

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

CERTIFICATE OF WAIVER OR AUTHORIZATION

ISSUED TO

Department of the Army

US Army UAS Project Office

SFAE-AV-UAS5300

Sparkman Circle

Sparkman Center 2nd Floor

Redstone Arsenal, AL 36898

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 ERMP (Gray Eagle MQ1C) Unmanned Aircraft System (UAS) in the Libby Army Airfield (FHU) Class D airspace at or below 2,500' Above Ground Level (AGL) under the jurisdiction of the FHU Air Traffic Control Tower (ATCT).

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-WSA-111 is effective from February 18, 2012 to February 17, 2013 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)

M. Randy Willis

(Signature)

February 17, 2012

(Date)

Acting Manager, Unmanned Aircraft Systems

(Title)

ATTACHMENT to FAA FORM 7711-1

Issued To: Department of the Army

Address: US Army UAS Project Office
SFAE-AV-UAS5300
Sparkman Circle
Sparkman Center 2nd Floor
Redstone Arsenal, AL 36898

Activity: Operation of the ERMP (Gray Eagle MQ1C) Unmanned Aircraft System (UAS) in the Libby Army Airfield (FHU) Class D airspace at or below 2,500' Above Ground Level (AGL) under the jurisdiction of the FHU Air Traffic Control Tower (ATCT).

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-WSA-111 is valid from February 18, 2012 through February 17, 2013. 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.
- The Department of the Army, 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 FHU ATCT at 520-538-2852 state pilot intentions, and comply with the following provisions:
 - Lost link, flight termination points (FTP), and in flight emergencies will be conducted and coordinated in accordance with the procedures contained within the application and in the LOP between Libby ATCT, Ft Huachuca Air Traffic and Airspace Office, and C Company, 2nd Battalion, 13th Aviation Regiment, 1st Aviation Brigade, Fort Huachuca dated 30 October 2011 (See attachment 1).
 - 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. A letter of procedure (LOP) has been developed between Libby air traffic control (ATC) and the battalion operating the Gray Eagle ERMP (October 30, 2011). If any provisions in the LOP and COA conflict, this COA shall be used as the governing document
 3. The Department of the Army must ensure the proper number of visual observer's are in place to meet any departure, arrival options that Fort Huachuca (identifier: FHU) air traffic control tower (ATCT) may use. The unmanned aircraft (UA) operator will not request special handling or refuse ATC instructions in order to meet the observer requirements.
 4. If the UAS crew detects conflicting traffic, the UAS crew shall coordinate with Libby ATCT prior to issuing maneuvering instructions inside the Class D airspace unless the observer believes a collision is imminent. The intent of this provision is to clarify and reiterate that Libby ATCT is the only agency authorized to separate and control aircraft in the Class D airspace. It is not intended to be so rigidly applied as to derogate the safety of flight.
 5. UAS operations are only authorized during the hours the FHU ATCT is operational.
 6. 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
 7. The PIC must have at least a Current FAA private pilot certificate or the FAA accepted agency equivalent, based on the application or 14 CFR Part 61 for any operations in Class D and E and above 400' AGL in Class G airspace.
 8. The pilot-in-command (PIC) must conduct a pre-takeoff briefing which includes a briefing on the contents of the COA, the maximum altitudes to be flown, initial heading, frequencies to be used, lost link procedures, the parameters for the use of a ditch point, a risk analysis for the flight being flown, emergency procedures, communications with ATC, frequencies to be monitored for flight operations and a briefing on the expected duration of flight.
 9. The PIC shall not engage in any activity not directly related to flying the aircraft. Such activities include, but are not limited to, operating UAS sensors or other payload systems.
 10. ATC procedures at Libby Army Airfield (AAF) while conducting UAS operations have been developed (see appendix A of the LOP contained in Attachment 2).

UA cannot operate in a traffic pattern like manned aircraft, specifically their inability to use routine visual procedures. The inability to use routine visual procedures does not imply priority handling for UAS and is not intended to disrupt the normal arriving and departing flow of other traffic. The Department of the Army may impose more, but not less, restrictive procedures to ensure separation and segregation of manned and unmanned aircraft provided those procedures do not violate existing federal regulations or other provisions of this COA.

