

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

CERTIFICATE OF WAIVER OR AUTHORIZATION

ISSUED TO

New Mexico State University – Physical Science Laboratory

21st Century Aerospace
Mail Stop 3548 NMSU
Las Cruces, NM 88003

This certificate is issued for the operations specifically described hereinafter. No person shall conduct any operation pursuant to the authority of this certificate except in accordance with the standard and special provisions contained in this certificate, and such other requirements of the Federal Aviation Regulations not specifically waived by this certificate.

OPERATIONS AUTHORIZED

Operation of the Aerostar Unmanned Aircraft System (UAS) in Class G and E airspace identified in Attachment 1 from surface to 17,500 feet Mean Sea Level (MSL) under the jurisdiction of the Albuquerque Air Route Traffic Control Center (ARTCC) (ZAB).

LIST OF WAIVED REGULATIONS BY SECTION AND TITLE

N/A

STANDARD PROVISIONS

1. A copy of the application made for this certificate shall be attached and become a part hereof.
2. This certificate shall be presented for inspection upon the request of any authorized representative of the Federal Aviation Administration, or of any State or municipal official charged with the duty of enforcing local laws or regulations.
3. The holder of this certificate shall be responsible for the strict observance of the terms and provisions contained herein.
4. This certificate is nontransferable.

Note-This certificate constitutes a waiver of those Federal rules or regulations specifically referred to above. It does not constitute a waiver of any State law or local ordinance.

SPECIAL PROVISIONS


Special Provisions are set forth and attached.

This certificate 2010-CSA-49 is effective from June 23, 2011 to June 22, 2012, and is subject to cancellation at any time upon notice by the Administrator or his/her authorized representative.

BY DIRECTION OF THE ADMINISTRATOR

FAA Headquarters, AJV-13
(Region)

June 22, 2011
(Date)


FOR
Dean E. Fulmer
(Signature)

Acting Manager, Unmanned Aircraft Systems
(Title)

ATTACHMENT to FAA FORM 7711-1

Issued To: New Mexico State University – Physical Science Laboratory

Address: 21st Century Aerospace
Mail Stop 3548 NMSU
Las Cruces, NM 88003

Activity: Operation of the Aerostar Unmanned Aircraft System (UAS) in Class G and E airspace identified in Attachment 1 from surface to 17,500 feet Mean Sea Level (MSL) under the jurisdiction of the Albuquerque Air Route Traffic Control Center (ARTCC) (ZAB).

Purpose: To prescribe UAS operating requirements (outside of restricted and/or warning area airspace) in the National Airspace System (NAS) for the purpose of training and/or operational flights.

Dates of Use: This Certificate of Authorization (COA) 2010-CSA-49 is valid from June 23, 2011 through June 22, 2012. Should a renewal become necessary, the proponent shall advise the Federal Aviation Administration (FAA), in writing, no later than 60 days prior to the requested effective date.

General Provisions:

- The review of this activity is based on our current understanding of UAS operations, and the impact of such operations in the NAS, and therefore should not be considered a precedent for future operations. As changes occur in the UAS industry, or in our understanding of it, there may be changes to the limitations and conditions for similar operations.
- All personnel connected with the UAS operation must comply with the contents of this authorization and its provisions.
- This COA will be reviewed and amended as necessary to conform to changing UAS policy and guidance.

Safety Provisions:

Unmanned Aircraft (UA) have no on-board pilot to perform see-and-avoid responsibilities, and therefore, when operating outside of restricted areas, special provisions must be made to ensure an equivalent level of safety exists for operations had a pilot been on board. In accordance with 14 CFR Part 91, General Operating and Flight Rules, Subpart J-Waivers, 91.903, Policy and Procedures, the following provisions provide acceptable mitigation of 14 CFR Part 91.111/113 and must be complied with:

- For the purpose of see-and-avoid, visual observers must be utilized at all times except in Class A airspace, restricted areas, and warning areas. The observers may

either be ground based or in a chase plane. If the chase aircraft is operating more than 100ft above/below and or ½ nm laterally, of the UA, the chase aircraft PIC will advise the controlling ATC facility.

