



U.S. Department  
of Transportation  
**Federal Aviation  
Administration**

800 Independence Ave., S.W.  
Washington, D.C. 20591

July 17, 2015

Exemption No. 12066  
Regulatory Docket No. FAA-2015-1314

Mr. Keith A. Johnson  
Air-X Solutions  
4 Carmichael Street, Suite 111, #114  
Essex Junction, VT 05452

Dear Mr. Johnson:

This letter is to inform you that we have granted your request for exemption. It transmits our decision, explains its basis, and gives you the conditions and limitations of the exemption, including the date it ends.

By letter dated April 24, 2015, you petitioned the Federal Aviation Administration (FAA) on behalf of Air-X Solutions (hereinafter petitioner or operator) for an exemption. The petitioner requested to operate an unmanned aircraft system (UAS) to conduct aerial photography, cinematography, data collection, and UAS pilot training<sup>1</sup>.

See Appendix A for the petition submitted to the FAA describing the proposed operations and the regulations that the petitioner seeks an exemption.

The FAA has determined that good cause exists for not publishing a summary of the petition in the Federal Register because the requested exemption would not set a precedent, and any delay in acting on this petition would be detrimental to the petitioner.

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<sup>1</sup> The petitioner also requested authority to conduct UAS training. At this time, the FAA is unable to authorize UAS operations for training until a further assessment is completed. When the FAA completes its review, we will proceed accordingly and no further action will be required by the petitioner. However, the petitioner is permitted to train its own pilot in commands and visual observers in accordance with condition no. 14 and the other conditions and limitations in this exemption.

## Airworthiness Certification

The UAS proposed by the petitioner is the Air-X UAS.

The petitioner requested relief from 14 CFR part 21, *Certification procedures for products and parts, Subpart H—Airworthiness Certificates*. In accordance with the statutory criteria provided in Section 333 of Public Law 112–95 in reference to 49 U.S.C. § 44704, and in consideration of the size, weight, speed, and limited operating area associated with the aircraft and its operation, the Secretary of Transportation has determined that this aircraft meets the conditions of Section 333. Therefore, the FAA finds that the requested relief from 14 CFR part 21, *Certification procedures for products and parts, Subpart H—Airworthiness Certificates*, and any associated noise certification and testing requirements of part 36, is not necessary.

## The Basis for Our Decision

You have requested to use a UAS for aerial data collection<sup>2</sup>. The FAA has issued grants of exemption in circumstances similar in all material respects to those presented in your petition. In Grants of Exemption Nos. 11062 to Astraeus Aerial (*see* Docket No. FAA–2014–0352), 11109 to Clayco, Inc. (*see* Docket No. FAA–2014–0507), 11112 to VDOS Global, LLC (*see* Docket No. FAA–2014–0382), and 11213 to Aeryon Labs, Inc. (*see* Docket No. FAA–2014–0642), the FAA found that the enhanced safety achieved using an unmanned aircraft (UA) with the specifications described by the petitioner and carrying no passengers or crew, rather than a manned aircraft of significantly greater proportions, carrying crew in addition to flammable fuel, gives the FAA good cause to find that the UAS operation enabled by this exemption is in the public interest.

Having reviewed your reasons for requesting an exemption, I find that—

- They are similar in all material respects to relief previously requested in Grant of Exemption Nos. 11062, 11109, 11112, and 11213;
- The reasons stated by the FAA for granting Exemption Nos. 11062, 11109, 11112, and 11213 also apply to the situation you present; and
- A grant of exemption is in the public interest.

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<sup>2</sup> Aerial data collection includes any remote sensing and measuring by an instrument(s) aboard the UA. Examples include imagery (photography, video, infrared, etc.), electronic measurement (precision surveying, RF analysis, etc.), chemical measurement (particulate measurement, etc.), or any other gathering of data by instruments aboard the UA.

## **Our Decision**

In consideration of the foregoing, I find that a grant of exemption is in the public interest. Therefore, pursuant to the authority contained in 49 U.S.C. 106(f), 40113, and 44701, delegated to me by the Administrator, Air-X Solutions is granted an exemption from 14 CFR §§ 61.23(a) and (c), 61.101(e)(4) and (5), 61.113(a), 61.315(a), 91.7(a), 91.119(c), 91.121, 91.151(a)(1), 91.405(a), 91.407(a)(1), 91.409(a)(1) and (2), and 91.417(a) and (b), to the extent necessary to allow the petitioner to operate a UAS to perform aerial data collection. This exemption is subject to the conditions and limitations listed below.