11. The unmanned aircraft must be operated in compliance with all provisions and conditions contained in the Airworthiness Release (AWR), including all appendices.
12. Any changes or revisions to the current UAS hardware or software configuration at the time of application or after the COA is approved will require a new or revised AWR. The new or revised AWR shall be submitted to the Unmanned Aircraft Systems Program Office (AFS-407) for further review. This includes hardware or software changes made to any unmanned aircraft system. The new AWR should identify the changes and list any new operating procedures or limitations imposed on the UAS.
13. The proponent will follow the provisions (to include notes, cautions and warnings) listed in the AWR memorandum dated October 7, 2011. The memorandum includes Appendix A -Restrictions and Operating Information, Appendix B - Configuration and Installation Detail, Appendix C -Inspections, Maintenance, and Logbook Instructions, and Appendix D-Reference List for the Gray Eagle UAS at Fort Huachuca, AZ. The memorandum constitutes airworthiness release authorizing operation of the MQ-1C Gray Eagle UAS within the Federal Aviation Administration approved COA area at Fort Huachuca, AZ, Libby AAF, and in restricted area R-2303 provided those procedures do not violate existing federal regulations or other provisions of this COA.
14. UAS carrying munitions is prohibited.
15. The PIC shall not engage in any activity not directly related to flying the aircraft. Such activity includes, but is not limited to, operating UAS sensors or other payload systems.
16. UAS night operations are those operations that occur during the time period starting thirty minutes after official sunset to thirty minutes before official sunrise. Operations outside of restricted airspace may be conducted during night time when the following conditions are met:
 - a. There will be no other aircraft in the FHU Class D airspace while the Gray Eagle UAS is in the FHU Class D airspace.
 - b. All lost link procedures will be contained within the operations area depicted in the COA application.

- c. For operations that will depart or arrive between sunset and sunrise, the Ground Observer must be in place 30 minutes prior to that operation to insure acclimation to the twilight/nighttime environment.
 - d. The FHU ATCT must be equipped with an operational Tower Display Monitor(TDM)/DBRITE and be in use. If the TBM/DBRITE is not operational, night operations are not authorized.
 - f. Ground observers will undergo additional training on the lighting configuration of the UA to ensure proper recognition during night flights.
 - g. The UA shall operate navigation and anti-collision (strobe) lights for all night time operations outside of active restricted airspace. It is recommended that they remain on for operations within restricted airspace. Night time operations are not allowed if the UA's lights are inoperative.
 - h. The use of night vision devices (NVD) to improve night vision is allowed. However, due to the limitations of the NVD, an additional observer without NVD shall be stationed directly next to any observer using NVD. The additional observer shall keep the UA in sight and scan for other traffic outside the NVD observer's field of view.
17. It remains the responsibility of the applicant to ensure the safety of flight and adequate visual range coverage to mitigate any potential collisions.

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, cell (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 the Department of the Army to resolve the matter. This COA does not authorize flight within Special Use Airspace without approval from the Using Agency. The Department of the Army is hereby authorized to operate the ERMP (Gray Eagle Warrior Class) Unmanned Aircraft System in the operations area depicted in "Activity" above and attachment 2 below.

LETTER OF PROCEDURE

**LIBBY AIR TRAFFIC CONTROL
AND
FORT HUACHUCA AIR TRAFFIC AND AIRSPACE OFFICE
AND
C COMPANY, 2nd BATTALION, 13TH AVIATION REGIMENT, 1st AVIATION
BRIGADE, FORT HUACHUCA**

SUBJECT: US Army Gray Eagle Unmanned Aircraft (UA) Entering and Exiting Libby Army Airfield and Fort Huachuca Special Use Airspace R-2303

EFFECTIVE DATE: 30 October 2011

1. PURPOSE: To establish air traffic control procedures to safely operate Army Gray Eagle Unmanned Aircraft conducting Unmanned Aircraft System (UAS) flight operations within Libby Army Airfield (LAAF) Class-D Airspace and transiting into and from Fort Huachuca R-2303A/B/C back into Libby Army Airfield.

2. CANCELLATION: Libby Air Traffic Control, Fort Huachuca Air Traffic & Airspace Office, Unmanned Aircraft System Training Battalion, 1st Aviation Brigade, Fort Huachuca and Program Manager Unmanned Aircraft Systems Field Office, Fort Huachuca. Subject: US Army Sky Warrior Unmanned Aircraft (UA) Entering and Exiting Libby Army Airfield and Fort Huachuca Special Use Airspace R-2303, dated 1 September 2009.

3. SCOPE: The responsibilities and procedures described in the Letter of Procedure (LOP) are applicable to C Company, 2nd Battalion, 13th Aviation Regiment (2-13th Avn Regt), 1st Aviation Brigade, Ft Huachuca AZ, Fort Huachuca Air Traffic and Airspace Office (AT&A), and Libby Air Traffic Control (ATC).

4. REFERENCES: The following documents provide the regulatory guidance under which LOP participants shall perform flight operations.

a. Federal Aviation Administration (FAA), N JO 7210.766 Air Traffic Organization Policy SUBJECT: Unmanned Aircraft Operations in the U.S. National Airspace System dated March 28, 2011

b. Department of the Army, US Army Intelligence Center and Fort Huachuca Regulation 95-2, Aviation - Test Aircraft, Unmanned Aerial Vehicle and Indirect Fire Procedures dated 22 September 2001

c. Army Regulation 95-23, Unmanned Aircraft System Flight Regulation 7 September 2006 (RAR 10 July 2010).

d. DAMO-OD-A, Interim Guidance for UAS Facilities and Operations In and Around Army Airfields in the NAS, 24 Mar 2009.

e. ATC procedures for Predator Operations at Libby Army Airfield (LAAF) Appendix A.

