

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION**CERTIFICATE OF WAIVER OR AUTHORIZATION**

ISSUED TO

Arlington Police Department

620 West Division Street

Arlington, TX 76004-1065

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 Leptron Avenger (UAS) in Class G airspace surface to 400 feet Above the Ground (AGL) within the confines of 32-42-52.51N /97-11-44.05W to 32-42-43.98N/97-11-23.93W to 32-42-49.62N/ 97-11-14.28W to 32-42-59.99N/ 97-11-20.20W to 32-43-19.70N/ 97-11-49.05W under the jurisdiction of the Dallas/Ft. Worth Terminal Radar Approach Control Facility (DFW TRACON). See special provisions.

LIST OF WAIVED REGULATIONS BY SECTION AND TITLE

N/A

STANDARD PROVISIONS

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

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

SPECIAL PROVISIONS

Special Provisions are set forth and attached.

This certificate 2010-CSA-83 effective from January 27, 2011 through January 26, 2012 excluding February 4-7, 2011 or anytime a NOTAM is issued restricting any aviation activities related to the Super Bowl or other major events 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)

Ardyth Williams

(Signature)

January 21, 2011

(Date)

Air Traffic Manager, Unmanned Aircraft Systems

(Title)

ATTACHMENT to FAA FORM 7711-1

Issued To: Arlington Police Department

Address: 620 West Division Street
Arlington, TX 76004-1065

Activity: Operation of the Leptron Avenger (UAS) in Class G airspace surface to 400 feet Above the Ground (AGL) within the confines of 32-42-52.51N /97-11-44.05W to 32-42-43.98N/97-11-23.93W to 32-42-49.62N/ 97-11-14.28W to 32-42-59.99N/ 97-11-20.20W to 32-43-19.70N/ 97-11-49.05W under the jurisdiction of the Dallas/Ft. Worth Terminal Radar Approach Control Facility (DFW TRACON).

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

Dates of Use: This Certificate of Authorization (COA) 2010-CSA-83 is valid from January 27, 2011 through January 26, 2012 excluding February 4-7, 2011 or anytime a NOTAM is issued restricting any aviation activities related to the Super Bowl or other major events. Should a renewal become necessary, the proponent shall advise the Federal Aviation Administration (FAA), in writing, no later than 60 business 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 91.113 and 91.111, 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 NOTAM's 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 Arlington Police Department 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 the Dallas/Ft. Worth Terminal Radar Approach Control Facility (DFW TRACON) at 972-615-2500, state pilot intentions, and comply with the following provisions:
 - Prior to any flight and as part of the mission preparation, the mission operator will insert appropriate lost link settings to allow the Avenger to safely return to the predetermined landing location. Additionally a timer value (no more than Ex. 7e) is set by the operator in the event of lost communication with the UA.
 - The settings are stored on the aircraft so that in the event of lost link the Avenger is able to continue operations under autonomous control. The mission operator will identify a safe altitude (no more than 400 AGL) and location for the aircraft to fly to once the Avenger detects lost link. All lost link points must be positioned so the lost link profile does not allow the UA to leave this COA operating area.
 - During flight the Avenger continuously monitors the status of communication with the ground station. When the Avenger detects a loss of link with the ground station it starts the timer. When this timer expires the Avenger goes into lost communication mode and will command the vehicle to an operator

indicated lost communication waypoint at a predetermined altitude, which must be whole contained within the COA operating area.

- The aircraft then commands a 7e decent until touchdown. Once aircraft lands aircraft automatically turns the rotors off.
 - 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 holder of this COA, or delegated representative, is responsible for halting or canceling activity in the confinement area if, at any time, the safety of persons or property on the ground, water or in the air is in jeopardy, or if there is a failure to comply with the terms or conditions of this authorization. It is the responsibility of the Arlington Police Department and Police Chief for the safety of flight in the National Airspace System and provide for the safety of persons and property on the ground and on the water.
 3. The Arlington Police Department and Police Chief have certified this UA is a public aircraft under section 40102 (a) (37), Title 49 United States Code, and certifies COA 2010-CSA-83-COA is inherently a governmental function so intimately related to the interest of the public. The Leptron Avenger UA must be used exclusively for the public interest by the Arlington Police Department, for the duration of COA 2010-CSA-83.
 4. All crewmembers including the PIC and visual observers must receive formal training under the direct supervision of a qualified instructor.
 5. The PIC must conduct a pre-takeoff briefing in accordance with Arlington Police policy on the use of UAS dated December 9, 2010. Additionally, the PIC will brief the applicable COA restrictions, frequencies to be used, the parameters for the use of a ditch point, hazards unique to the mission being flown, emergency procedures, and on the amount of battery capacity in minutes, including reserve, on the UAS.
 6. Missions will be confined to the Class G airspace designated in the COA application while remaining well clear of the housing area to the south, the road and golf course to the north and east, and any persons or watercraft while over Lake Arlington.
 7. During UA operations, the use of cell phones or other telephonic communications is restricted to the operational conduct of the UA and any required

communications with Air traffic Control (ATC). Additionally, 24 hours prior to the UAS mission and 2 hours prior to and upon the conclusion of the Mission(s), the proponent shall notify the DFW TRACON at 972-615-2500 and advise of the time for commencing and termination of operations, NOTAM number for planned activities, intended location and duration of flight, maximum altitude (no more than 400'AGL), and the point of contact and phone number of two individuals at mission site.