- In order to comply with the see and avoid requirements of Title 14 of the Code of Federal Regulations sections 91.111 and 91.113, the pilot-in-command and visual observers must be able to see the aircraft and the surrounding airspace throughout the entire flight; and be able to determine the aircraft's altitude, flight path and proximity to traffic and other hazards (terrain, weather, structures) sufficiently to exercise effective control of the aircraft to give right-of-way to other aircraft, and to prevent the aircraft from creating a collision hazard.
- UAS pilots will ensure there is a safe operating distance between manned and unmanned aircraft at all times in accordance with 14 CFR 91.111, *Operating Near Other Aircraft*, and 14 CFR 91.113, *Right-of-Way Rules*. Cloud clearances and VFR visibilities for Class E airspace will be used regardless of class of airspace. Additionally, UAS operations are advised to operate well clear of all known manned aircraft operations.
- The dropping or spraying of aircraft stores, or carrying of hazardous materials (included ordnance) outside of active Restricted, Prohibited, or Warning Areas is prohibited unless specifically authorized in the Special Provisions of this COA.

Airworthiness Certification Provisions:

- UA must be shown to be airworthy to conduct flight operations in the NAS.
- Public Use Aircraft must contain one of the following:
 - A civil airworthiness certification from the FAA, or
 - A statement specifying that the Department of Defense Handbook "Airworthiness Certification Criteria" (MIL-HDBK-516), as amended, was used to certify the aircraft or
 - Equivalent method of certification.

Pilot / Observer Provisions:

- **Pilot Qualifications:** UA pilots interacting with Air Traffic Control (ATC) shall have sufficient expertise to perform that task readily. Pilots must have an understanding of and comply with Federal Aviation Regulations and Military Regulations applicable to the airspace where the UA will operate. Pilots must have in their possession a current second class (or higher) airman medical certificate that has been issued under 14 CFR 67, Medical Standards and Certification, or a military equivalent. 14 CFR 91.17, Alcohol or Drugs, applies to UA pilots.
- Aircraft and Operations Requirements:
 - Flight Below 18,000 Feet Mean Sea Level (MSL).
 - UA operations below 18,000 feet MSL in any airspace generally accessible to aircraft flying in accordance with visual flight rules (VFR) require visual observers, either airborne or ground-based. Use of ATC radar alone does not

- constitute sufficient collision risk mitigation in airspace where uncooperative airborne operations may be conducted.
- Flights At or Above 18,000 Feet Mean Sea Level (MSL)
 - When operating on an instrument ATC clearance, the UA pilot-in-command must ensure the following:
 1. An ATC clearance has been filed, obtained and followed.
 2. Positional information shall be provided in reference to established NAS fixes, NAVAIDS, and waypoints. Use of Latitude/Longitude is not authorized.
- **Observer Qualifications:** Observers must have been provided with sufficient training to communicate clearly to the pilot any turning instructions required to stay clear of conflicting traffic. Observers will receive training on rules and responsibilities described in 14 CFR 91.111, *Operating Near Other Aircraft*, 14 CFR 91.113, *Right-of-Way Rules*, cloud clearance, in-flight visibility, and the pilot controller glossary including standard ATC phraseology and communication. Observers must have in their possession a current second class (or higher) airman medical certificate that has been issued under 14 CFR 67, Medical Standards and Certification, or a military equivalent. 14 CFR 91.17, Alcohol or Drugs, applies to UA observers.
- **Pilot-in-Command (PIC) –**
 - **Visual Flight Rules (VFR) as applicable:**
 - The PIC is the person directly responsible for the operation of the UA. The responsibility and authority of the pilot in command as described by 14 CFR 91.3 (or military equivalent), applies to the UAS PIC.
 - The PIC operating a UA in line of sight must pass at a minimum the required knowledge test for a private pilot certificate, or military equivalent, as stated in 14 CFR 61.105, and must keep their aeronautical knowledge up to date.
 - There is no intent to suggest that there is any requirement for the UAS PIC to be qualified as a crewmember of a manned aircraft.
 - Pilots flying a UA on other than instrument flight plans beyond line of sight of the PIC must possess a minimum of a current private pilot certificate, or military equivalent in the category and class, as stated in 14 CFR 61.105.
 - **Instrument Flight Rules (IFR) as applicable:**
 - The PIC is the person directly responsible for the operation of the UA. The responsibility and authority of the pilot in command as described by 14 CFR 91.3 (or military equivalent), applies to the UAS PIC.
 - The PIC must be a certified pilot (minimum of private pilot) of manned aircraft (FAA or military equivalent) in category and class of aircraft flown.
 - The PIC must also have a current/appropriate instrument rating (manned aircraft, FAA or military equivalent) for the category and class of aircraft flown.
- **Pilot Proficiency – VFR/IFR as applicable:**