5. NORMAL PROCEDURES:

a. General: While operating at Libby Army Airfield, Gray Eagle UA ground and flight operations shall be conducted in accordance with FH Reg. 95-2, AR 95-23, 14 CFR Parts 91.111 and 91.113, other appropriate subparts of 14 CFR Part 91, and/or applicable military regulations and the approved FAA Certificate of Authorization.

b. Taxi and Take-Off Procedures: Gray Eagle UA operator shall contact Libby ATC, provide intentions and receive taxi instructions and take-off clearance.

c. Departure and Traffic Pattern Procedures:

(1). After take-off and climbing through a safe maneuvering altitude, expect a crosswind leg departure and proceed on-course per Libby ATC instructions into R-2303A, sub-sectors B and C, or as directed by ATC.

(2). Local Traffic Pattern: 5,700 feet MSL or as directed by Libby ATC.

(3). Runway intersection take-offs and landing may be requested and approved by Libby ATC.

(4). Practice Automated Takeoff and Landing Aborts and Touch and Go approaches shall be coordinated with and approved by Libby ATC.

d. Arrival Procedures: The Gray Eagle UA operator will contact Libby ATC prior to commencing arrival and descent procedures from R-2303A/B with intent of landing at Libby Army Airfield.

6. LOST LINK PROCEDURES: The LOST LINK CONTINGENCY MISSION PROFILE is loaded into the Gray Eagle UA's Primary Control Module (similar to Auto-Pilot) by the operator.

a. When a LOST LINK condition occurs, the Gray Eagle UA operator shall immediately notify Libby ATC and provide the following information:

(1). Call Sign in accordance with DOD FLIP.

(2). Pre-programmed UAS IFF Squawk 7600 LOST LINK CONTINGENCY.

(3). Altitude.

(4). Endurance Remaining. Expressed in hours and minutes of useable fuel remaining to burn-out (e.g. 9 hours and 22 minutes to burn-out).

(a). The Gray Eagle UA Mission Coordinator will determine if the mission can be continued or return to LAAF, in the event a LOST LINK condition occurs and the UA operator regains LINK CONTROL with the UA. The Gray Eagle operator will notify Libby ATC of intentions.

(b). CONTINGENCY MISSION PROFILE (cMP), LOST LINK GENERAL PROCEDURES:

(1). Different scenarios exist for Lost Link Procedures depending on where the UAS is flying when link with the aircraft is lost and are detailed in this LOP.

(2). INITIAL LOST LINK HEADINGS (ILLH): While operating in LAAF Class D airspace the LOST LINK HEADING will be set to the Runway Heading. While operating outside of Class D, but inside of R-2303, ILLH will be set by the operator to insure the aircraft remains within the Fort Huachuca R-2303 area in the event of LOST LINK.

(3). The aircraft will remain within Fort Huachuca R-2303 by flying the pre-established CMPs listed in the Attachment to this LOP and fly to the Contingency Mission Loiter as defined in the CMP. Aircraft will climb or descend to the CMP Altitude for each waypoint as programmed, and upon achieving the CMP altitude will continue to hold it.

(4). In the event of LOST LINK, the Gray Eagle UA will:

(a). Set airspeed to 75 KIAS. If below 75 KIAS, aircraft will adjust pitch and power to accelerate to 75 KIAS, which could result in a loss of altitude (100 to 200 feet max). If above 75 KIAS, aircraft will adjust pitch and power to decelerate to 75 KIAS, which could result in a gain in altitude (500 feet max). To ensure aircraft does not leave its assigned altitude block, the aircraft will not be intentionally flown within 500 feet above the bottom of the block altitude, and 500 feet below the top of the altitude block.

(b). Begin a climb/descent and fly an INITIAL LOST LINK HEADING (ILLH) for 51 seconds. If during the 51 seconds the aircraft reaches the INITIAL LOST LINK ALTITUDE (ILLA), the aircraft will then turn toward the CMP.

(c). If at 52 seconds, the aircraft has not reached the ILLA, the aircraft will continue to climb/descent to its INITIAL LOST LINK ALTITUDE (ILLA)

by setting up an orbiting loiter 2.5 miles from the LOST LINK location in the direction of the ILLH, or descend to the ILLA enroute, and turn, toward the CMP Initial Waypoint.

b. Detailed Lost Link Procedures during Libby traffic pattern operations or within R2303 are:

(1) Any time in the traffic pattern below 9,000 ft MSL: Immediately turn in the shortest direction to the programmed initial lost link heading (i.e., 260 degrees for Runway 26; 080 degrees for Runway 08; or as applicable for other LAAF runways) while simultaneously climbing for 51 seconds. And then:

(a) At 52 seconds if the aircraft is below 9,000 ft MSL, the aircraft will enter a circular orbit (centered on a point 2.5nms from the actual lost link point in direction of lost link heading), and continue climbing until reaching 9,000 ft MSL, and then turn in the shortest direction toward the Contingency Mission Loiter as defined in the CMP attachment while maintaining 9,000 ft MSL.

