

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

CERTIFICATE OF WAIVER OR AUTHORIZATION

ISSUED TO

Utah State University – Utah Water Research Laboratory

8200 Old Main Hill

Logan, UT 84322

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 Aggie Air Unmanned Aircraft System (UAS) in Class E and G airspace at or below 3,000 feet Above Ground Level (AGL) over the Logan City Wastewater Treatment Lagoons in Cache County, UT under the jurisdiction of the SLC ARTCC.

LIST OF WAIVED REGULATIONS BY SECTION AND TITLE

N/A

STANDARD PROVISIONS

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

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

SPECIAL PROVISIONS

Special Provisions are set forth and attached.

This certificate 2010-WSA-40 is effective from February 18, 2011 to February 17, 2012, and is subject to cancellation at any time upon notice by the Administrator or his/her authorized representative.

BY DIRECTION OF THE ADMINISTRATOR



FAA Headquarters, AJR-36

(Region)

Ardyth Williams

(Signature)

February 17, 2011

(Date)

Air Traffic Manager, Unmanned Aircraft Systems

(Title)

ATTACHMENT to FAA FORM 7711-1

Issued To: Utah State University – Utah Water Research Laboratory

Address: 8200 Old Main Hill
Logan, UT 84322

Activity: Operation of the Aggie Air Unmanned Aircraft System (UAS) in Class E and G airspace at or below 3,000 feet Above Ground Level (AGL) over the Logan City Wastewater Treatment Lagoons in Cache County, UT under the jurisdiction of the SLC ARTCC.

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

Dates of Use: This Certificate of Authorization (COA) 2010-WSA-40 is valid from February 18, 2011 through February 17, 2012. Should a renewal become necessary, the proponent shall advise the Federal Aviation Administration (FAA), in writing, no later than 60 days prior to the requested effective date.

General Provisions:

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

Safety Provisions:

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

- For the purpose of see-and-avoid, visual observers must be utilized at all times except in Class A airspace, restricted areas, and warning areas. The observers may either be ground based or in a chase plane. If the chase aircraft is operating more

than 100ft above/below and or ½ nm laterally, of the UA, the chase aircraft PIC will advise the controlling ATC facility.

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

Airworthiness Certification Provisions:

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

Pilot / Observer Provisions:

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

- Flights At or Above 18,000 Feet Mean Sea Level (MSL)
 - When operating on an instrument ATC clearance, the UA pilot-in-command must ensure the following:
 1. An ATC clearance has been filed, obtained and followed.
 2. Positional information shall be provided in reference to established NAS fixes, NAVAIDS, and waypoints. Use of Latitude/Longitude is not authorized.
- **Observer Qualifications:** Observers must have been provided with sufficient training to communicate clearly to the pilot any turning instructions required to stay clear of conflicting traffic. Observers will receive training on rules and responsibilities described in 14 CFR 91.111, *Operating Near Other Aircraft*, 14 CFR 91.113, *Right-of-Way Rules*, cloud clearance, in-flight visibility, and the pilot controller glossary including standard ATC phraseology and communication. Observers must have in their possession a current second class (or higher) airman medical certificate that has been issued under 14 CFR 67, Medical Standards and Certification, or a military equivalent. 14 CFR 91.17, Alcohol or Drugs, applies to UA observers.
- **Pilot-in-Command (PIC) –**
 - **Visual Flight Rules (VFR) as applicable:**
 - The PIC is the person directly responsible for the operation of the UA. The responsibility and authority of the pilot in command as described by 14 CFR 91.3 (or military equivalent), applies to the UAS PIC.
 - The PIC operating a UA in line of sight must pass at a minimum the required knowledge test for a private pilot certificate, or military equivalent, as stated in 14 CFR 61.105, and must keep their aeronautical knowledge up to date.
 - There is no intent to suggest that there is any requirement for the UAS PIC to be qualified as a crewmember of a manned aircraft.
 - Pilots flying a UA on other than instrument flight plans beyond line of sight of the PIC must possess a minimum of a current private pilot certificate, or military equivalent in the category and class, as stated in 14 CFR 61.105.
 - **Instrument Flight Rules (IFR) as applicable:**
 - The PIC is the person directly responsible for the operation of the UA. The responsibility and authority of the pilot in command as described by 14 CFR 91.3 (or military equivalent), applies to the UAS PIC.
 - The PIC must be a certified pilot (minimum of private pilot) of manned aircraft (FAA or military equivalent) in category and class of aircraft flown.
 - The PIC must also have a current/appropriate instrument rating (manned aircraft, FAA or military equivalent) for the category and class of aircraft flown.
- **Pilot Proficiency – VFR/IFR as applicable:**
 - Pilots will not act as a VFR/ IFR PIC unless they have had three qualified proficiency events within the preceding 90 days.