- Pilots will not act as a VFR/ IFR PIC unless they have had three qualified proficiency events within the preceding 90 days.
 - The term “qualified proficiency event” is a UAS-specific term necessary due to the diversity of UAS types and control systems.
 - A qualified proficiency event is an event requiring the pilot to exercise the training and skills unique to the UAS in which proficiency is maintained.
- Pilots will not act as an IFR PIC unless they have had six instrument qualifying events in the preceding six calendar months (an event that requires the PIC to exercise instrument flight skills unique to the UAS).
- **PIC Responsibilities:**
 - Pilots are responsible for a thorough preflight inspection of the UAS. Flight operations will not be undertaken unless the UAS is airworthy. The airworthiness provisions of 14 CFR 91.7, Civil Aircraft Airworthiness, or the military equivalent, apply.
 - One PIC must be designated at all times and is responsible for the safety of the UA and persons and property along the UA flight path.
 - The UAS pilot will be held accountable for controlling their aircraft to the same standards as the pilot of a manned aircraft. The provisions of 14 CFR 91.13, *Careless and Reckless Operation*, apply to UAS pilots.
- **Pilot/Observer Task Limitations:**
 - Pilots and observers must not perform crew duties for more than one UA at a time.
 - Chase aircraft pilots must not concurrently perform either observer or UA pilot duties along with chase pilot duties.
 - Pilots are not allowed to perform concurrent duties both as pilot and observer.
 - Observers are not allowed to perform concurrent duties both as pilot and observer.

Standard Provisions: These provisions are applicable to all operations unless indicated otherwise in the Special Provisions section.

- The UA PIC will maintain direct two-way communications with ATC and have the ability to maneuver the UA per their instructions, unless specified otherwise in the Special Provisions section. The PIC shall comply with all ATC instructions and/or clearances.
- If equipped, the UA shall operate with an operational mode 3/A transponder, with altitude encoding, or mode S transponder (preferred) set to an ATC assigned squawk.
- If equipped, the UA shall operate with position/navigation lights on at all times during flight.
- The UA PIC shall not accept any ATC clearance requiring the use of visual separation or sequencing.

- VFR cloud clearances and visibilities for Class E airspace will be used regardless of class of airspace the UAS is operating in, except when operating in Class A airspace where 14 CFR Part 91.155 will apply.
- Special VFR is not authorized.
- Operations (including lost link procedures) shall not be conducted over populated areas, heavily trafficked roads, or an open-air assembly of people.
- Operations outside of restricted areas, warning areas, prohibited areas (designated for aviation use) and/or Class A airspace may only be conducted during daylight hours, unless authorized in the Special Provisions section.
- Operations shall not loiter on Victor airways, Jet Routes, Q Routes, IR Routes, or VR Routes. When necessary, transit of airways and routes shall be conducted as expeditiously as possible.
- Operations conducted under VFR rules shall operate at appropriate VFR altitudes for direction of flight (14 CFR 91.159).
- The UA PIC or chase plane PIC (whichever is applicable) will notify ATC of any in flight emergency or aircraft accident as soon as practical.
- All operators that use GPS as a sole source must check all NOTAMs and Receiver Autonomous Integrity Monitoring (RAIM). Flight into GPS test area or degraded RAIM is prohibited without specific approval in the special provisions.
- At no time will TCAS be used in any mode while operating an unmanned aircraft.
- Only one UA will be flown in the operating area unless indicated otherwise in the Special Provisions.
- A copy of this COA will be maintained on site by the PIC or designated representative.
- New Mexico State University – Physical Science Laboratory, and/or its representatives, is responsible at all times for collision avoidance with non-participating aircraft and the safety of persons or property on the surface with respect to the UAS.