(b) If during the 51 seconds the aircraft reaches 9,000 ft MSL, the aircraft will turn in the shortest direction toward the Contingency Mission Loiter as defined in the CMP attachment while maintaining 9,000 feet MSL.

(2) If transiting to / from an assigned altitude block (or hard altitude) within R2303: Immediately turn in the shortest direction toward the ILLH (ILLH will be set by the operator to insure the aircraft remains within Fort Huachuca R-2303) while climbing/descending to any altitude within the current ATC assigned block altitude (or current assigned hard altitude) for 51 seconds. For example, if Lost Link occurs after vacating assigned block altitude FL200-220 for a descent to 15,000 ft MSL, the UAS will continue descent to 15,000 ft MSL. At 52 seconds if the aircraft has not reached the ILLA, the aircraft will enter a circular orbit (centered on a point 2.5nms from the actual lost link point in direction of lost link heading), and continue climbing/descending until reaching the ILLA, as per the example 15,000 ft MSL and then turn in the shortest direction toward the Contingency Mission Loiter as defined in the CMP attachment while maintaining 15,000 ft MSL.

(3) If established within an assigned block altitude within R2303: Immediately turn in the shortest direction toward the ILLH (ILLH will be set by the operator to ensure the aircraft remains within Fort Huachuca R-2303 and while operating in R-2303C the operators shall ensure the required vertical separation to remain clear of R-2312 airspace) while climbing/descending to an altitude halfway between the requested mission flight altitude block that has been approved by Libby ATC for 51 seconds. At 52 seconds if the aircraft has not reached the ILLA, the aircraft will enter a circular orbit (centered on a point 2.5nms from the actual lost link point in direction of lost link heading), and continue climbing/descending until reaching the ILLA, as per the example 15,000 ft MSL and then turn in the shortest direction toward the Contingency Mission Loiter as defined in the CMP attachment while maintaining 15,000 ft MSL.

(a) Once the aircraft reaches the CONTINGENCY Mission Loiter portion of the CMP it will continuously fly the (six (6) waypoint) Loiter at CMP altitude until LINK CONTROL is regained or fuel exhaustion.

(b) LOST LINK CONTINGENCY LANDING: The aircraft will follow its designated CMP to the CMP Loiter portion of the CMP and will fly the CMP Loiter until link is reestablished. If link is not reestablished, the UA will fly the CMP Loiter until fuel exhaustion, at which time the engine will quit and the UA will transition to BATTERY POWER. Aircraft will then continue to fly the CMP Loiter under battery power, lower landing gear, and commence a preprogrammed descent at the CMP airspeed until ground contact.

(c) Minimum LL altitude assigned and programmed will be 9000' MSL regardless of area of operation.

7. OTHER IN-FLIGHT EMERGENCIES:

- a. Contact Libby ATC. Declare the emergency condition and state intentions.
- b. If landing at LAAF is possible, inform Libby ATC and follow instructions.
- c. If landing at LAAF cannot be accomplished, inform Libby ATC and provide location of intending landing.
- d. All necessary action will be taken by the Gray Eagle operator to minimize collateral damage.

8. ATTACHMENT :

**CONTINGENCY MISSION PROFILE (CMP) FLIGHT PLANS
CONTINGENCY MISSION PROFILE (CMP) DIAGRAMS
CONTINGENCY MISSION AND ILLA PLANNING DIAGRAM**

9. TAKEOFFS AND LANDINGS:

a. For normal operations, the Gray Eagle UA system performs an Automated Takeoff and Landing (ATLS) utilizing a Differential Global Positioning System (DGPS) and runway survey information. The UA then flies a 9 Waypoint Landing Pattern. The UA Pilot/Operator has the ability to enter the landing pattern at Waypoints 1, 2, or 3 and can abort the landing at any Waypoint and follow ATC instructions. During takeoff the Pilot/Operator can take the UA out of the Automated Takeoff Mode once the UA has reached 300' Above Ground Level.

b. As a secondary recovery capability, the Gray Eagle UA will have a Tactical Automatic Landing System (TALS) adjacent to the runway. Until TALS, or a different backup system, is brought online, a "Legacy" Ground Control Station with an

Operator/Pilot capable of manually landing the UA will be operational and prepared to perform either the takeoff or landing as required.

