DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

CERTIFICATE OF WAIVER OR AUTHORIZATION

ISSUED TO

New Mexico State University – Physical Science Laboratory

PO Box 30002
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

One time operation, for the purpose of a flight demonstration at the 2011 TACC Conference, of the AeroVironment Puma, AeroVironment Wasp, AeroVironment Raven, and AirRobot AR-100B Unmanned Aircraft Systems (UAS) in Class G airspace at or below 400 feet Above Ground Level (AGL) in the vicinity of Santa Ana Pueblo, New Mexico, under the jurisdiction of the Albuquerque ARTCC and Albuquerque Approach Control.

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 2011-CSA-58 is effective from December 5, 2011 to December 7, 2011, and is subject to cancellation at any time upon notice by the Administrator or his/her authorized representative.

BY DIRECTION OF THE ADMINISTRATOR

Dean E. Fulmer

FAA Headquarters, AJV-13
(Region)

Dean E. Fulmer
(Signature)

November 15, 2011
(Date)

Acting Manager, Unmanned Aircraft Systems
(Title)

FAA Form 7711-1 (7-74)

ATTACHMENT to FAA FORM 7711-1

Issued To: New Mexico State University – Physical Science Laboratory

Address: PO Box 30002
Mail Stop 3548 NMSU
Las Cruces, NM 88003

Activity: One time operation, for the purpose of a flight demonstration at the 2011 TACC Conference, of the AeroVironment Puma, AeroVironment Wasp, AeroVironment Raven, and AirRobot AR-100B Unmanned Aircraft Systems (UAS) in Class G airspace at or below 400 feet Above Ground Level (AGL) in the vicinity of Santa Ana Pueblo, New Mexico, under the jurisdiction of the Albuquerque ARTCC and Albuquerque Approach Control.

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) 2011-CSA-58 is valid from December 5, 2011 through December 7, 2011.

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.

- o 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) –**
  - o **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.
  - o **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, congested areas, 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 at 505-856-4571 and Albuquerque Approach Control at 505-856-4935, state pilot intentions, and comply with the following provisions:

    - The aircraft will comply with the Contingency Planning Limitations and Lost Link procedures depicted in Attachment 2 of this document.
    - 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. In addition to the limitations contained in this COA, the Albuquerque Flight Standards District Office (FSDO) shall issue a separate COA covering specific limitations for an air show under its jurisdiction and in accordance with FAA Order 8900.1 as revised. Crowd line distances and other specific operational parameters will be annotated in the COA issued by the FSDO.

3. The proponent shall notify Albuquerque ARTCC at 505-856-4571 and Albuquerque Approach Control at 505-856-4935, 30 minutes prior to the start of flight operations, upon completion of flight operations, and in the case of an emergency.

4. All operations shall be conducted in visual meteorological conditions (VCM) during daylight hours only and in compliance with Title 14 of the Code of Federal Regulations (CFR) section 91.155, Basic VFR Weather Minimums, Class E.

5. Concurrent multiple UAS operations are not authorized.

6. Due to the fact that this is a flight demonstration, the PIC must have at least a current FAA private pilot certificate.

7. A Pilot-in-Command (PIC) means the person who has final authority and responsibility for the operation and safety of the flight and has been designated as PIC before or during the flight and holds the appropriate category, class and type rating, if appropriate, for the conduct of flight. The PIC must control the aircraft (or override authority to assume control) during all UAS operations.

8. All supplemental pilots shall hold, at a minimum, an FAA Private Pilot Certificate or have successfully completed the written examination for the Private Pilot Certificate within the past 24 calendar months.

9. All PICs and visual observers shall hold, at a minimum, a valid FAA Class 2 medical certificate issued under 14 CFR Part 67, or equivalent.

10. Special provisions 1 and 3 will be used in lieu of maintaining direct two-way communications with ATC (Standard Provisions, bullet one).

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.