## **Conditions and Limitations**

In this grant of exemption, Air-X Solutions is hereafter referred to as the operator.

Failure to comply with any of the conditions and limitations of this grant of exemption will be grounds for the immediate suspension or rescission of this exemption.

1. Operations authorized by this grant of exemption are limited to the Air-X UAS when weighing less than 55 pounds including payload. Proposed operations of any other aircraft will require a new petition or a petition to amend this exemption.
2. Operations for the purpose of closed-set motion picture and television filming are not permitted.
3. The UA may not be operated at a speed exceeding 87 knots (100 miles per hour). The exemption holder may use either groundspeed or calibrated airspeed to determine compliance with the 87 knot speed restriction. In no case will the UA be operated at airspeeds greater than the maximum UA operating airspeed recommended by the aircraft manufacturer.
4. The UA must be operated at an altitude of no more than 400 feet above ground level (AGL). Altitude must be reported in feet AGL.
5. The UA must be operated within visual line of sight (VLOS) of the PIC at all times. This requires the PIC to be able to use human vision unaided by any device other than corrective lenses, as specified on the PIC's FAA-issued airman medical certificate or U.S. driver's license.
6. All operations must utilize a visual observer (VO). The UA must be operated within the visual line of sight (VLOS) of the PIC and VO at all times. The VO may be used to satisfy the VLOS requirement as long as the PIC always maintains VLOS capability. The VO and PIC must be able to communicate verbally at all times; electronic messaging or texting is not permitted during flight operations. The PIC must be designated before the flight and cannot transfer his or her designation for the

duration of the flight. The PIC must ensure that the VO can perform the duties required of the VO.

7. This exemption and all documents needed to operate the UAS and conduct its operations in accordance with the conditions and limitations stated in this grant of exemption, are hereinafter referred to as the operating documents. The operating documents must be accessible during UAS operations and made available to the Administrator upon request. If a discrepancy exists between the conditions and limitations in this exemption and the procedures outlined in the operating documents, the conditions and limitations herein take precedence and must be followed. Otherwise, the operator must follow the procedures as outlined in its operating documents. The operator may update or revise its operating documents. It is the operator's responsibility to track such revisions and present updated and revised documents to the Administrator or any law enforcement official upon request. The operator must also present updated and revised documents if it petitions for extension or amendment to this grant of exemption. If the operator determines that any update or revision would affect the basis upon which the FAA granted this exemption, then the operator must petition for an amendment to its grant of exemption. The FAA's UAS Integration Office (AFS-80) may be contacted if questions arise regarding updates or revisions to the operating documents.
8. Any UAS that has undergone maintenance or alterations that affect the UAS operation or flight characteristics, e.g., replacement of a flight critical component, must undergo a functional test flight prior to conducting further operations under this exemption. Functional test flights may only be conducted by a PIC with a VO and must remain at least 500 feet from other people. The functional test flight must be conducted in such a manner so as to not pose an undue hazard to persons and property.
9. The operator is responsible for maintaining and inspecting the UAS to ensure that it is in a condition for safe operation.
10. Prior to each flight, the PIC must conduct a pre-flight inspection and determine the UAS is in a condition for safe flight. The pre-flight inspection must account for all potential discrepancies, e.g., inoperable components, items, or equipment. If the inspection reveals a condition that affects the safe operation of the UAS, the aircraft is prohibited from operating until the necessary maintenance has been performed and the UAS is found to be in a condition for safe flight.
11. The operator must follow the UAS manufacturer's maintenance, overhaul, replacement, inspection, and life limit requirements for the aircraft and aircraft components.
12. Each UAS operated under this exemption must comply with all manufacturer safety bulletins.