10. EXCEPTIONS: Exceptions to any of the above agreement shall be coordinated and agreed upon by all parties concerned.

(b) (6)

(b) (6)

Libby Army Airfield

Date: 17 Oct 2011

Libby Army Airfield

Date: 17 Oct 2011

(b) (6)

Date: 12 OCT 2011

2 Attachments:

1. Contingency Mission Profile Flight Plans
2. Automated Landing Profile/Pattern

1 Appendix

Appendix A: ATC Procedures at Libby while conducting UAS Operations

ATTACHMENT A

CONTINGENCY MISSION PROFILE (CMP) FLIGHT PLANS

SCOPE:

a. The intent of the listed Libby Contingency Mission 'RETURN HOME' flight paths/plans is to avoid over-flight of densely populated areas should the Gray Eagle Unmanned Aircraft (UA) experience a total LOST LINK condition while performing flight operations within R-2303A/B/C and as the UA executes the LOST LINK PROCEDURES cited in paragraph six. The Libby Contingency Mission 'RETURN HOME' flight paths will navigate the aircraft to the Initial Point (IP) which is the entry waypoint (WP) of Libby Contingency Mission ([HILL FOUR]).

b. Libby Contingency Mission 'RETURN HOME' altitudes will be based on scenario/situation and will be briefed at mission brief. Per C Company, Unmanned Aircraft Training Battalion Unit SOP, no changes to the Libby Contingency Mission 'RETURN HOME' altitudes will be authorized without Mission Commander approval/direction.

1. If flying in R-2303C; aka "Charlie Corridor":

WP-1	12R WV 6500 7800 / N31 26' 05.0" W110 18' 57.4"
WP-2	12R WV 5300 9600 / N31 35' 59.0" W110 26' 31.3"
WP-3	12R WV 6500 9600 / N31 35' 56.9" W110 18' 55.6"
WP-4	12R WA 6700 0000 / N31 37.99" W110 17.61" (IP)
WP-5	12R WA 6900 0300 / N31 39.61" W110 16.33"
WP-6	12R WA 7300 0300 / N31 39.60" W110 13.80"
WP-7	12R WA 7500 0000 / N31 37.96" W110 12.55"
WP-8	12R WV 7300 9700 / N31 36.35" W110 13.83"
WP-9	12R WV 6900 9700 / N31 36.36" W110 16.36"

2. If flying West of Grid 55, aka "Sonoita Corridor":

WP-2	12R WV 5300 9600 / N31 35' 59.0" W110 26' 31.3"
WP-3	12R WV 6500 9600 / N31 35' 56.9" W110 18' 55.6"
WP-4	12R WA 6700 0000 / N31 37.99" W110 17.61" (IP)
WP-5	12R WA 6900 0300 / N31 39.61" W110 16.33"
WP-6	12R WA 7300 0300 / N31 39.60" W110 13.80"
WP-7	12R WA 7500 0000 / N31 37.96" W110 12.55"
WP-8	12R WV 7300 9700 / N31 36.35" W110 13.83"
WP-9	12R WV 6900 9700 / N31 36.36" W110 16.36"

3. If flying East of Grid 55 and North of Grid 92, aka "Whetstone Corridor":

WP-3	12RWV 6500 9600 / N31 35' 56.9" W110 18' 55.6"
WP-4	12R WA 6700 0000 / N31 37.99" W110 17.61" (IP)
WP-5	12R WA 6900 0300 / N31 39.61" W110 16.33"
WP-6	12R WA 7300 0300 / N31 39.60" W110 13.80"
WP-7	12R WA 7500 0000 / N31 37.96" W110 12.55"
WP-8	12R WV 7300 9700 / N31 36.35" W110 13.83"
WP-9	12R WV 6900 9700 / N31 36.36" W110 16.36"