Special Provisions:

1. In the event of a lost link, the UAS pilot will immediately notify Albuquerque ARTCC (ZAB) at 505-586-4500, state pilot intentions, and comply with the following provisions:
 - Provide Albuquerque Air Route Traffic Control Center of the lost link condition and provide the following:
 - UA last know location
 - UA altitude
 - Direction of flight/heading
 - Fuel on board
 - The loss of link waypoint location, route to the waypoint, and holding airspace at the loss of link waypoint.
 - Proceed to the preprogrammed lost link waypoint at the pre-programmed altitude and hold until link is reestablished or fuel is exhausted.

- If lost link occurs within a restricted or warning area, or the lost link procedure above takes the UA into the restricted or warning area – the aircraft will not exit the restricted or warning areas until the link is re-established.
 - The UA lost link mission will not transit or orbit over populated areas.
 - When outside of restricted/warning area airspace, lost link programmed procedures will avoid unexpected turn-around and/or altitude changes and will provide sufficient time to communicate and coordinate with ATC.
 - Lost link orbit points shall not coincide with the centerline of Victor airways.
2. All operations outside of Warning areas, Restricted areas, and Class A airspace shall be conducted in visual meteorological conditions during daylight hours only and in compliance with Title 14 of the Code of Federal Regulations (14 CFR) section 91.155, *Basic VFR Weather Minimums*, as annotated for operations in Class E airspace regardless of airspace flown. If a chase aircraft is utilized, the minimum visibility requirement at all times is five statute miles or greater.
 3. Flight operations are approved for the following airports only: Las Cruces International (KLRU), Lordsburg Municipal (KLSB), and Playas Air Strip (NM86).
 4. All transit operations between approved operating areas must be accompanied by a chase aircraft with onboard visual observer.
 5. Flight operations at NM86 must be coordinated with operations at Playas Medical Building heliport (85NM) which is approximately 1.2 miles south of NM86.
 6. All flight operations shall be conducted at or below 17,500 feet MSL.
 7. Concurrent multiple unmanned aircraft system (UAS) operations at each site are not authorized.
 8. The UA pilot-in-command (PIC) shall hold, at a minimum, a Federal Aviation Administration (FAA) Current FAA private pilot certificate, the FAA accepted the agency equivalent, based on the application or 14 CFR Part 61.
 9. All supplemental pilots shall hold an FAA Private Pilot's Certificate (or higher) or have successfully completed the written examination for the Private Pilot's Certificate within the past 24 calendar months.
 10. All UA pilots and observers shall hold, at a minimum, a valid FAA Class 2 medical certificate issued under 14 CFR Part 67, or equivalent.
 11. The UA shall not be operated over congested areas, heavily trafficked roads, or an open air assembly of persons.
 12. The proponent shall comply with the Contingency Planning provisions depicted in Attachment 2 of this document.

NOTAM: A distance (D) Notice to Airmen shall be issued when UA operations are being conducted. This requirement may be accomplished through your local base operations or NOTAM issuing authority. You may also complete this requirement by contacting Flight Service Station at 1-877-4-US-NTMS (1-877-487-6867) not more than 72 hours in advance, but not less than 48 hours prior to the operation and provide:

