

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

CERTIFICATE OF WAIVER OR AUTHORIZATION

ISSUED TO

NEW MEXICO STATE UNIVERSITY – PHYSICAL SCIENCE LABORATORY

ADDRESS

P. O. Box 30002, Stewart & Espina Streets
Las Cruces, New Mexico 88003-8002

Attn: (b) (6)

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 various types of UAS in Class E and G airspace under the jurisdiction of Albuquerque Air Route Traffic Control Center (ARTCC) (ZAB) identified in Attachment 1. See Special Provisions.

LIST OF WAIVED REGULATIONS BY SECTION AND TITLE

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.

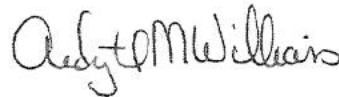
Note-This certificate constitutes a waiver of those Federal rules or regulations specifically referred to above. It does not constitute a waiver of any State law or local ordinance.

SPECIAL PROVISIONS

Special Provisions are set forth and attached.

This certificate 2008-CSA-7 is effective from July 18, 2008 through July 17, 2009 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, AJR-36

(Region)

Ardyth Williams

(Signature)

18 July 2008

(Date)

Air Traffic Manager, Unmanned Aircraft Systems

(Title)

ATTACHMENT to FAA FORM 7711-1

ISSUED TO: New Mexico State University - Physical Science Laboratory

ADDRESS: New Mexico State University – Physical Science Laboratory
P. O. Box 30002, Stewart & Espina Streets
Las Cruces, New Mexico 88003-8002
Attn: (b) (6)

NAME: Federal Aviation Administration (FAA) Certificate of Authorization (COA) for various Unmanned Aircraft Systems (UAS) in the National Airspace System (NAS) outside of restricted/warning area airspace in accordance with the Cooperative Research and Development Agreement between the Federal Aviation Administration and New Mexico State University – Physical Science Laboratory (NMSU-PSL) dated February 19, 2008.

ACTIVITY: Operation of various types of UAS in Class E and G airspace under the jurisdiction of Albuquerque Air Route Traffic Control Center (ARTCC) (ZAB) identified in Attachment 1.

PURPOSE: To prescribe operating requirements in the NAS (outside of restricted and/or warning area airspace) for the purpose of testing, training and/or operational flights in accordance with the Cooperative Research and Development Agreement between the Federal Aviation Administration and New Mexico State University - PSL dated February 19, 2008.

DATES OF USE: This COA 2008-CSA-7 is valid from July 18, 2008 through July 17, 2009. Should a renewal become necessary, the proponent shall advise the 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 the 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 special provisions.
- This COA will be reviewed and amended as necessary to conform to changing UAS policy and guidance.
- All documentation required to be kept by the NMSU PSL will be made available for inspection upon request by the FAA.
- NMSU PSL will maintain records (qualification, training and flight) for all UAS crewmembers flying under this COA.

SAFETY PROVISIONS:

Unmanned Aircraft (UA) have no on-board pilot to perform see-and-avoid responsibilities, and therefore, when operating outside of restricted/warning/Class A airspace 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 91.113 and must be complied with:

- Visual Observers, either ground-based or airborne, must be used.
- 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*. Additionally, UAS operations are advised to operate well clear of all known manned aircraft operations.
- The applicant and/or its representatives are responsible for collision avoidance with all aircraft, other aviation operations, and the safety of persons or property on the surface.

AIRWORTHINESS CERTIFICATION PROVISIONS:

- UA must be shown to be airworthy to conduct flight operations in the NAS.
- Public Use Aircraft applications 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 listed in the CRDA..

PILOT / OBSERVER PROVISIONS:

- New Mexico State University (NMSU) Physical Science Lab (PSL) will maintain copies of all chase pilot and observer qualification records.

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 UAS 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. NMSU will have an established drug testing program to ensure NAS safety.

- **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*, and 14 CFR 91.155, *Basic VFR Weather Minimums* (including clearance from clouds) knowledge of air traffic and radio communications, including the use of approved ATC/pilot phraseology; and knowledge of appropriate sections of the *Aeronautical Information Manual*. 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.

Other Personnel Qualifications: Ancillary personnel such as systems operators or mission specialists must be thoroughly familiar with and possess operational experience of the equipment being utilized. If the subject systems being utilized are for observation and detection of other aircraft for collision avoidance purposes, they must be thoroughly trained on collision avoidance procedures and techniques and have direct communication with the UAS pilot, observer, and other applicable personnel on an inter-communication system.

- **Pilot-in-Command (PIC) – Visual Flight Rules (VFR):**
 - 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 pass 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.
 - If operating beyond line of sight, the PIC will possess a current Private pilot certificate in the category and class of UAS flown.

Pilot Proficiency – VFR:

- Pilots will not act as a 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.
- For within line of sight, Pilots flying UA on other than instrument flight plans must pass the required knowledge test for a private pilot certificate, or military equivalent, as stated in 14 CFR 61.105. For operations beyond line of sight, the PIC must be a rated manned pilot (minimum of Private) in the category and class of UAS flown.