13. Under this grant of exemption, a PIC must hold either an airline transport, commercial, private, recreational, or sport pilot certificate. The PIC must also hold a current FAA airman medical certificate or a valid U.S. driver's license issued by a state, the District of Columbia, Puerto Rico, a territory, a possession, or the Federal government. The PIC must also meet the flight review requirements specified in 14 CFR § 61.56 in an aircraft in which the PIC is rated on his or her pilot certificate.
14. The operator may not permit any PIC to operate unless the PIC demonstrates the ability to safely operate the UAS in a manner consistent with how the UAS will be operated under this exemption, including evasive and emergency maneuvers and maintaining appropriate distances from persons, vessels, vehicles and structures. PIC qualification flight hours and currency must be logged in a manner consistent with 14 CFR § 61.51(b). Flights for the purposes of training the operator's PICs and VOs (training, proficiency, and experience-building) and determining the PIC's ability to safely operate the UAS in a manner consistent with how the UAS will be operated under this exemption are permitted under the terms of this exemption. However, training operations may only be conducted during dedicated training sessions. During training, proficiency, and experience-building flights, all persons not essential for flight operations are considered nonparticipants, and the PIC must operate the UA with appropriate distance from nonparticipants in accordance with 14 CFR § 91.119.
15. UAS operations may not be conducted during night, as defined in 14 CFR § 1.1. All operations must be conducted under visual meteorological conditions (VMC). Flights under special visual flight rules (SVFR) are not authorized.
16. The UA may not operate within 5 nautical miles of an airport reference point (ARP) as denoted in the current FAA Airport/Facility Directory (AFD) or for airports not denoted with an ARP, the center of the airport symbol as denoted on the current FAA-published aeronautical chart, unless a letter of agreement with that airport's management is obtained or otherwise permitted by a COA issued to the exemption holder. The letter of agreement with the airport management must be made available to the Administrator or any law enforcement official upon request.
17. The UA may not be operated less than 500 feet below or less than 2,000 feet horizontally from a cloud or when visibility is less than 3 statute miles from the PIC.
18. If the UAS loses communications or loses its GPS signal, the UA must return to a pre-determined location within the private or controlled-access property.
19. The PIC must abort the flight in the event of unpredicted obstacles or emergencies.
20. The PIC is prohibited from beginning a flight unless (considering wind and forecast weather conditions) there is enough available power for the UA to conduct the

intended operation and to operate after that for at least five minutes or with the reserve power recommended by the manufacturer if greater.

21. Air Traffic Organization (ATO) Certificate of Waiver or Authorization (COA). All operations shall be conducted in accordance with an ATO-issued COA. The exemption holder may apply for a new or amended COA if it intends to conduct operations that cannot be conducted under the terms of the attached COA.
22. All aircraft operated in accordance with this exemption must be identified by serial number, registered in accordance with 14 CFR part 47, and have identification (N-Number) markings in accordance with 14 CFR part 45, Subpart C. Markings must be as large as practicable.
23. Documents used by the operator to ensure the safe operation and flight of the UAS and any documents required under 14 CFR §§ 91.9 and 91.203 must be available to the PIC at the Ground Control Station of the UAS any time the aircraft is operating. These documents must be made available to the Administrator or any law enforcement official upon request.
24. The UA must remain clear and give way to all manned aviation operations and activities at all times.
25. The UAS may not be operated by the PIC from any moving device or vehicle.
26. All Flight operations must be conducted at least 500 feet from all nonparticipating persons, vessels, vehicles, and structures unless:
  - a. Barriers or structures are present that sufficiently protect nonparticipating persons from the UA and/or debris in the event of an accident. The operator must ensure that nonparticipating persons remain under such protection. If a situation arises where nonparticipating persons leave such protection and are within 500 feet of the UA, flight operations must cease immediately in a manner ensuring the safety of nonparticipating persons; and
  - b. The owner/controller of any vessels, vehicles or structures has granted permission for operating closer to those objects and the PIC has made a safety assessment of the risk of operating closer to those objects and determined that it does not present an undue hazard.

The PIC, VO, operator trainees or essential persons are not considered nonparticipating persons under this exemption.

27. All operations shall be conducted over private or controlled-access property with permission from the property owner/controller or authorized representative. Permission from property owner/controller or authorized representative will be obtained for each flight to be conducted.

28. Any incident, accident, or flight operation that transgresses the lateral or vertical boundaries of the operational area as defined by the applicable COA must be reported to the FAA's UAS Integration Office (AFS-80) within 24 hours. Accidents must be reported to the National Transportation Safety Board (NTSB) per instructions contained on the NTSB Web site: [www.nts.gov](http://www.nts.gov).

If this exemption permits operations for the purpose of closed-set motion picture and television filming and production, the following additional conditions and limitations apply.