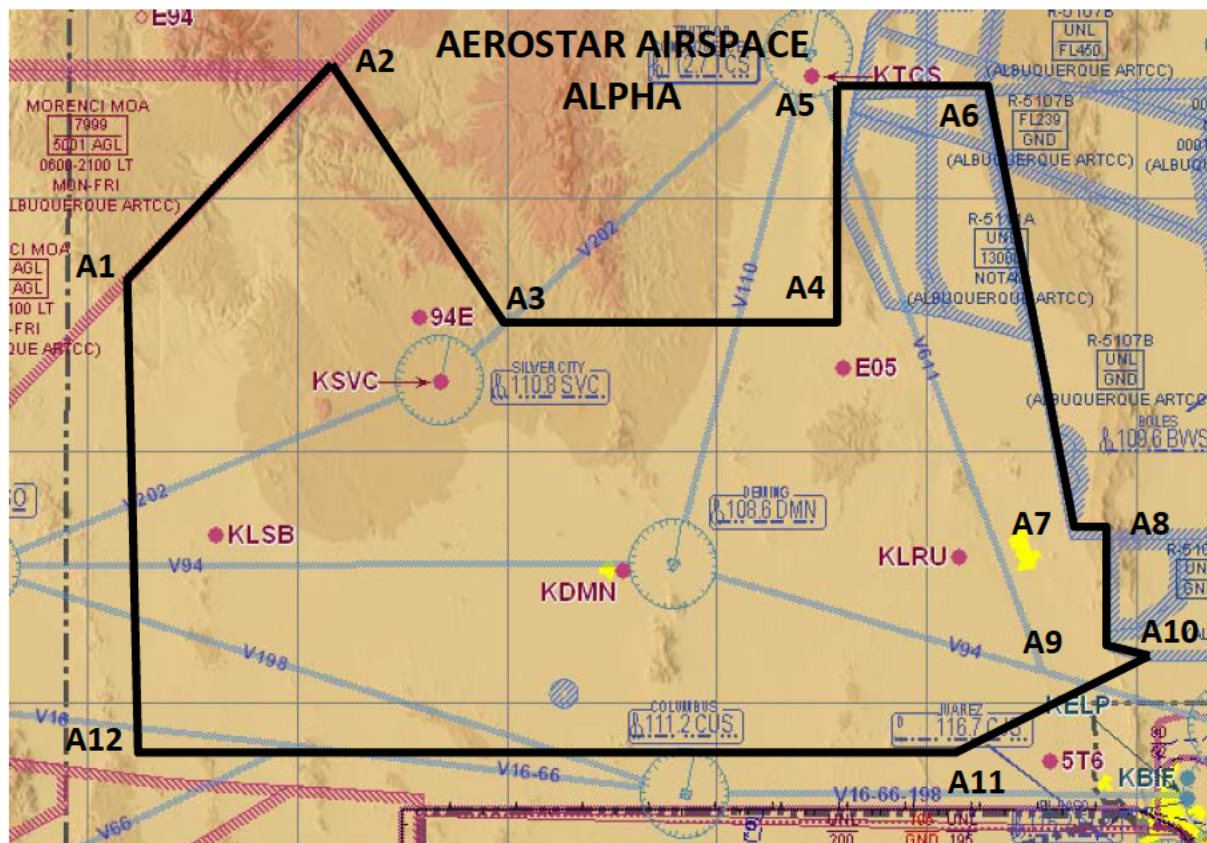
- Name and Address of pilot filing NOTAM request
- Location, Altitude or the operating Area
- Time and nature of the activity

NOTE FOR PROPONENTS FILING THEIR NOTAM WITH DoD ONLY: This requirement to file with the AFSS is in addition to any local procedures/requirements for filing through DINS. The FAA Unmanned Aircraft Systems Office is working with the AFSS, and to eliminate the requirement to file a NOTAM with both the AFSS and DINS in the near future.

Incident / Accident and Normal Reporting Provisions: The following information is required to document routine and unusual occurrences associated with UAS activities in the NAS.

- The proponent for the COA shall provide the following information to Donald.E.Grampp@faa.gov on a monthly basis:
 - Number of flights conducted under this COA.
 - Pilot duty time per flight.
 - Unusual equipment malfunctions (hardware/software).
 - Deviations from ATC instructions.
 - Operational/coordination issues.
 - All periods of loss of link (telemetry, command and/or control)
- The following shall be submitted via COA Online, email or phone (202-385-4542, (b)(6) [REDACTED]) to Donald.E.Grampp@faa.gov **within 24 hours and prior to any additional flight under this COA:**
 - All accidents or incidents involving UAS activities, including lost link.
 - Deviations from any provision contained in the COA.

This COA does not, in itself, waive any Federal Aviation Regulation (FAR) nor any state law or local ordinance. Should the proposed operation conflict with any state law or local ordinance, or require permission of local authorities or property owners, it is the responsibility of New Mexico State University – Physical Science Laboratory to resolve the matter. This COA does not authorize flight within Special Use Airspace without approval from the Using Agency. New Mexico State University – Physical Science Laboratory is hereby authorized to operate the Aerostar Unmanned Aircraft System in the operations area depicted in “Activity” above and attachment 1 below.