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.
 - Pilots must not perform crew duties for more than one UAS at a time.
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- Pilots are not allowed to perform concurrent duties both as pilot and observer. The PIC may be augmented by supplemental pilots; however, the PIC retains complete and overall responsibility of the flight, regardless of who may be piloting the UA. It is common for operators to have both an "internal" and an "external" UAS pilot. The PIC can assume any of these positions provided a written checklist is followed during the assumption of said positions. The PIC duty may be rotated as necessary to fulfill operational requirements. If a PIC is rotated for operational requirements, the rotation will be documented immediately.
- (1) Ratings. Rating requirements for the UAS PIC depend on the type of operation conducted and fall into two categories: Operations that require a pilot certificate and operations that do not require a pilot certificate.
 - (2) Currency. The operator shall provide a process that ensures that the pilots receive an appropriate level of currency in the UAS being operated. At a minimum, the PIC must demonstrate three takeoffs (launch) and landings (recovery) in the specific UAS in the previous 90 days. For those operations that require a certificated pilot per the previous section above, the PIC, in order to exercise the privileges of his certificate, shall have flight reviews and maintain currency in manned aircraft per 14 CFR 61.56, *Flight Review* and 61.57, *Recent Flight Experience: Pilot in Command*.
 - (3) Training. In addition to the aforementioned training required for a pilot certificate, UAS pilots will have additional training in all specific details of the UAS being operated including normal, abnormal, and emergency procedures. This must include manufacturer specific training (or military equivalent), demonstrated proficiency, and testing in the UAS being operated.

Supplemental Pilots:

Supplemental pilots are those pilots assigned UA flight duty to augment the PIC. It is common for operators to have both an "internal" and an "external" UA pilot. The supplemental pilot can assume any of these positions.

- (1) Ratings. No specific rating is required for supplemental pilots unless they are assuming the role of pilot in command. However, at a minimum, they must have successfully completed private pilot ground school and have passed the written test.
- (2) Currency. The operator shall provide a process that ensures that the pilots maintain an appropriate level of currency in the UAS being operated.
- (3) Medical. Supplemental pilots shall maintain, at a minimum, a valid FAA Class 2 medical certificate issued under 14 CFR part 67, and have it in their possession. Any supplemental pilot acting as a dedicated visual observer or flying the UA on a visual basis shall also maintain a valid FAA Class 2 medical certificate.
- (4) Training. The UAS pilot shall be additionally trained in all specific details of the UAS being operated including normal, abnormal, and emergency procedures.

Pilot/ATC Instructions: The PIC will maintain direct two-way radio communications with ATC and have the ability to maneuver the UA per their instructions as applicable.

Observer Responsibilities:

- Visual observer(s) shall be used to perform the see and avoid responsibility that is applicable to all aircraft operations in the NAS. It is the visual observers responsibility to detect other aircraft, determine if there is a potential conflict between the UA and another aircraft, detect if an obstruction (cloud / antenna / building, etc) is in the flight path and provide the UA pilot a change of course or altitude to eliminate the conflict.
- Visual observers shall have no other responsibility or perform other duties when conducting the see and avoid function and shall not perform the see and avoid function for more than one UA at a time.

SPECIAL PROVISIONS:

Listed below are the special provisions that must be complied with. All personnel connected with this UAS operation shall comply with the contents of this authorization and its special provisions.

1. All UAS operations shall be conducted under Visual Flight Rules (VFR) in Visual Meteorological Conditions (VMC) in accordance with CFR 14 Part 91.

2. For the purpose of see-and-avoid, visual observers must be utilized at all times. The visual observers must remain within 1 mile, or less laterally and/or 3,000, or less feet vertically of the UAS during all operations. Pilot/observers must not operate any UA at a distance beyond that at which see-and-avoid responsibilities can be exercised. The visual observer may be either ground based or in a chase aircraft. The observer(s) must keep the UAS in sight at all times. The visual observer will only be responsible for one UA at a time.
3. Ensure a spectrum analysis is completed for each UAS system to ensure that all of the spectrum frequencies used for command and control of the UA, communication by the flight crew and visual observers, and for mission objectives do not adversely impact other spectrum users. Spectrum usage must comply with existing FCC regulations.
4. The UA PIC will only operate one UA at a time.
5. Operations outside of restricted airspace may only be conducted during daylight hours.
6. The UAS transponder and position/navigation/anti-collision strobe lights shall be activated at all times during flight, if equipped. If transponder equipped, the UAS will contact Albuquerque ARTCC for their assigned beacon code. Flights in airspace identified in 14 CFR 91.215 will require a transponder. No waiver will be granted.
7. Operations to include lost link procedures shall not be conducted over populated areas, heavily trafficked roads, an open-air assembly of people, or airways and approach courses.
8. Special VFR operations are not authorized.
9. The Observer will maintain direct two-way radio communications with UA pilot at all times.
10. Flight operations that involve an external pilot (EP) shall use a visual observer to assist the EP in detecting other aircraft.
11. There are a myriad of emergencies and operational problems that can surface during the flight operations of UA. Therefore, it is impossible to define what course of action should be taken in each instance when an exigency occurs. In emergency situations, each UA pilot shall use his/her experience, expertise, flight skills, and knowledge of established emergency operation procedures to operate the UA safely under the existing circumstances. Safety for people shall be given priority over the recovery of the UA. Planning for flight operation contingencies shall include:
 - a. Defining a loss of control link waypoint and associated orbit airspace that is situated over an unpopulated surface area, within airspace of low air

traffic density, and of sufficient distance from any airport so as not to impact any airport traffic pattern, airway, or approach courses.