29. The operator must have a motion picture and television operations manual (MPTOM) as documented in this grant of exemption.
30. At least 3 days before aerial filming, the operator of the UAS affected by this exemption must submit a written Plan of Activities to the local Flight Standards District Office (FSDO) with jurisdiction over the area of proposed filming. The 3-day notification may be waived with the concurrence of the FSDO. The plan of activities must include at least the following:
  - a. Dates and times for all flights;
  - b. Name and phone number of the operator for the UAS aerial filming conducted under this grant of exemption;
  - c. Name and phone number of the person responsible for the on-scene operation of the UAS;
  - d. Make, model, and serial or N-Number of UAS to be used;
  - e. Name and certificate number of UAS PICs involved in the aerial filming;
  - f. A statement that the operator has obtained permission from property owners and/or local officials to conduct the filming production event; the list of those who gave permission must be made available to the inspector upon request;
  - g. Signature of exemption holder or representative; and
  - h. A description of the flight activity, including maps or diagrams of any area, city, town, county, and/or state over which filming will be conducted and the altitudes essential to accomplish the operation.
31. Flight operations may be conducted closer than 500 feet from participating persons consenting to be involved and necessary for the filming production, as specified in the exemption holder's MPTOM.

Unless otherwise specified in this grant of exemption, the UAS, the UAS PIC, and the UAS operations must comply with all applicable parts of 14 CFR including, but not limited to, parts 45, 47, 61, and 91.

This exemption terminates on July 31, 2017, unless sooner superseded or rescinded.

Sincerely,

/s/

John S. Duncan

Director, Flight Standards Service

Enclosures



24-April-2015

U. S. Department of Transportation  
Docket Management System  
1200 New Jersey Ave., SE  
Washington, DC 20590

Re: Exemption Request Section 333 of the FAA Reform Act and Part 11 of the Federal Aviation Regulations from 14 C.F.R. 45.23(b); 14 CFR Part 21; 14 CFR 91.7 (a); 91.9 (b) (2); 91.103(b); 91.109; 91.119; 91.121; 91.151(a); 91.203(a) & (b); 91.405 (a); 91.407(a) (1); 91.409 (a) (2); 91.417 (a) & (b).

Dear Sir or Madam:

Pursuant to Section 333 of the FAA Modernization and Reform Act of 2012 (the Reform Act) and 14 C.F.R. Part 11, Air-X Solutions hereinafter refereed to as Air-X, builder and operator of Small Unmanned Aircraft Systems ("sUASs"), hereinafter refereed to as UAS equipped to conduct aerial photography/cinematography/aerial data collection and UAS pilot training, hereby applies for an exemption from the listed Federal Aviation Regulations ("FARs") to allow commercial operation of its UAS, so long as such operations are conducted within and under the conditions outlined herein or as may be established by the FAA as required by Section 333.

As described more fully below, the requested exemption would permit the operation of small, unmanned UAS under controlled conditions in airspace that is:

1. Limited
2. Predetermined
3. Controlled as to access and,
4. Would provide safety enhancements to the already safe operations in the aerial photography/cinematography/aerial data collection and UAS pilot training industry presently using conventional aircraft. Approval of this exemption would thereby enhance safety and fulfill the Secretary of Transportation's (the FAA Administrator's) responsibilities to "... establish requirements for the safe operation of such aircraft systems in the national airspace system." Section 333(c) of the Reform Act.

The name and address of the applicant is:

Air-X Solutions  
Attn: Keith A. Johnson  
Email: airx401@yahoo.com  
Address: 4 Carmichael Street, Suite 111, #144, Essex Junction, Vt 05452

**Regulations from which the exemption is requested:**

14 CFR Part 21  
14 C.F.R. 45.23(b)  
14 C.F.R. 91.7 (a)  
14 CFR 91.9 (b) (2)  
14 C.F.R. 91.103  
14 C.F.R. 91.109  
14 C.F. R. 91.119  
14 C.F.R. 91.121  
14 CFR 91.151 (a)  
14 CFR 91.203 (a) & (b)  
14 CFR 91.405 (a)  
14 CFR 407 (a) (1)  
14 CFR 409 (a) (2)  
14 CFR 417 (a) & (b)

This exemption application is expressly submitted to fulfill Congress' goal in passing Section 333(a) through (c) of the Reform Act. This law directs the Secretary of Transportation to consider whether certain unmanned aircraft systems may operate safely in the national airspace system (NAS) before completion of the rule-making required under Section 332 of the Reform Act. In making this determination, the Secretary is required to determine which types of UAS do not create a hazard to users of the NAS or the public or pose a threat to national security in light of the following:

- The UAS size, weight, speed, and operational capability;
- Operation of the UAS in close proximity to airports and populated areas; and
- Operation of the UAS within visual line of sight of the operator.

Reform Act § 333 (a). Lastly, if the Secretary determines that such vehicles “may operate safely in the national airspace system, the Secretary shall establish requirements for the safe operation of such aircraft in the national airspace system.” Id. §333(c) (emphasis added) .