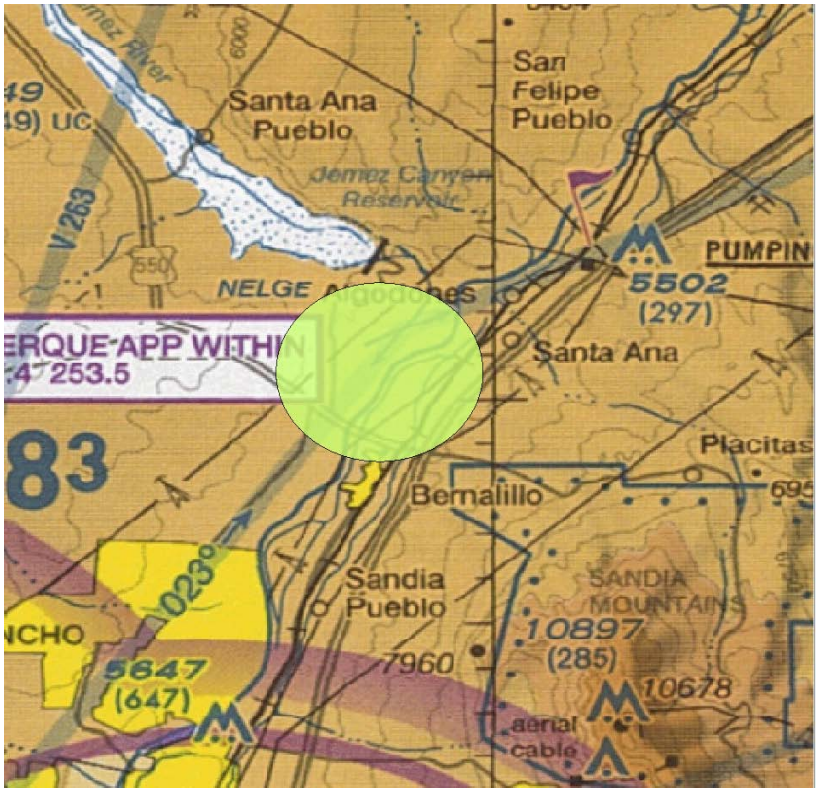
Incident / Accident and Normal Reporting Provisions: The following information is required to document routine and unusual occurrences associated with UAS activities in the NAS.