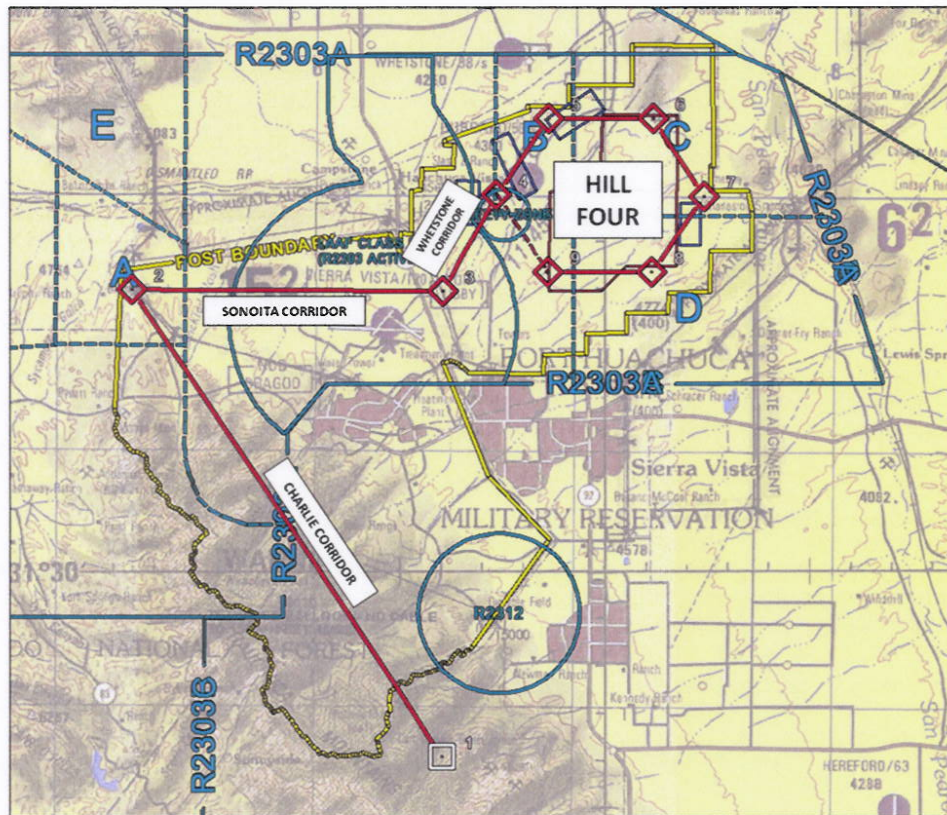


Figure 1

CONTINGENCY MISSION AND INITIAL LOST LINK ALTITUDE (ILLA)
PLANNING

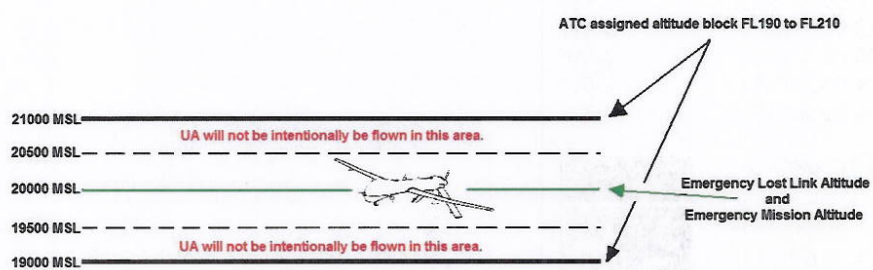


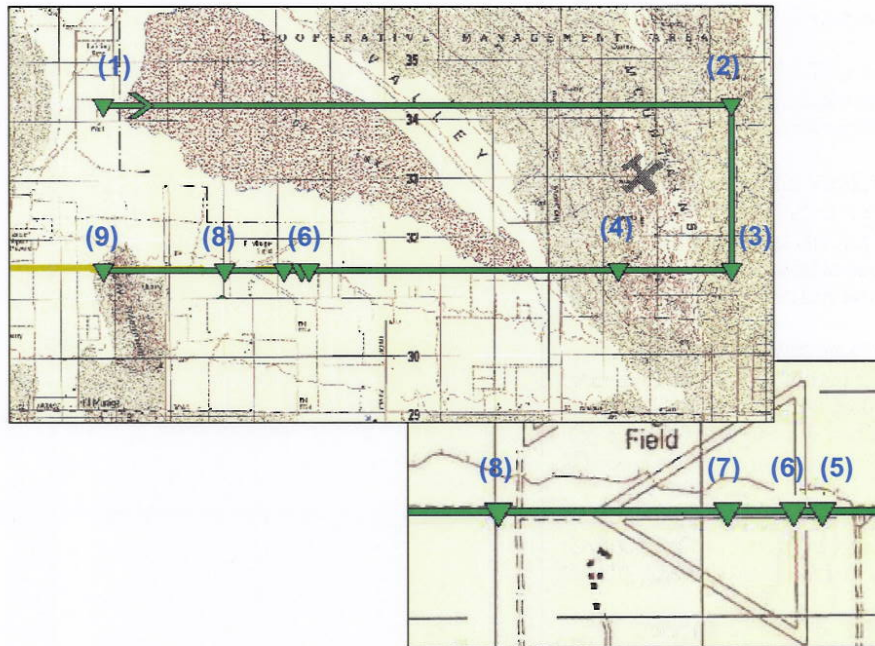
Figure 2

ATTACHMENT B

AUTOMATED LANDING PROFILE AND PATTERN

1. Point (1) - ATLS Pattern Entry Point: 1 is located 2.0 nautical miles upwind of the touch down point at 1000 ft Above Field Level (AFL). It is automatically placed 2 nautical miles abreast of the runway centerline.
2. Point (2) - ATLS Turn to Base Pattern Point: 2 is located 6.25 nautical miles downwind of 1 at 1000 ft AFL. This point is also 2.0 nautical miles abreast of the runway centerline.
3. Point (3) - ATLS Final Approach Entry Point. 3 is located 3.25 nautical miles downwind of the touchdown point at 1000 ft AFL. It is the entry point for the final landing approach. This point is separated from the glide slope intercept point in order to accommodate any remaining transients in airspeed, altitude and heading from the turn to final.
4. Point (4) - Glide Slope Intercept: 4 is located 2.0 nautical miles from the Touch Down Point (TDP), at 635 ft AFL. Once the aircraft reaches 4 the TALS TS should be tracking the aircraft during normal operation. The aircraft will lower the landing gear, set landing flaps, and configure the system for an approach.
5. Point (5) - Flare Point: 5 is located 20 feet AFL. It is based on the height of the aircraft as measured by the laser altimeter. Upon reaching 20 AFL, the aircraft pitches up to reduce VSI.
6. Point (6) - TDP: The TDP was selected during the runway survey. The aircraft automatically adjusts pitch/roll/yaw and flare control in order to land as close as possible to the TDP. The adjustment during the approach is transparent to the AO. The AO maintains the ability to manually abort or override aborts during the approach.
7. Point (7) - TALS Alignment Point/Slope Point: 7 is used to align the TALS Track Subsystem (TS) to the runway and capture the runway topography. It is entered during the runway survey by taxiing the aircraft onto the spot and clicking the record position button on the runway setup screen.
8. Point (8) - Rollout Point: 8 is the rollout point for landing. This point is used as a reference during ground roll. It is entered during the runway survey by taxiing the aircraft onto the spot and clicking the record position button.

(9) Point (9) - Go-Around Point: This point is automatically located 2.0 nautical miles upwind of the TDP. It is initially 1,000 ft AFL and aligned with the runway. This point is used as the go-to point after takeoff, as well as the go-around point for landing aborts.



APPENDIX A

ATC Procedures at Libby AAF While Conducting UAS Operations

1. Purpose. Provide uniform air traffic control procedures at Libby AAF during Warrior A, Gray Eagle, and CBP/DHS Predator UAS operation in the Class D.