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

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

- The UA PIC will maintain direct two-way communications with ATC and have the ability to maneuver the UA per their instructions, unless specified otherwise in the Special Provisions section. The PIC shall comply with all ATC instructions and/or clearances.
- If equipped, the UA shall operate with an operational mode 3/A transponder, with altitude encoding, or mode S transponder (preferred) set to an ATC assigned squawk.
- If equipped, the UA shall operate with position/navigation lights on at all times during flight.
- The UA PIC shall not accept any ATC clearance requiring the use of visual separation or sequencing.
- VFR cloud clearances and visibilities for Class E airspace will be used regardless of class of airspace the UAS is operating in, except when operating in Class A airspace where 14 CFR Part 91.155 will apply.
- Special VFR is not authorized.

- Operations (including lost link procedures) shall not be conducted over populated areas, heavily trafficked roads, or an open-air assembly of people.
- Operations outside of restricted areas, warning areas, prohibited areas (designated for aviation use) and/or Class A airspace may only be conducted during daylight hours, unless authorized in the Special Provisions section.
- Operations shall not loiter on Victor airways, Jet Routes, Q Routes, IR Routes, or VR Routes. When necessary, transit of airways and routes shall be conducted as expeditiously as possible.
- Operations conducted under VFR rules shall operate at appropriate VFR altitudes for direction of flight (14 CFR 91.159).
- The UA PIC or chase plane PIC (whichever is applicable) will notify ATC of any in flight emergency or aircraft accident as soon as practical.
- All operators that use GPS as a sole source must check all NOTAMs and Receiver Autonomous Integrity Monitoring (RAIM). Flight into GPS test area or degraded RAIM is prohibited without specific approval in the special provisions.
- At no time will TCAS be used in any mode while operating an unmanned aircraft.
- Only one UA will be flown in the operating area unless indicated otherwise in the Special Provisions.
- A copy of this COA will be maintained on site by the PIC or designated representative.
- The Utah State University – Utah Water Research 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 SLC ARTCC OMIC desk at 801-320-2560, state pilot intentions, and comply with the following provisions:
 - The aircraft will comply with the procedures contained 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. The Aggie Air must be operated in strict compliance with all manufacturer's specifications and recommendations as well as with all of the provisions and

conditions contained in the most current Airworthiness Release, including all appendices.

3. The pilot-in-command (PIC) must coordinate with the following organizations prior to conducting flight operations:
 - SLC ARTCC Airspace office at (801) 320-2565 or (801) 320-2533
 - SLC ARTCC Traffic Management Unit (TMU) at (801) 320-2565
 - Logan-Cache Airport, (435) 752-8111
 - Utah State University Professional Pilot Program, (435) 753-4289
 - Utah Jet Center, (435) 753-2221
 - Leading Edge Aviation, (435) 752-5955
4. The PIC is responsible for ensuring two observers are positioned, one at R3 and one at R4 locations of the Logan City Wastewater Treatment Lagoons. Observers must be in position prior to the launch, during the flight and upon termination of the UA flight.
5. The PIC must establish two way radio communications with each observer prior to the launch of the UA, and maintain communication during the UA operation, and upon termination of the UA flight.
6. Pre-flight coordination must be accomplished with a minimum of forty-eight hours notice to SLC ARTCC Airspace at (801) 320-2532 for completion of control room approval. If the event is to occur on Saturday to Wednesday notification needs to be accomplished by noon on the prior Thursday.
7. Twenty-four hours prior to flight operations, the proponent shall notify ZLC ARTCC TMU at (801) 320-2565; advise of the time for commencing and termination of operations, and a notice to airmen number for planned activities.
8. Thirty minutes prior to operations, and upon conclusion of operations, the proponent must notify ZLC – Salt Lake City Center and advise of the time for commencing and terminating operations.
9. Prior to UAS operations, the PIC will establish and maintain two-way radio communications with Logan-Cache Airport (KLGU) using the Common Traffic Advisory Frequency (CTAF), (122.8 MHz). The PIC must make a radio announcement on the CTAF frequency immediately prior to launch that UAS operations are commencing three nautical miles southwest of the airport at or below 3,000' Above Ground Level (AGL). Every 10 minutes, the PIC must make an advisory call indicating operations southwest of the airport until conclusion of flight operations. The PIC will continuously monitor the Logan-Cache Airport (KLGU) designated CTAF during all operations.