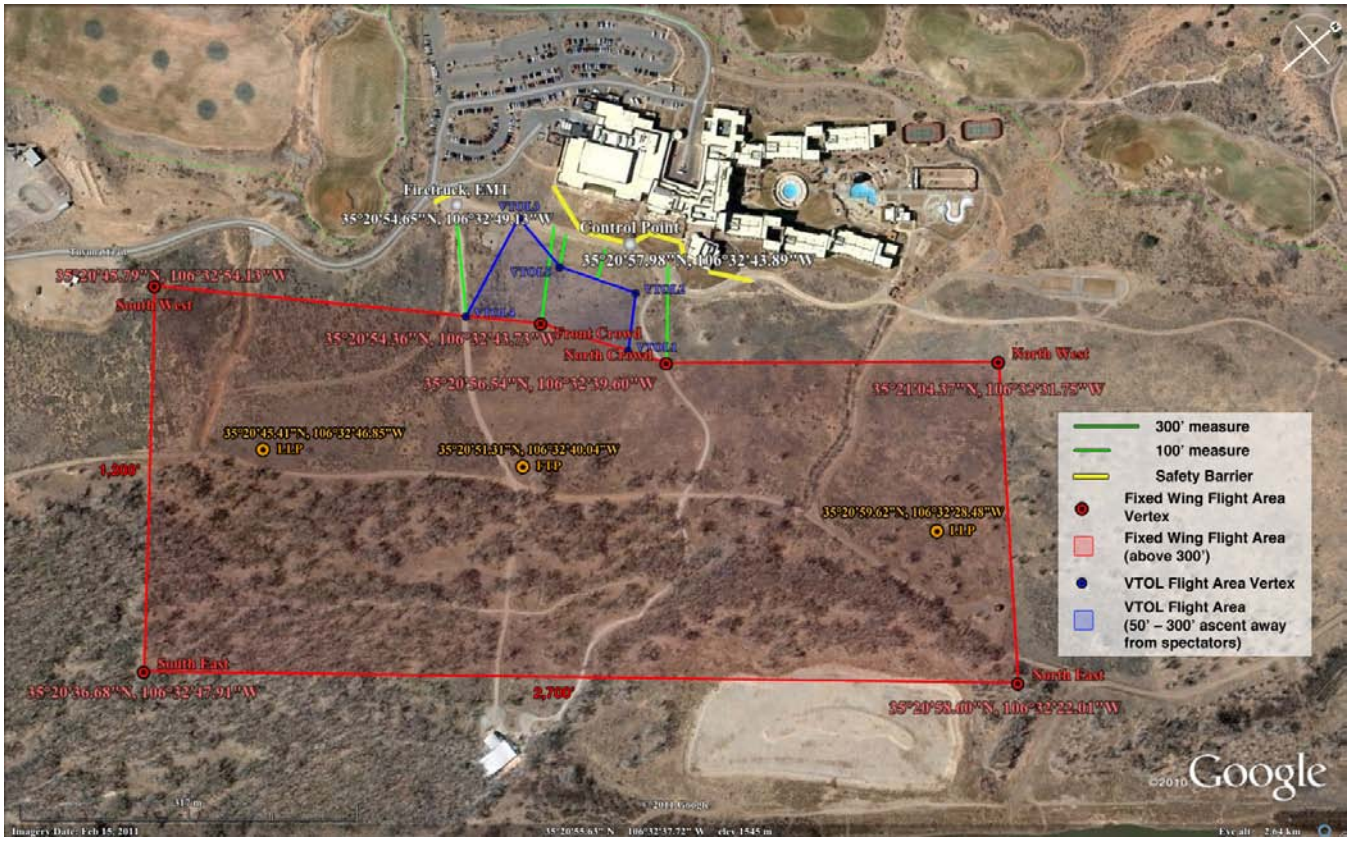
- The proponent for the COA shall provide the following information to Donald.E.Grampp@faa.gov on a monthly basis:
  - Number of flights conducted under this COA.
  - Pilot duty time per flight.
  - Unusual equipment malfunctions (hardware/software).
  - Deviations from ATC instructions.
  - Operational/coordination 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)) 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 AeroVironment Puma, AeroVironment Wasp, AeroVironment Raven, and AirRobot AR-100B Unmanned Aircraft Systems in the operations area depicted in “Activity” above and attachment 1 below.

Attachment 1





TAAC Air Show Lost Link/Mission Procedures

Air show procedures are:

1) Lost Link Point (LLP) will be near the middle of the fixed wing box.
2) LLP point will be confirmed by the TAAC Mission Commander prior to requesting flight authorization from the Air Boss.
3) Lost link time will be the minimum for that particular UAS, not to exceed 10 seconds.
4) If link margins are not “good, green, or other designation of steadily good” then the flight will be cut short.
5) If a UAS loses link, until the situation is resolved, no other flights will ensue until the problem is resolved, the UA has been recovered, and on site FAA personnel agree that the demonstration can continue safely.
6) Two (2) Flight Termination Points have been selected for any required terminations. These are designated on the map and are in good locations for the emergency/fire crew to easily access. If a UAS flight terminates, no other flights will ensue until the problem is resolved, the UA has been recovered, and on site FAA personnel agree that the demonstration can continue safely.

Contingency Planning Limitations

1. Point Identification. The applicant must submit contingency plans that address emergency recovery or flight termination of the unmanned aircraft (UA) in the event of unrecoverable system failure. These procedures will normally include Lost Link Points (LLP), Divert/Contingency Points (DCP) and Flight Termination Points (FTP) for each operation. LLPs and DCPs must be submitted in latitude/longitude (Lat/Long) format along with a graphic representation plotted on an aviation sectional chart (or similar format). FTPs, or other accepted contingency planning measures, must also be submitted in latitude/longitude (Lat/Long) format along with a graphic representation plotted on an aviation sectional chart, or other graphic representation acceptable to the FAA. The FAA accepts contingency points and contingency planning measures submitted by the proponent, however, does not approve them. When conditions preclude the use of FTPs, the applicant must submit other contingency planning options for consideration and approval. At least one LLP, DCP, and FTP (or acceptable alternative contingency planning measures) are required for each operation. The applicant must furnish this data with the initial COA application. Any subsequent

changes or modifications to this data must be provided to AJV-13 for review and consideration no later than 30 days prior to proposed flight operations.

