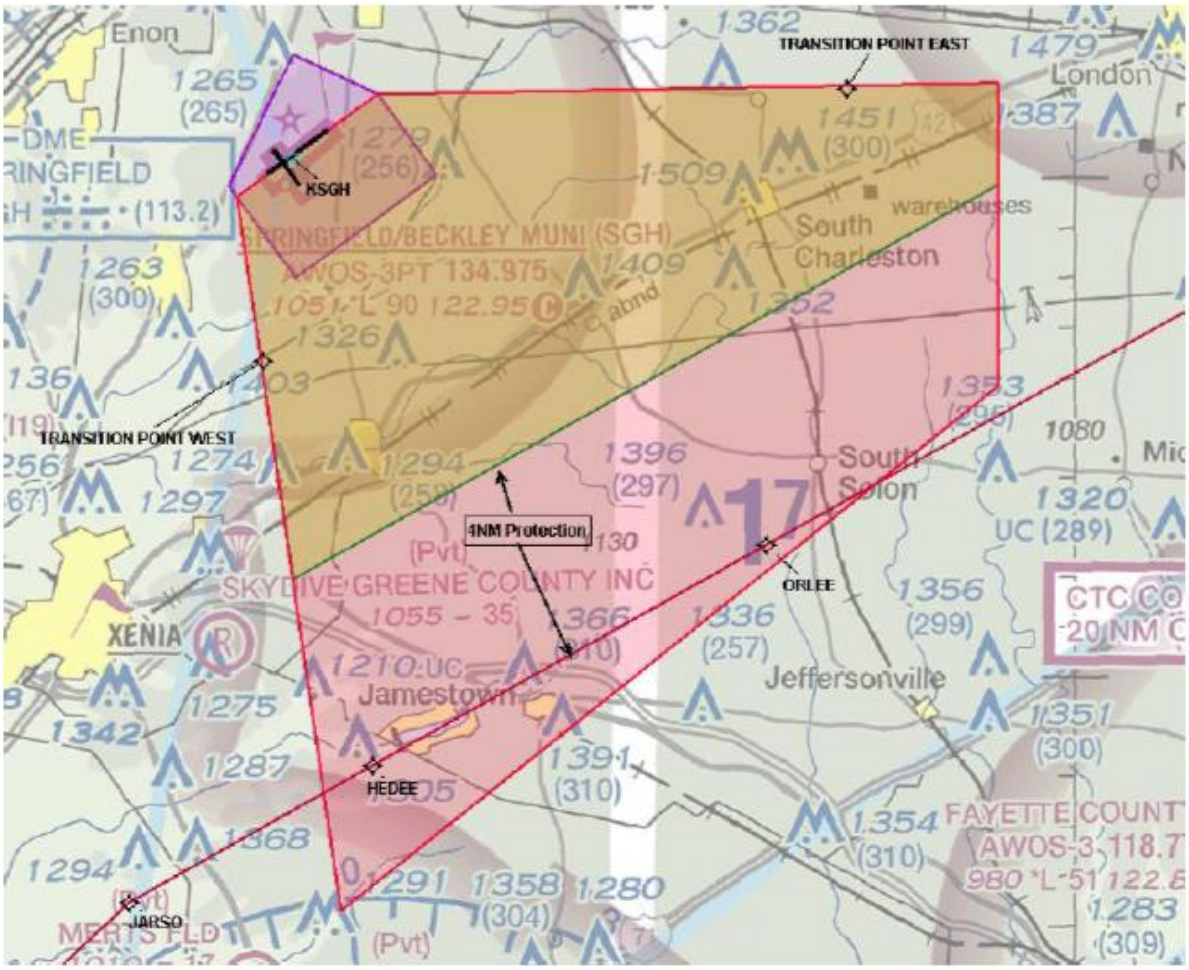


Figure 5

Part 107 Operating Areas

In addition to Part 91 VLOS and BVLOS Operating Areas SGH airport has deconflicted areas for Part 107 Operations. These areas are geographically separated to accommodate simultaneous operations across the airport. The lateral limits are well defined and vertical limits may be adjusted upon user request. Figure 4 below identifies Part 107 Operating areas.

Figure 4

Process to start testing in Ohio with AFRL and Springfield Airport

Initial contact can be made through informal means such as a telephone call or email with the Ohio UAS Center. Depending on the scope of the project the Ohio UAS Center will coordinate with AFRL and the Springfield Airport to determine the most effective path towards operating with the Ohio UASC. Those options may include DOD, Ohio UASC or Springfield Airport sponsorship.

Initial Questionnaire

a. What type of testing are you looking to do?
(Platform, payload, parachute, software, standards validation, etc.)

b. Do you have your own pilots?

- Yes – what are the pilots' credentials? (ratings, training, etc.)
- No – do you need us to provide pilots for your testing?

c. What vehicle(s) are you planning to fly?

- Is/are your vehicle(s) registered with FAA? (all UAS must be registered)
- What is/are the weight(s) of the vehicle(s)?

d. Do you have UAS Operator's Manual?
(Copy of the operator's manual or equivalent documentation required).

e. Do you know the mission profile yet? (How high/long/far, with ground track depiction etc.)

f. When are you looking to fly?

g. Do you need office space?

h. Do you need hangar space?

Scheduling

An initial range and airspace request form captures initial UAS operator proponent contact information, air and ground space details, spectrum and frequency, dates and project description as a precursor to a more detailed planning document. Early and accurate planning of air and ground spacefootprint is critical to project planning and execution. Programs planning to conduct multiple testrange operations should work through AFRL and the Ohio UASC to determine what capability exists to develop an integrated schedule.

The Ohio UASC is the focal for tracking and scheduling activities to ensure airspace access and deconfliction of overlapping events.

Airworthiness

Air Force Research Labs Entities that work with AFRL New York UAS Test Site has two FAA designated airworthiness representatives (DARs) who take a risk-based approach to airworthiness, as outlined within the previous safety section.Each operation goes through a test readiness review (TRR) process, designed to assess the airworthiness of unmanned aircraft systems in order to issue limited operations approval and special airworthiness certificates. The TRR process can accommodate all categories of UAS ata variety of developmental stages, from the initial design of an aircraft, to the conversion of model aircraft to experimental aircraft, and through more traditional flight testing.