- b. Developing loss of control link routes from any location on the mission flight route to the loss of control link waypoint that avoids flight over any city, town, airport, airway, approach courses or within any restricted area or MOA that is active. The loss of control link altitude associated with the route shall be at least 1,500 feet above the highest terrain along the route.
 - c. Notification to Albuquerque ARTCC, as soon as possible, of the emergency. Notification shall include the identification of the loss of control link way-point, route and altitude to the waypoint, and any other information that will be of assistance to Albuquerque ARTCC in maintaining safety for other airspace users.
 - d. Develop a plan to ensure the safety for all NAS users is achieved if there is a loss of communication between the visual observer in a chase aircraft or ground observer and the UA pilot.
12. Multiple unmanned aircraft system (UAS) operations are not authorized in any flight operations area or individual location/airport within the approved COA operating areas depicted in attachment 1.
13. During all operations, unmanned aircraft (UA) pilots will continuously monitor and make proper radio calls on appropriate common traffic advisory frequency when operating within 10 nautical miles of any airport.
14. Any visual observer, sensor operator, or other person charged with providing collision avoidance for the UA must have immediate two-way radio communication with the UAS pilot. If a chase aircraft is being utilized, two-way radio communication between the chase aircraft observer and the UAS pilot shall be required at all times. When ATC communications are required, the observer, if able, should monitor all communications between ATC and pilot. The chase PIC cannot relay ATC communications, or observer information to the UA PIC.
15. It is generally understood that most UAS have some level of autonomy associated with its operation. Although it is possible to have a completely manual UAS, which requires a pilot-in-the-loop, the majority of UAS are autonomous to a certain degree. Only those UAS that have the capability of pilot intervention, or pilot-on-the-loop, shall be allowed in the NAS outside of active Restricted, Prohibited, or Warning areas. UAS that are designed to be completely autonomous, with no capability of pilot intervention, are not authorized in the national airspace system.
16. Airspace Considerations by Airspace Designation with an Air Traffic Control Tower:
- a. Class E: UAS operations approved for Class E must comply with 14 CFR

91.127, *Operating on or in the Vicinity of an Airport in Class E Airspace.*

b. Class G: UA operations approved for Class G must comply with 14 CFR 91.126, *Operating on or in the Vicinity of an Airport in Class G Airspace.*

c. Class D: If there is an operating Air Traffic Control Tower Class D rules will apply.

17. UAS operations will not take place in current or forecasted moderate/severe turbulence.

18. UAS operations will not take place in current or forecasted icing conditions.

19. UAS operations will not take place in areas that have convective SIGMETs or AIRMETs issued.

20. Crew flight time and rest requirements.

a. Crewmembers will not be assigned to work more than 12 hours in any 24 hour period.

b. Crewmembers will not fly more than 4 hours in any 24 hour period as an external pilot.

c. Crewmembers will not fly more than 8 hours in any 24 hour period in a ground control station (GCS).

d. External pilot and GCS pilot times cannot exceed 8 hours total with no more than 4 hours of external pilot time.

21. NMSU will develop a crew resource management program for UA equal to a manned aircraft program.

The following airports maybe considered for UAS operations in accordance with Letters of Authorization from the appropriate airport authority.

a. Las Cruces, NM (KLRU)

b. Lordsburg, NM (KLSB)

c. Deming, NM (KDMN)

d. Grant County, NM (KSVC)

e. Truth or Consequences, NM (KTCS)

- f. Socorro, NM (KONM)
- g. Shoestring Ranch, NM (Private)
- h. Waids, NM (Private)
- i. College Ranch Airstrip, NM (Private)
- j. Playas, NM (Private)

NOTAM: A distance (D) Notice to Airman 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 the Automated Flight Service Station at 1-800-WX-BRIEF (992-7433) not more than 72 hours in advance, but not less than 48 hours prior to the operation and provide:

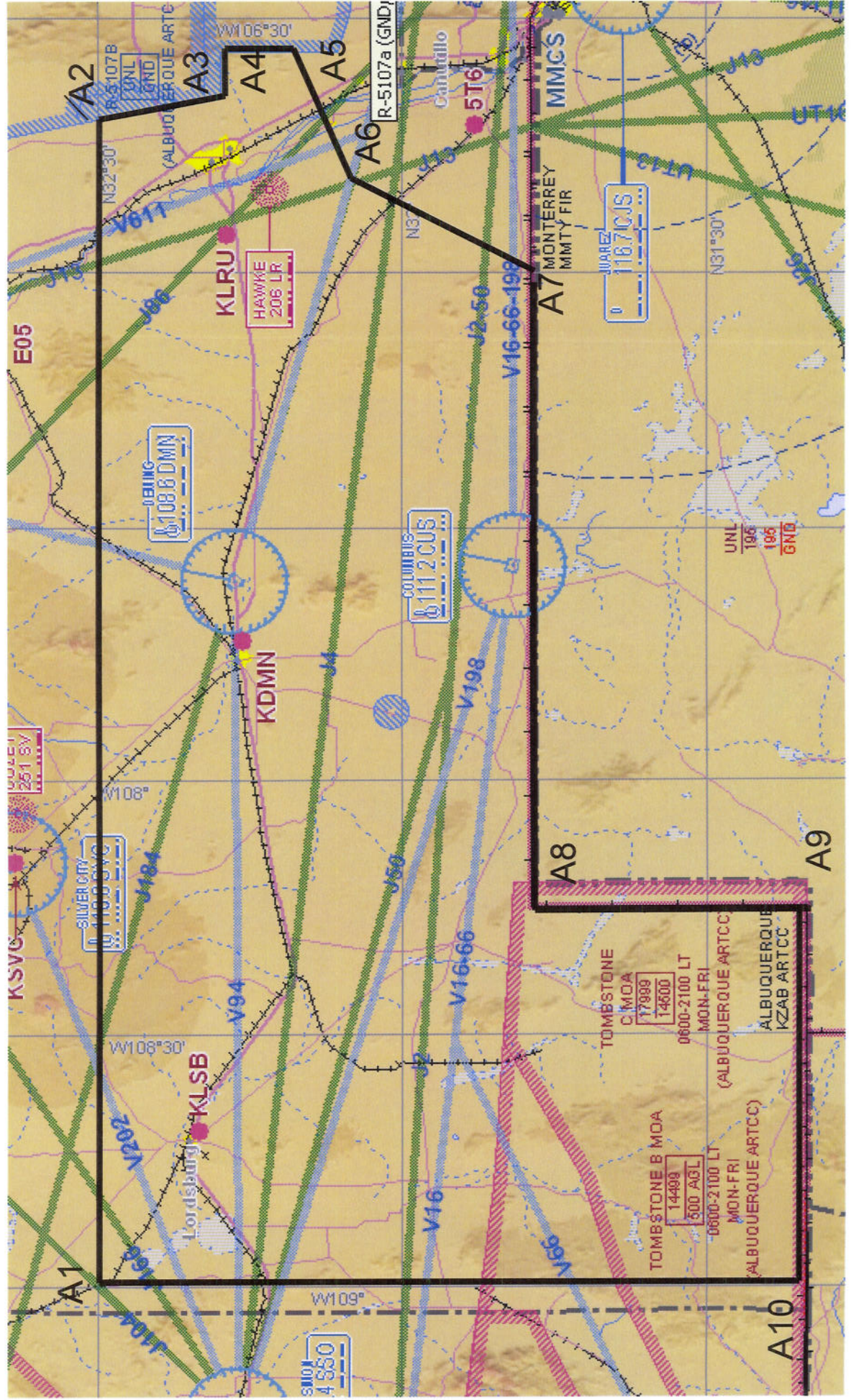
- Name and Address of operator filing NOTAM request
- Location, Altitude or the operating Area
- Time and nature of the activity