8. A frequency integrity check must be conducted prior to the launch of the UA in addition to the requirements stated in Arlington Police policy on the use of the UAS dated December 9, 2010.
9. Sterile cockpit procedures must be observed during critical phases of flight. Crew Resource Management practices will be used during UA operations.
10. If both pilot and observer lose sight of the UA, lost link procedures must be executed immediately, as stated in Attachment 7 Emergency procedures of the COA application. (Attachment 2)
11. The visual observer must have immediate communication with the PIC.
12. Despite the capabilities of the Leptron Avenger, only one computer or R/C controller will control the UA, and that device will be used by the PIC. Networking of the controlling computer is not authorized. Video data from the UA may be downloaded and networked to multiple computers provided it is independent of UA control frequency links.
13. The DFW TRACON must immediately be notified in the event of any emergency, loss or subsequent restoration of PIC and observer visual contact, or any other malfunction or occurrence that would impact air traffic safety or operations.
14. The proponent will contact Bell Helicopter Tower at Ex. 7e prior to and after termination of flight activity providing them with the NOTAM number and planned activity(s).
15. The DFW TRACON may terminate or delay this COA at any time it deems a sufficient level of safety for operations is not met.
16. Special provisions 1, 7, 13, and 15 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 email, COA online 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 Arlington Police Department to resolve the matter. This COA does not authorize flight within Special Use Airspace without approval from the Using Agency. The Arlington Police Department is hereby authorized to operate the Leptron Avenger Unmanned Aircraft System UAS in the operations area depicted in "Activity" above and attachment 1 below.

Attachment 1

Excerpt from sectional chart identifies area of operation--Redacted Ex.7e



The arrow identifies
the area of operations.

Aerial photograph identifies area of operation--Redacted Ex. 7e



ATTACHMENT 2

Attachment 7 - Emergency Procedures

The Leptron Avenger utilizes a redundant communication system to ensure constant contact between the aircraft and the remote pilot. The ground control station provides real-time data regarding aircraft location, altitude and flight characteristics. The pilot constantly monitors the flight information provided to ground control station and through the assistance of a trained observer maintains visual line of sight of the aircraft. In the event of a loss of link between the aircraft and the ground control station, the following procedures are followed:

- **Preflight Actions** - Prior to any flight and as part of the mission preparation, the mission operator will insert appropriate lost link settings to allow the Avenger to safely return to the predetermine landing location. The settings are stored on the aircraft so that in the event of lost link the Avenger is able to continue operations under autonomous control. The mission operator will identify a safe altitude and location for the aircraft to fly to once the Avenger detects lost link. Once aircraft reaches the specific GPS location, it will begin at auto descent and shut off the rotors upon landing
- **In the Air** - The Avenger continuously monitors the status of communication with the ground station. When the Avenger detects a loss of link with the ground station it starts a timer. This timer value (typically **Ex. 7e**) is set by the operator in the mission settings page. When this timer expires the Avenger goes into lost communication mode and will command the vehicle to an operator indicated lost communication waypoint at a predetermined altitude. The aircraft then commands a **7e** decent until touchdown. Once aircraft lands aircraft automatically turns the rotors off.

Potential System Failures			
Type of Failure	Sign of Problem	Monitored through Telemetry	Solution
Low Signal Strength	Vehicle is slow to respond to manual commands or PCC commands. Autopilot terminates steering mode. Audible and warning light alarms	Yes, Signal strength displayed in percentage and packet update rate	Turn Autopilot on and abandon manual flight. Initiate auto-land
Loss of Communication	Autopilot terminates manual control, or fails to respond to PCC commands. Audible communication alarm	Yes	The vehicle returns to loss communication waypoint, hovers until elapse of flight timer, then

Unclassified/Law Enforcement Sensitive/SSI

	and warning light		commences auto-land procedure.
Loss of GPS	First indication is poor altitude hold performance, also poor position hold during hover	Yes, indicated by number of satellites tracked and GPS Quality PDOP	Assume manual control of aircraft and land.
Low Power Avionics	System voltage warning audible and warning light	Yes	Land immediately
Low Power Actuators	Lower than nominal voltage displayed	Yes	Land Immediately
Generator Failure	Actuator or system voltages begin to fall	Yes	Land when battery indicator indicates low levels.
Engine Failure	Noise level or RPM changes, engine loses power	Yes, monitored by rotor RPM thru the RPM sensor	Return and land immediately. If engine dies initiate autorotation procedure
Tail Rotor Failure	Loss of tail control	No	Switch to manual control and initiate autorotation procedure