***2. Scope.** These procedures are supplemental to the procedures in FAAO 7110.65, N JO 7210.766, DAMO-OD-A, Interim Guidance for UAS Facilities and Operations In and Around Army Airfields in the NAS, 24 Mar 2009, and AR 95-2. They do not waive any ATC procedures specified in the above references except where specifically addressed or the Special Provisions listed in the COA.

3. Provisions.

- a. No simultaneous/crossing traffic pattern operations with a UAS and manned aircraft. A manned aircraft may follow a UAS on final.
- b. *Deconfliction of UA and manned aircraft within the Class D airspace or transit through will be accomplished by use of segregated patterns, holding points with specific lateral (minimum 1 NM) and vertical limits (minimum 500').
- c. *A manned aircraft may only be positioned to follow an unmanned aircraft once the unmanned aircraft is established on final and is within the Class D airspace when utilizing the same runway.
- d. *Ft Huachuca Air Traffic and Airspace Officer or Libby ATC Chief will provide briefings to all routine airfield users concerning UAS operations at LAAF. Briefing will include lost link procedures, lost communication procedures, emergency procedures, contingency procedures, standard operating procedures, use of UA Zones and UA Operating Areas,

4. Definitions.

- a. Intruder aircraft: Any aircraft operating within the Class D airspace without two way radio communication with the ATC facility per 14 CFR Part 91.
- b. UA Zones: Published marshalling zones, defined by visual or GPS reference, used by UA and ATC as departure/arrival points to/from airfield. UA Zones are also used for lost link and emergency orbit points for UA.
- c. UA Operating Area: Area designated for UA operations within the Class D airspace.

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- d. UAS VFR holding points: Geographic or GPS based locations to contain the UAS at a specific location.
- e. *Lost link: UAS Operator/Pilot has lost the ability to provide real-time control of the UAS airborne or on the ground. Loss may be permanent or temporary.
- f. *Lost link procedures: Pre-approved written procedures to be followed by the UAS in the event of lost link both airborne or on the ground. ATC will approve and maintain a copy of all lost link procedures. Lost link procedures may make use of UA zones or UAS VFR holding points.
- g. *Lost of radio communications: UAS pilot/operator is not able to communicate with ATC.
- h. Primary radio communications: Recorded communications made between ATC and the UAS pilot/operator on local ATC tower UHF/VHF frequencies.
- i. Alternate communications: Recorded communications made between ATC and the UAS pilot/operator on a ground-to-air radio or telephone.
- j. Observer: A person who is responsible to assist the UAS pilot/operator, by visual means, in meeting the requirements of FAR 91.111/113 or 115 and to relay situations that are observed, which may cause a collision hazard to other aircraft.