INCIDENT / ACCIDENT REPORTING: The following information is required in addition to the reporting requirements listed in the CRDA between the Federal Aviation Administration and New Mexico State University - PSL dated February 19, 2008.

- The following shall be submitted to Donald.E.Grampp@faa.gov within 24 hours:
 - Deviations from the "Special Provisions" contained in the COA.
 - All periods of Loss Link, including duration.
 - All incidents involving the UAS as defined in 49 CFR 830.
 - All accidents involving the UAS as defined in 49 CFR 830.

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 the 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. The New Mexico State University - PSL is hereby authorized to operate UA in the operations area depicted in "Activity" above and the attachment 1 below in accordance with the Cooperative Research and Development Agreement between the Federal Aviation Administration and New Mexico State University - PSL dated February 19, 2008.

AIRSPACE ALPHA



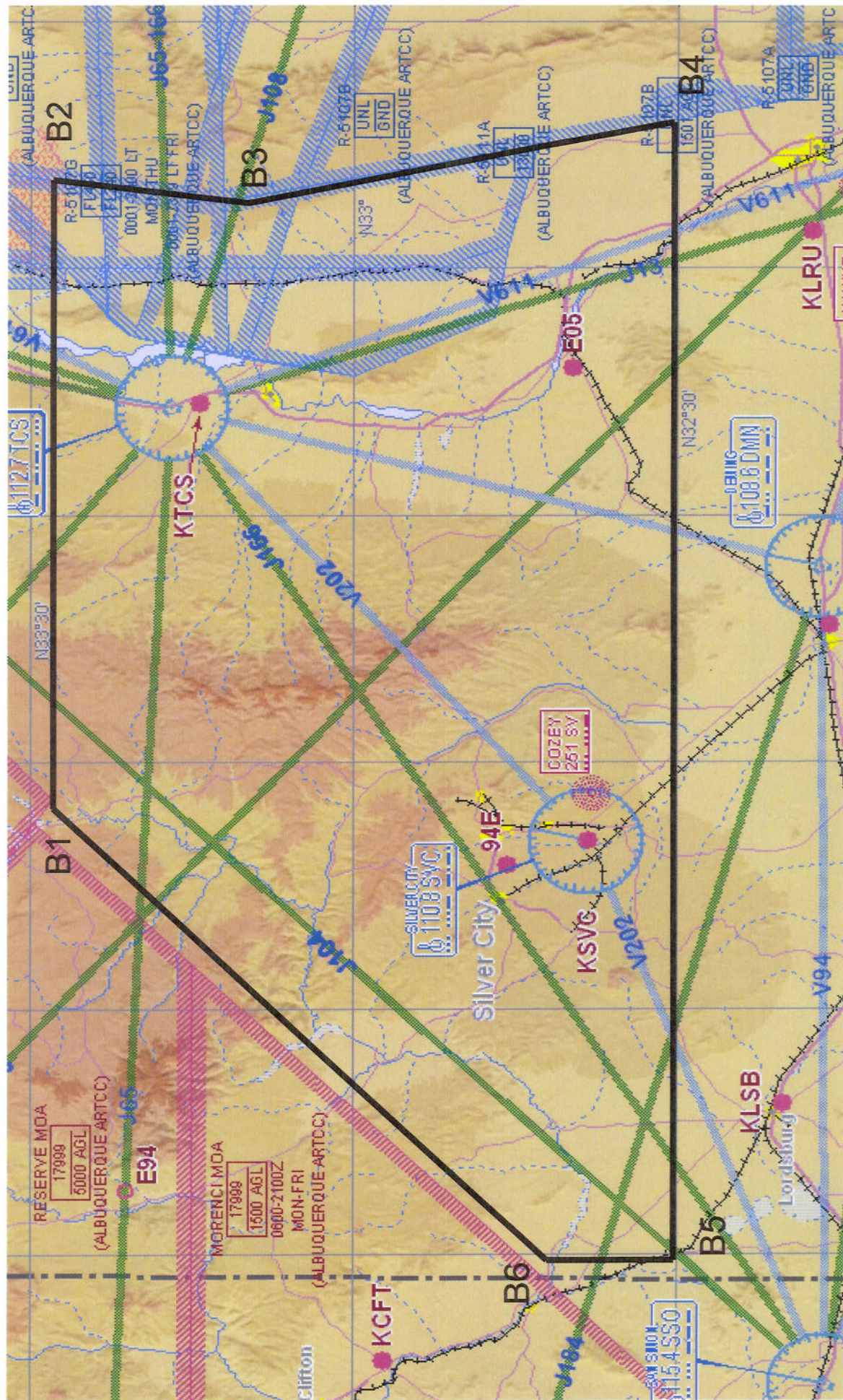
AIRSPACE ALPHA

Beginning at 32-30-00N / 109-00-00W (A1) to
32-30-00N / 106-42-00W (A2) to
32-19-30N / 106-39-32W (A3) to
32-18-00N / 106-34-02W (A4) to
32-11-00N / 106-34-00W (A5) to
32-04-00N / 106-48-00W (A6) to
31-47-24N / 107-00-00W (A7) to
31-47-24N / 108-15-00W (A8) to
31-20-00N / 108-15-00W (A9) to
31-20-00N / 109-00-00W (A10) to