AEROSTAR AIRSPACE ALPHA

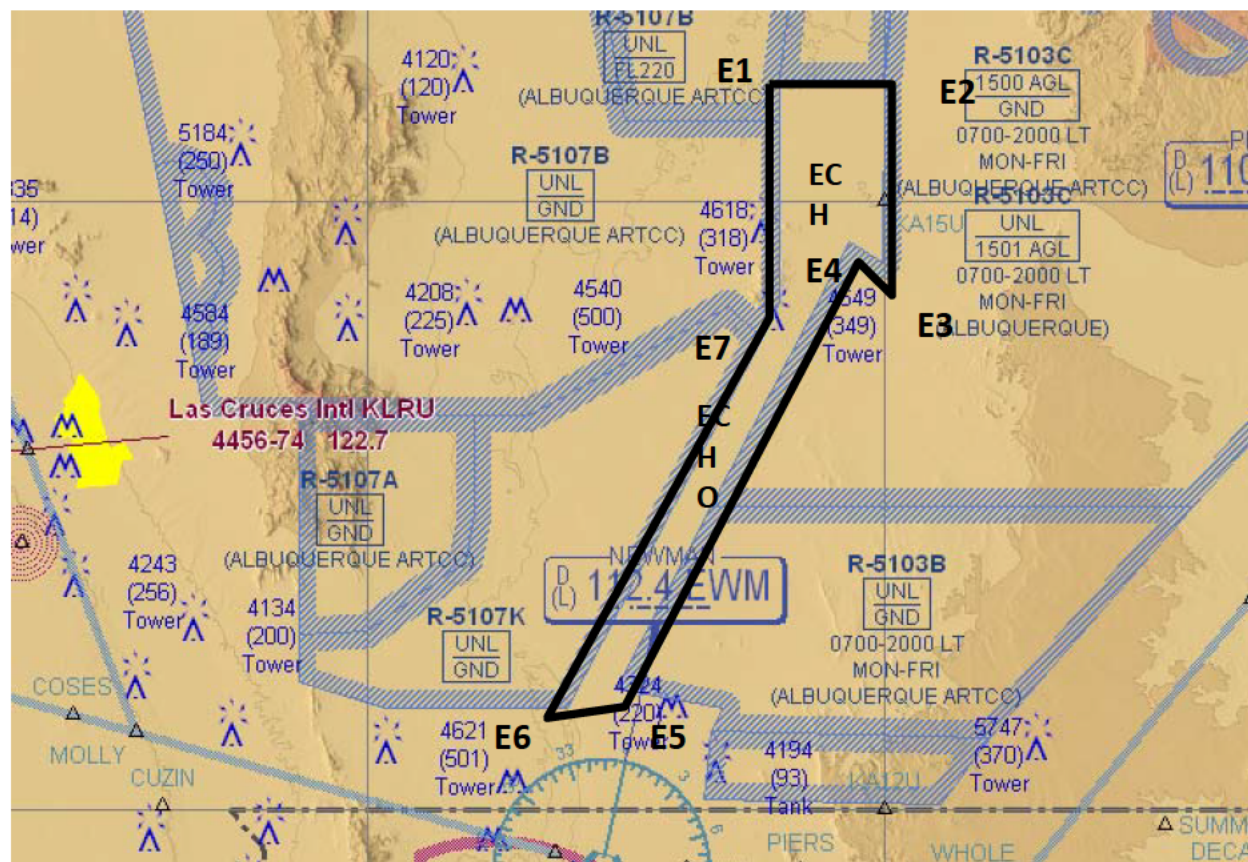
Beginning at

**32-50-00N / 108-52-00W (A1) to
33-15-00N / 108-24-32W (A2) to
32-43-00N / 108-00-00W (A3) to
32-43-00N / 107-13-00W (A4) to
33-13-00N / 107-13-00W (A5) to
33-13-00N / 106-52-02W (A6) to
32-19-30N / 106-39-32W (A7) to
32-19-30N / 106-34-02W (A8) to
32-06-20N / 106-34-02W (A9) to
32-05-00N / 106-29-02W (A10) to
31-51-00N / 106-55-00W (A11) to
31-51-00N / 108-52-00W (A12) to
point of beginning**

Altitude – Surface to 17,500 feet MSL

NO FLIGHT OPERATIONS WE BE PERFORMED WITHIN ANY PORTION OF R-5111A, B, C OR D WHEN THIS RESTRICTED AREA AIRSPACE IS ACTIVE, UNLESS, PRIOR APPROVAL IS OBTAINED FROM WSMR SCHEDULING AUTHORITY