5. Procedures.

a. ATC Procedures.

(1) Description of aircraft types. Describe UAS to other aircraft as “unmanned aircraft”.

(2) ATIS Procedures. Make a new recording when UAS operations are in effect or have terminated for the day.

(3) Light Signals. Light signals will only work with UAS when line of sight with pilot/operator or observer is possible.

(4) Sequencing and Spacing Application. UAS pilots cannot be instructed to follow another aircraft.

(5) Simultaneous Same Direction. All UAS will be treated as “other” aircraft.

(6) Same Runway Separation. All UAS will be treated as Category III aircraft.

*(7) All UAS will be treated as small aircraft for the purpose of applying wake turbulence.

(8) Use of Visual Separation between UAS and manned aircraft or UAS and UAS is not authorized.

(9) SVFR is not authorized with UAS.

b. Development of Departure/Arrival/Operations/Emergency Procedures.

(1) UA Zones and VFR holding points are used as departure/arrival points to and from the airfield, for lost link orbit points, emergency orbit points, and to assist ATC with spacing and sequencing. Subsections B and C of the East Range currently serves as the main UA Zone/VFR holding area for UAS, however, other areas may be used for departures/arrivals/holding as directed by ATC, i.e. West Range.

(2) UA Zones will not be used as UA Operating Areas. The UA Operating Area is the Class D pattern airspace, which is segregated from the UA Zones which lie in Restricted Airspace.

c. Arrival and Departure Procedures.

De-conflict UA departures from manned aircraft using one or more of the following methods:

- (1) Spatial or geographic separation
- (2) Holding of manned aircraft during UA arrivals/departures
- (3) Hold the UAS
- (4) Scheduling procedures

***d. Pattern/Transit deconfliction Procedures.**

*(1) UA will be segregated from manned aircraft utilizing one or more of the following when transiting through the Class D airspace or when necessary to sequence a manned aircraft to follow the unmanned aircraft once established on final approach:

- a) Altitude (minimum 500' vertical separation)
- b) Direction of traffic
- c) Distance from manned pattern (minimum of 1 NM)

(2) All UAS will be treated as small aircraft for the purpose of applying wake turbulence. In addition to the requirements of FAAO 7110.65, ATC will apply the following procedures:

- a) Issue cautionary wake turbulence advisories, and the position, altitude, and direction of flight to the pilot/operator of UAS landing behind all manned aircraft regardless of weight class.

- b) Wake Turbulence Rules cannot be waived by the UAS pilot/operator.

e. Non-cooperative/Intruder/NORDO Aircraft Procedures. ATC will keep the UA pilot/operator apprised of any known aircraft operations that may impact operations. ATC should assist the UA pilot/operator in ensuring de-confliction by recommending altitudes, providing directions to predetermined points (UA Zones), or by having operations ceased to a landing if it will not aggravate the situation. ATC will broadcast on emergency frequencies when non-cooperative/intruder aircraft are present to expeditiously establish two-way radio communications with the aircraft.

NOTE: All aircraft who do not establish two-way radio communication as per CFR prior to entering Class D airspace will be reported to the FAA.

- f. Emergency Procedures.

- (1) ATC will apply the procedures listed in Chapter 10, Section 1 of FAAO

7110.65. Minimum required information for in-flight emergencies:

- Aircraft identification and type
- Nature of the emergency (lost link, equipment failure)
- Intentions of the UA pilot/operator
- Aircraft altitude / position
- Fuel remaining in time

(2) The safety of manned aircraft will take precedence over unmanned aircraft in an emergency situation.

(3) UAS within Class D airspace will be directed by ATC to land or proceed to assigned UA Zone and hold until further instructions are given by ATC.

(4) If primary radio communications between UA pilot/operator and ATC are lost, UA Operator/Pilot or ATC will be notified immediately via designated alternate communications method. Failure to establish or maintain radio communication between UA Operator/Pilot and ATC will require termination of UA operations.

(5) If lost link occurs, UAS pilot/operator will immediately notify ATC with the following information:

- a) Time of lost link
- b) Last known position
- c) Altitude
- d) Direction of flight
- e) Confirm execution of lost link procedures
- f) Confirm pilot/observer have visual contact with UA.

NOTE: UA lost link is an emergency, but may not require Crash-Rescue services

(6) In the event of lost link, lost communication between UA Observer/Pilot and ATC or lost communication between UA Operator/Pilot and observer, ATC will do the following:

- a) Cease aircraft launches until status of affected UAS is determined
- b) Recover other UA as appropriate
- c) Issue advisories and ATC instructions as appropriate to ensure the safe operation of all aircraft
- d) Terminate affected UA operations if communications cannot be re-established

(7) If UA observer loses visual/situational awareness of the UA, ATC will be notified immediately. If visual observation cannot be established, the flight shall be terminated.

Attachment 2