point of beginning

Altitude – Surface to 17,999 MSL

AIRSPACE BRAVO



AIRSPACE BRAVO

Beginning at 33-27-00N / 108-04-00W (B1) to

33-27-00N / 106-49-00W (B2) to

33-13-00N / 106-52-02W (B3) to

32-30-00N / 106-42-00W (B4) to

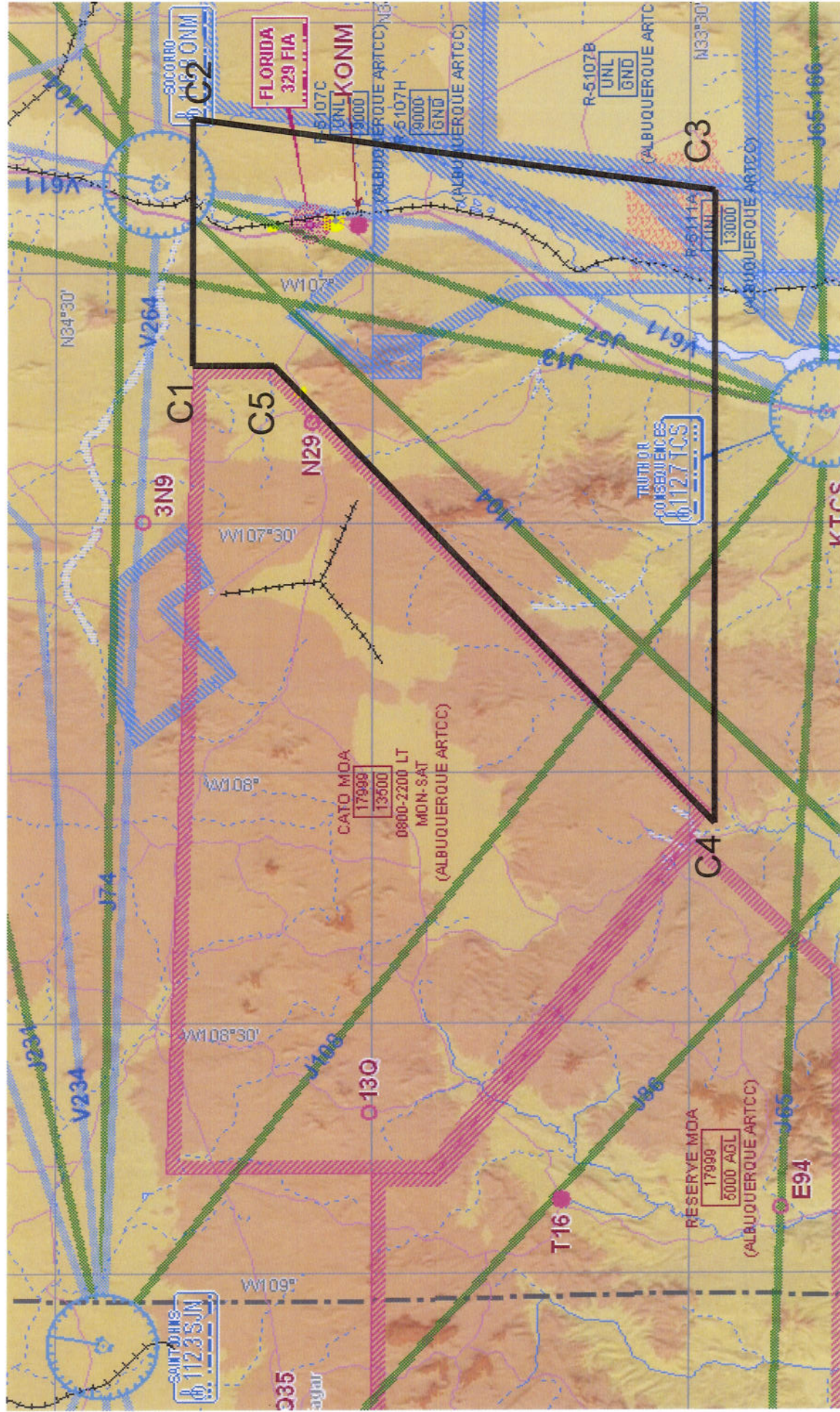
32-30-00N / 109-00-00W (B5) to

32-40-00N / 109-00-00W (B6) to

point of beginning

Altitude – Surface to and including 17,999 MSL

AIRSPACE CHARLIE



AIRSPACE CHARLIE

Beginning at 34-17-00N / 107-11-00W (C1) to

34-17-00N / 106-40-32W (C2) to

33-27-00N / 106-49-00W (C3) to

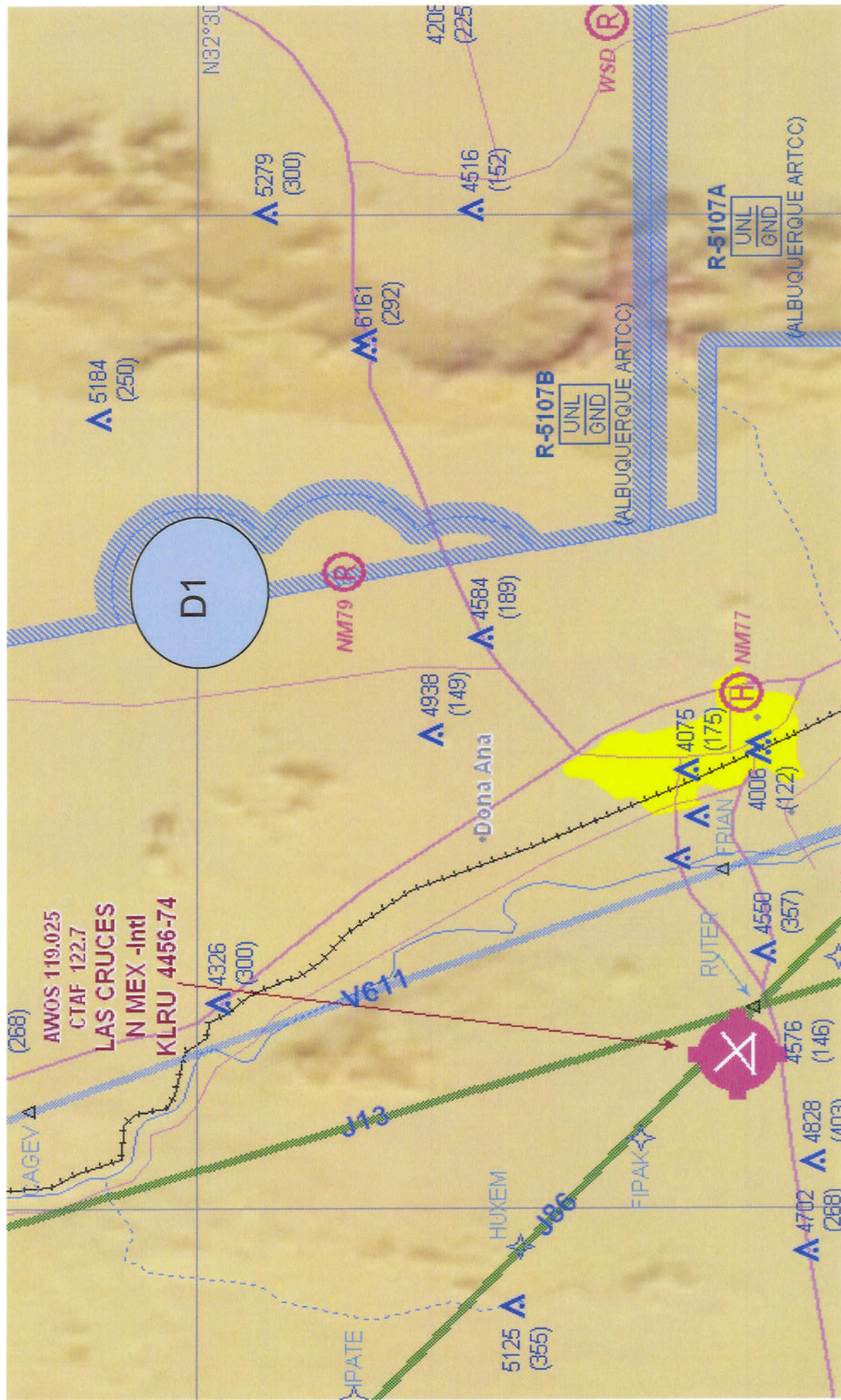