AEROSTAR AIRSPACE ECHO

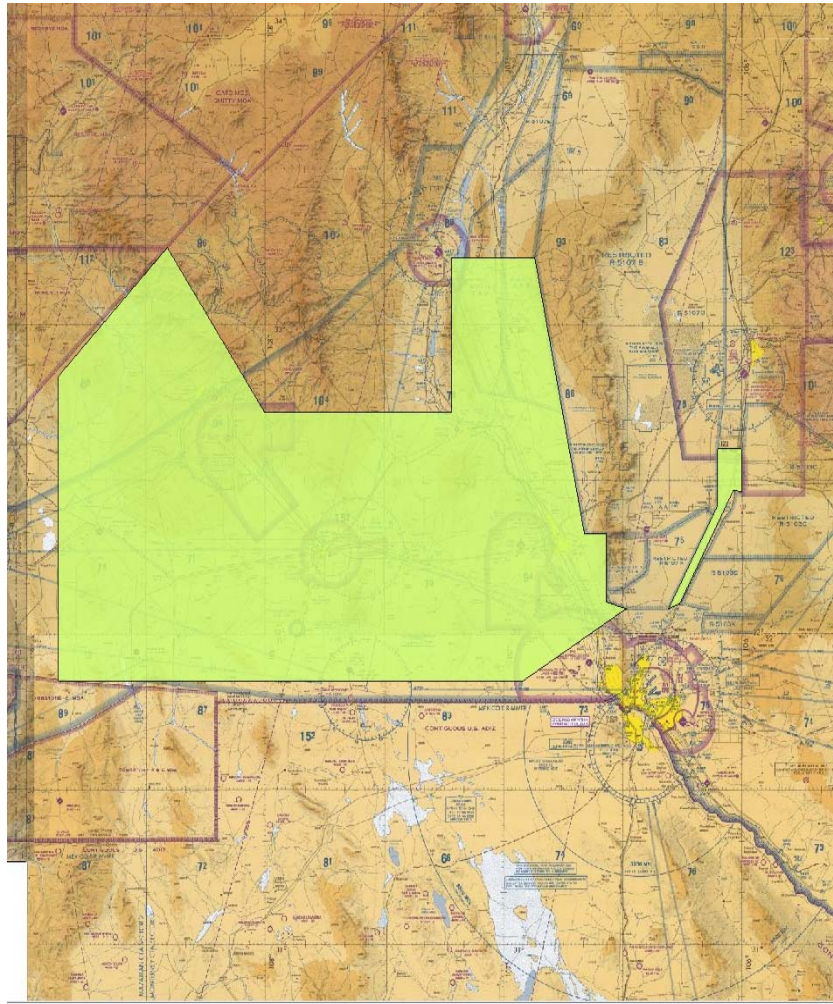


AEROSTAR AIRSPACE ECHO

Beginning at

32-36-00N / 106-06-02W (E1) to
 32-36-00N / 106-00-02W (E2) to
 32-27-40N / 106-00-02W (E3) to
 32-28-00N / 106-02-02W (E4) to
 32-06-00N / 106-15-32W (E5) to
 32-05-00N / 106-18-22W (E6) to
 32-25-00N / 106-06-02W (E7) to
 point of beginning