10. The 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, hazards unique for the flight being flown, emergency procedures, communication requirements with Logan-Cache Airport (KLGU) using the CTAF (122.8 MHz) and ZDC – Salt Lake City Center, and the amount of battery power including reserve for the UA.
11. Sterile cockpit procedures must be observed during critical phases of flight.
12. The PIC is responsible for ensuring the UA remains within the defined operations area, and must take the appropriate actions to ensure the UA remains within the defined area.
13. The PIC must not allow any person to stand at a distance close enough to the bungee cord during UA operations that create a hazard.
14. A frequency integrity check must be conducted prior to launch of the Aggie Air UA.
15. All crewmembers including the PIC and visual observers must receive training from a qualified instructor who has, at all times, operational control of the UA.
16. The use of cell phones or other telephonic communication is restricted to the operational control of the UA, and any required communications with Air Traffic Control.
17. Operations may only be conducted during daylight hours.
18. The ATC facility, ZLC – Salt Lake City Center, may terminate or delay the provisions of this COA at any time it deems a sufficient level of safety for operations is not met.
19. The holder of this COA, or delegated representative, is responsible for halting or cancelling activity in the operations area if, at any time, the safety of persons or property on the ground or in the air is in jeopardy, or if there is a failure to comply with the terms or conditions of this COA.
20. Special provisions 1, 3, 7, 8, 9, and 18 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:

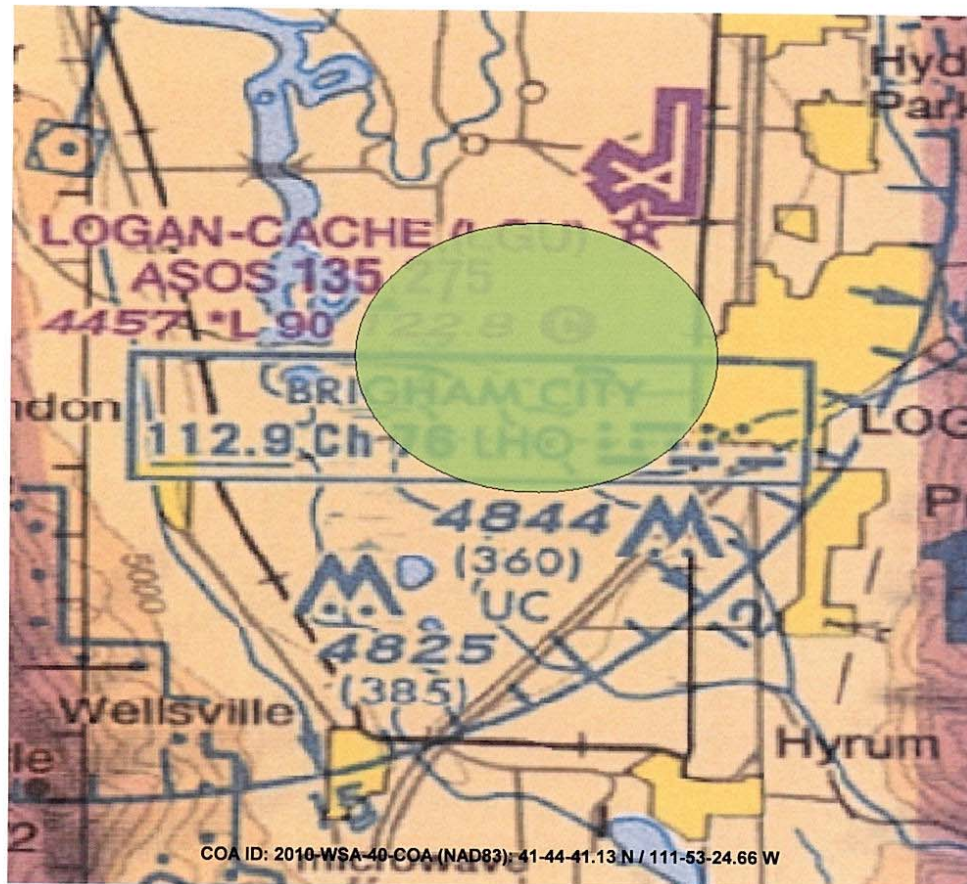
- Name and Address of pilot filing NOTAM request
- Location, Altitude or the operating Area
- Time and nature of the activity