33-27-00N / 108-04-00W (C4) to

34-09-00N / 107-11-00W (C5) to

point of beginning

Altitude – Surface to 17,999 MSL

AIRSPACE DELTA ONE



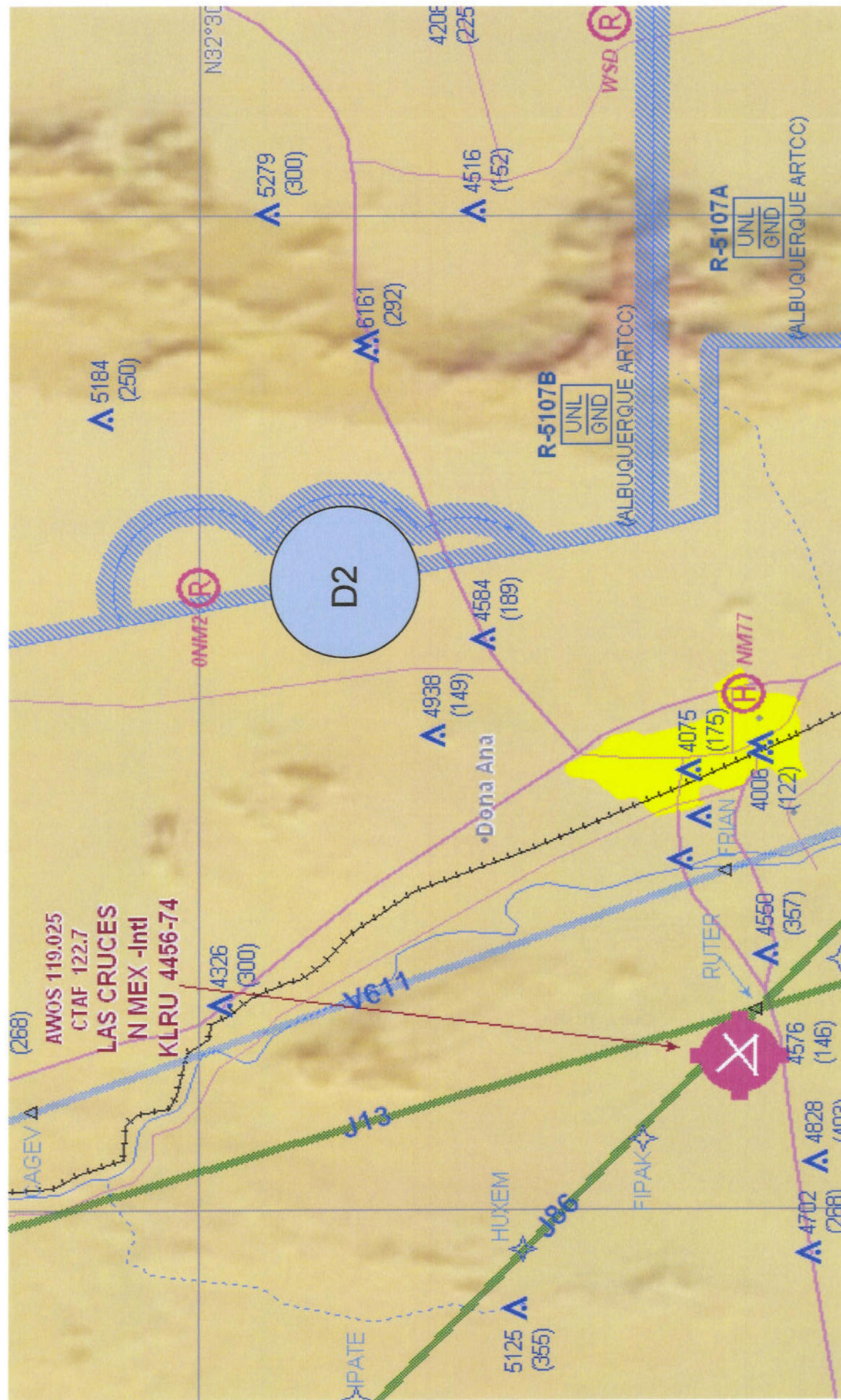
AIRSPACE DELTA ONE

That airspace from the surface to and including 1,500 feet above the surface within a 2-nautical-mile radius of the following Latitude/Longitude

32-30-00N / 106-41-12W – (D1) Waids Pvt Airport (NM2)

This is the airspace that is depicted as a cutout of the western boundary of R-5107B as displayed on the Albuquerque Aeronautical Sectional chart.