Surface to 17,500 MSL



Contingency Planning Limitations

- The applicant must define and specify Lost Link Points (LLP), Divert/Contingency Points (DCP, and Flight Terminations Points (FTP) for each operation. These points must be submitted in Lat/Long format along with a graphic representation plotted on an aviation sectional chart (or similar format). At least one LLP, DCP, and FTP are required for each operation. Any subsequent changes or modifications to this data must be provided to AJV-13 for review and acceptance no later than 30 days prior to proposed flight operations.
- For all operations, the applicant must develop detailed plans to mitigate the risk of collision with other aircraft and the risk posed to persons and property on the ground in the event the UA encounter a lost link, needs to divert, or the flight needs to be terminated.
- LLPs are defined as those points where the UA shall proceed to and hold at a specified altitude, for a specified period of time, in the event the command and control link to the aircraft is lost. The UA shall autonomously hold, or loiter, at the LLP until communication link with the aircraft is restored or the specified time elapses. If the time period elapses, the aircraft may either proceed to another LLP in an attempt to regain communication link or proceed to an FTP for flight termination. LLPs may be used as FTPs. In this case, the aircraft may loiter at the LLP/FTP until link is reestablished or fuel exhaustion occurs where the aircraft will terminate.
- For those operations where multiple UA are approved for concurrent operations in the same operational area, the applicant must submit a plan to ensure de-confliction of the UA in the event of simultaneous lost link scenario. De-confliction strategies must include altitude offsets and horizontal separation by using independent LLPs whenever possible.
- A DCP is defined as an alternate landing/recovery site to be used in the event of an abnormal condition that requires a precautionary landing. Since a DCP is defined as an alternate site, the applicant must ensure that the proper support equipment is available to execute a safe landing. This includes the availability of ground control stations capable of launch/recovery, communication equipment, and an adequate power source to operate all required equipment.
- For local operations, the DCP specified will normally be the airport/facility used for launch and recovery; however, the applicant may specify additional DCPs as alternates.

- For transit and/or mission operations that are being conducted in Class A airspace or Class E airspace above FL600, DCPs will be identified along the route of flight, no further than one hour of flight time at any given time, taking into consideration altitude, winds, fuel consumption, and other factors. If it is not possible to define DCPs along the entire flight plan route, the applicant must identify qualified FTPs along the entire route and be prepared to execute flight termination at one of the specified FTPs if a return to base (RTB) is not possible.
- It is preferred that specified DCPs are non-joint use military airfields, other government owned airfields, or private use airfields. However, the applicant may designate any suitable airfield for review and acceptance.
- For each DCP, plans must incorporate the means of communication with Air Traffic Control (ATC) throughout the descent and landing as well as a plan for ground operations, securing/parking the aircraft on the ground, and ultimately retrieval/recovery of the aircraft.
- Flight termination is the intentional and deliberate process of performing controlled flight into the terrain. Flight termination shall be executed in the event that all contingencies have been exhausted and further flight of the aircraft cannot be safely achieved or other potential hazards exist that require immediate discontinuation of flight. FTPs shall be submitted for review and acceptance and must be located within power off glide distance of the UA during all phases of flight. The applicant must ensure sufficient FTPs are defined to accommodate flight termination at any given point along the route of flight. The location of the FTP is based on the assumption of a failed engine and must take into consideration altitude, winds, and other factors.
- FTPs must be located in uninhabited areas and shall be located no closer than five nautical miles from any airport, heliport, airfield, navigational aid, airway, populated area, major roadway, oil rig, power plant, or any other infrastructure. For offshore locations, the applicant must refer to appropriate U.S. Coast Guard charts and other publications to avoid maritime obstructions, shipping lanes, and other hazards. Populated areas are defined as those areas depicted in yellow on a sectional chart and as augmented from other sources such as satellite imagery and Google® maps.
- It is preferred that specified FTPs are located in Restricted or Warning areas, government owned land, or offshore locations that are restricted from civil use. However, the applicant may designate any suitable location for review and acceptance.
- The applicant is required to survey all designated areas prior to their use as an FTP. All FTPs shall be reviewed for suitability on a routine and periodic basis, not to

exceed six months. The applicant assumes full risk and all liability associated with the selection and use of any designated FTP.

- It is desirable that the applicant receive prior permission from the land owner or using agency prior to use of this area as an FTP. The applicant should clearly communicate the purpose and intent of the FTP.
- For each FTP, plans must incorporate the means of communication with ATC throughout the descent as well as a plan for retrieval/recovery of the aircraft.
- The applicant must take into consideration all airspace constructs and minimize risk to other aircraft by avoiding published airways, military training routes, nav aids, and congested areas.
- In the event of a contingency divert or flight termination, the use of a chase aircraft is preferred when the UA is being operated outside of Restricted or Warning areas. If time permits, the applicant should make every attempt to utilize a chase aircraft to monitor the UA to a DCP or to the FTP.

In the event of a contingency divert or flight termination, the applicant shall operate in Class A airspace (if applicable) and Special Use airspace (if applicable) to the maximum extent possible to reduce the risk of collision with non-participating aircraft.