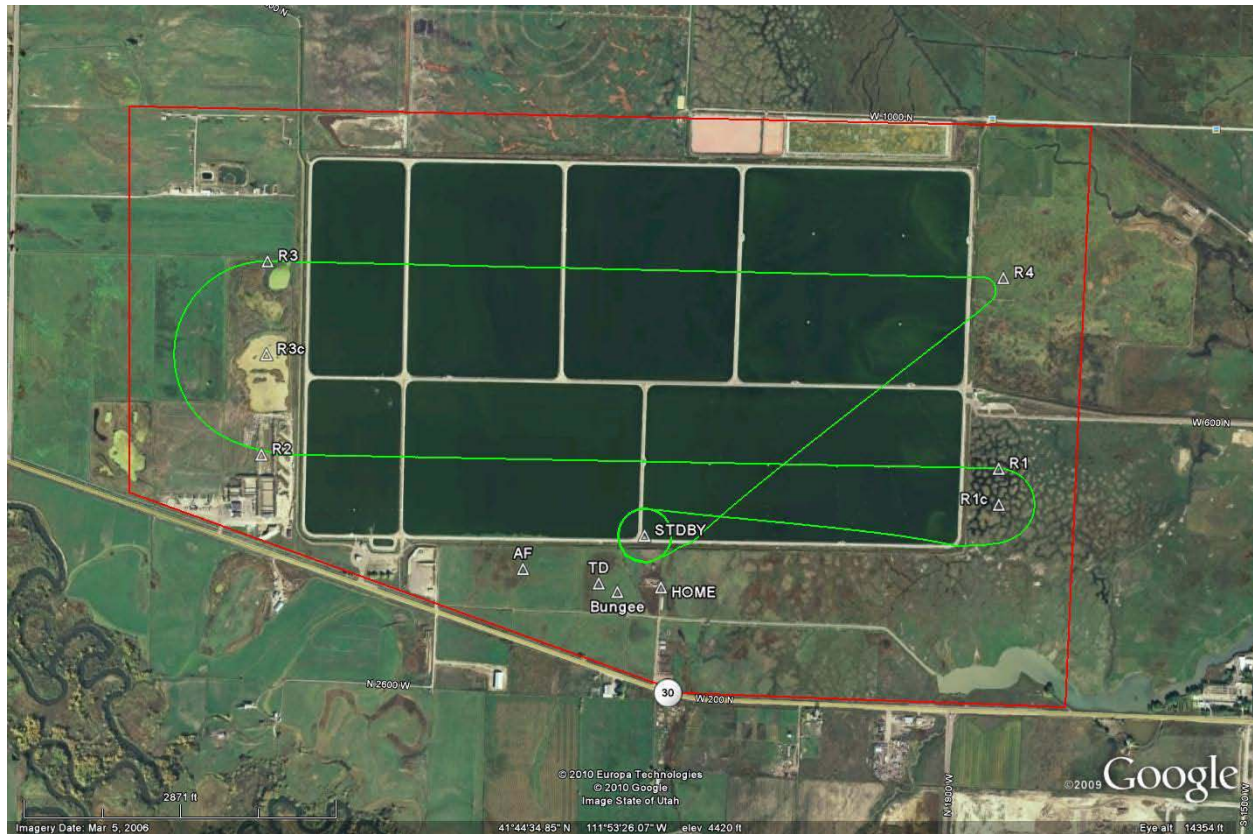
NOTE FOR PROPONENTS FILING THEIR NOTAM WITH DoD ONLY: This requirement to file with the AFSS is in addition to any local procedures/requirements for filing through DINS. The FAA Unmanned Aircraft Systems Office is working with the AFSS, and to eliminate the requirement to file a NOTAM with both the AFSS 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, cell 443-569-1732) 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 Utah State University – Utah Water Research Laboratory to resolve the matter. This COA does not authorize flight within Special Use Airspace without approval from the Using Agency. The Utah State University – Utah Water Research Laboratory is hereby authorized to operate the Aggie Air Unmanned Aircraft System in the operations area depicted in “Activity” above and attachment 1 below.





Attachment 2

LOST LINK PROCEDURES

Before takeoff, the UA is preprogrammed with a flight plan. This flight plan can be modified during flight if the UA is within communication range of the ground control station (GCS). However, the flight plan is built and simulated such that the UA can successfully fly the flight plan without any interaction from the GCS operator. Therefore the communication link between the UA and the GCS operator is not necessary for a successful flight. Nonetheless, for more safety, the UA is programmed to fly back to the STDBY waypoint and circle above at 650' AGL if communication is lost for more than 30 seconds. The STDBY waypoint is located near the pilot (41°44'24.40"N, 111°53'24.09"W). If communication is reestablished while flying towards the STDBY waypoint, the GCS operator can change the flight plan to stay within communication range and resume the flight. The GCS operator could also land the UA using the landing area indicated by the flight operations (Flight Termination Point: 41°44'20.00"N, 111°53'29.52"W). If communication is not reestablished, the pilot will take manual control and land the UA in the landing area when it comes into visual line-of-sight. If the pilot is not able to take manual control of the UA and communication has not been reestablished with the GCS, the UA will continue circling around STDBY waypoint for 2 minutes or until the battery voltage falls below 10v. At this point, the motor will shut off, the autopilot will stop holding altitude, and the UA will safely descend to the ground in the same pattern around STDBY waypoint.