AIRSPACE DELTA TWO



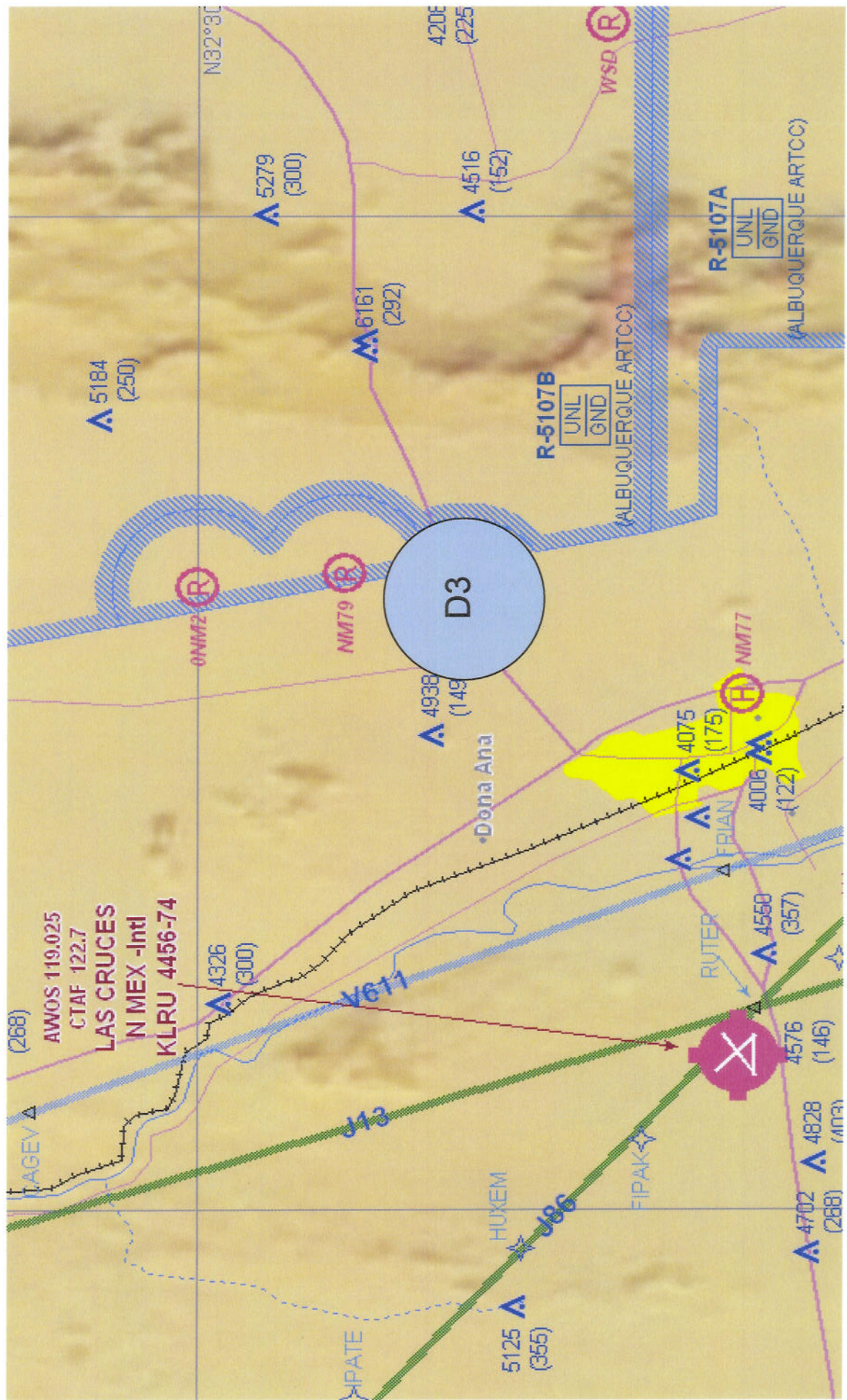
AIRSPACE DELTA TWO

That airspace from the surface to and including 1,500 feet above the surface within a 2-nautical-mile radius of the following Latitude/Longitude

32-26-35N / 106-40-47W – (D2) Shoestring Pvt Airport (NIM79)

This is the airspace that is depicted as a cutout of the western boundary of R-5107B as displayed on the Albuquerque Aeronautical Sectional chart.

AIRSPACE DELTA THREE



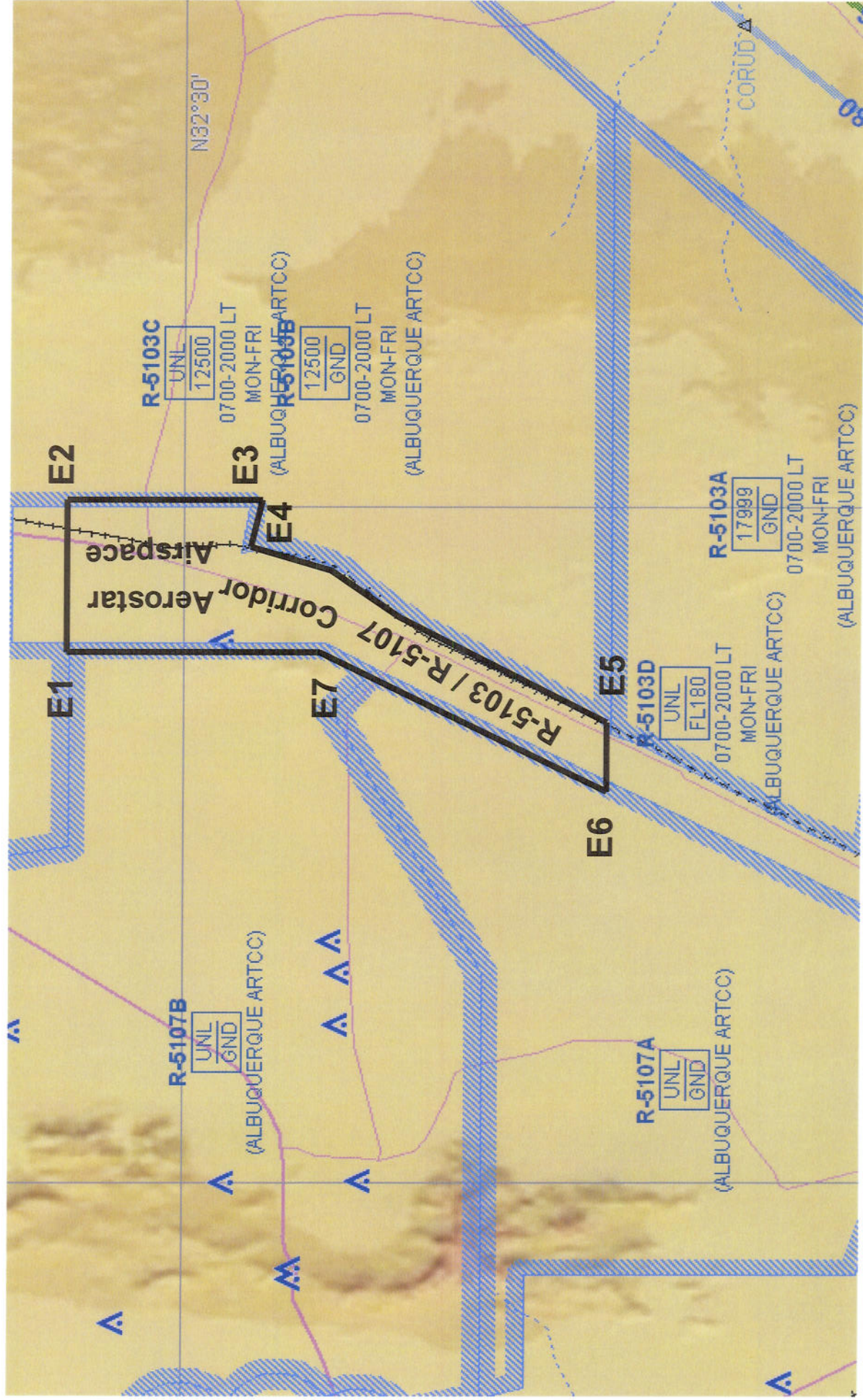
AIRSPACE DELTA THREE

That airspace from the surface to and including 1,500 feet above the surface within a 2-nautical-mile radius of the following Latitude/Longitude

32-23-49N / 106-41-29W – (D3)

This is the airspace that is depicted as a cutout of the western boundary of R-5107B as displayed on the Albuquerque Aeronautical Sectional chart.

AIRSPACE ECHO



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
32-15-00N / 106-10-02W (E5) to
32-15-00N / 106-12-00W (E6) to
32-24-48N / 106-09-02W (E7) to
point of beginning

Altitude – Surface to 17,999 MSL