2. Risk Mitigation Plans. 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 UAS encounters lost link, needs to divert, or the flight needs to be terminated. The applicant must take into consideration all airspace constructs and minimize risk to other aircraft by avoiding published airways, military training routes, NAVAIDS, and congested areas. In the event of a contingency divert or flight termination, the use of a chase aircraft is preferred when the UAS is operated outside of Restricted or Warning Areas. If time permits, the applicant should make every attempt to utilize a chase aircraft to monitor the aircraft to a DCP or to the FTP. In the event of a contingency divert or flight termination, the applicant will operate in Class A airspace and Special Use airspace to the maximum extent possible to reduce the risk of collision with non-participating air traffic.

3. Specific Procedures.

a. LLP Procedures.

1. LLPs are defined as a point, or sequence of points where the aircraft will 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 aircraft will autonomously hold, or loiter, at the LLP until the communication link with the aircraft is restored or the specified time elapses. If the time period elapses, the aircraft may autoland, proceed to another LLP in an attempt to regain the 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 re-established or fuel exhaustion occurs.

2. For areas where multiple or concurrent UAS operations are authorized in the same operational area, a segregation plan must be in place in the event of a simultaneous lost link scenario. The segregation plan may include altitude offsets and horizontal separation by using independent LLPs whenever possible.

b. DCP Procedures.

1. 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. Each DCP must incorporate the means of communication with ATC throughout the descent and landing (unless otherwise specified in the Special Provisions) as well as a plan for ground operations and securing/parking the aircraft on the ground. This includes the availability of ground control stations capable of launch/recovery, communication equipment, and an adequate power source to operate all required equipment.

2. 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.

3. For transit and/or mission operations that are being conducted in Class A airspace or Class E airspace above flight level (FL) 600, DCP will be identified during the flight to be 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.

4. 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 consideration.

c. Flight Termination Procedures.

1. Flight termination is the intentional and deliberate process of performing controlled flight into terrain (CFIT). Flight termination must be executed in the event that all other 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 or alternative contingency planning measures must be located within power off glide distance of the aircraft during all phases of flight and must be submitted for review and acceptance. The applicant must ensure sufficient FTPs, or other acceptable contingency plan measures, are defined to accommodate flight termination at any given point along the route of flight. The location of these points is based on the assumption of an

unrecoverable system failure and must take into consideration altitude, winds, and other factors.

2. Unless otherwise authorized, FTPs must be located in sparsely populated areas. Except for on-or-near-airport operations, FTPs will be located no closer than five nautical miles from any airport, heliport, airfield, NAVAID, airway, populated area, major roadway, oil rig, power plant, or any other infrastructure. For offshore locations, the applicant must refer to appropriate United States Coast Guard (USCG) 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 VFR sectional chart or as determined from other sources.

3. It is preferred that flight termination occurs in Restricted or Warning Areas, government-owned land, or offshore locations that are restricted from routine civil use. However, the applicant may designate any suitable location for review and consideration.

4. The applicant is required to survey all designated areas prior to their use as an FTP. All FTPs will 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.

5. It is desirable that the applicant receive prior permission from the land owner or using agency prior to the use of this area as an FTP. The applicant should clearly communicate the purpose and intent of the FTP.

6. 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.

7. Contingency planning must take into consideration all airspace constructs and minimize risk to other aircraft by avoiding published airways, military training routes, NAVAIDS, and congested areas to the maximum extent possible.

8. In the event of a contingency divert or flight termination, if time permits, the use of a chase aircraft is preferred when the UA is operated outside of Restricted or Warning Areas.

9. In the event of a contingency divert or flight termination or other approved contingency measures, the applicant will operate in Class A airspace and Special Use airspace to the maximum extent possible to reduce the risk of collision with non-participating air traffic.