The Federal Aviation Act expressly grants the FAA the authority to issue exemptions. This statutory authority by its terms includes exempting civil aircraft, as the term is defined under §40101 of the Act, that includes UAS, from the requirement that all civil aircraft must have a current airworthiness certificate.

The Administrator may grant an exemption from a requirement of a regulation prescribed under subsection (a) or (b) of this section or any sections 44702-44716 of this title if the Administrator finds the exemption in the public interest. 49 U.S.C. §44701(f) See also 49 USC §44711(a); 49 USC §44704; 14 CFR §91.203 (a) (1).

Air-X UAS is one (1) quad-copter aircraft, constructed by Air-X with four (4) rotors and four (4) motors in a quad-copter configuration (X4), with a max gross weight of seven (7) or fewer lbs. including payload and with serial #AX001. The UAS will operate, under normal conditions at a speed of no more than 30 knots and have the capability to hover, and move in the vertical and horizontal

plane simultaneously. PIC will operate only in line of sight of UAS and will follow procedures described in the confidential Air-X Operations Handbook (AOH) which can be provide upon request. Such operations will insure that the UAS will “not create a hazard to users of the national airspace system or the public.

Given the small size of the UAS involved and the restricted nature in which it will operate, the applicant falls squarely within that zone of safety (an equivalent level of safety) in which Congress envisioned that the FAA must, by exemption, allow commercial operations of UAS to commence immediately. Also due to the size of the UAS and the nature in which the relevant UAS will operate, approval of the application presents no national security issue. Given the clear direction in Section 333 of the Reform Act, the authority contained in the Federal Aviation Act, as amended; the strong equivalent level of safety surrounding the proposed operations, and the significant public benefit, including enhanced safety, reduction in environmental impacts, including reduced emissions associated with allowing UAS for aerial photography/cinematography/aerial data collection and UAS pilot training operations, the granting of the requested exemptions is in the public interest. Accordingly, the applicant respectfully requests that the FAA grant the requested exemption without delay.

### **AIRCRAFT AND EQUIVALENT LEVEL OF SAFETY**

The applicant proposes that the exemption requested herein apply to civil aircraft that have the characteristics and that operate with the limitations listed herein. These limitations provide for at least an equivalent or even higher level of safety to operations under the current regulatory structure. The proposed operations represent a safety enhancement to the already safe photography/cinematography and data collection industry operations, conducted with conventional aircraft.

The limitations and conditions, Standard Operating Procedures (SOP), to which Air-X agrees to be bound when conducting commercial operations under an FAA issued exemption include:

1. The Pilot in Command (PIC) will be a commercially rated pilot.
2. The UAS will be operated at an altitude of no more than 200 feet above ground level (AGL). All altitudes reported to ATC will be in AGL.
3. The UAS will not be flown at an airspeed exceeding 30 knots.
4. The UAS will be operated within Visual Line of Sight (VLOS) of the PIC at all times. This requires the PIC to be able to use human vision unaided by any device other than corrective lenses.
5. All operations will utilize a Visual Observer (VO). The UAS will be operated within VLOS of the VO at all times. The VO may be used to satisfy the VLOS requirement as long as the PIC always maintains VLOS capability. The VO and PIC will be able to communicate verbally at all times. The PIC will be designated before the flight and cannot transfer his or her designation for the duration of the flight. The PIC will ensure that the VO can perform the functions prescribed in the AOH.
6. The AOH and the grant of exemption will be accessible during UAS operations and made

available to the Administrator upon request.

7. UAS operations will not be conducted during night, as defined in 14 CFR 1.1. All operations will be conducted under visual meteorological conditions (VMC).
8. A Notice to Airman (NOTAM) will be issued not less than 24 hours in advance, prior to flight operations unless:
  - (a) a request has been made to Air-X by law enforcement, first responder or exigent circumstances exist that would preclude data collection if prompt action is not taken and a waiver to the 24 hour NOTAM requirement has been given to Air-X by the controlling Air Traffic Organization (ATO).
9. Non-Controlled Airport-The UAS will not operate within two (2) nautical miles of an airport reference point as denoted on a current FAA-published aeronautical chart unless:
  - (a) radio calls are made on the airport unicom frequency prior to and during flight operations stating PIC's intentions and location. During operations altitudes are limited to 100 ft AGL and PIC will maintain visual separation from all aircraft.
10. Controlled Airport-The UAS will not operate within five (5) nautical miles of an airport reference point as denoted on a current FAA-published aeronautical chart unless:
  - (a) Prior approval has been given by the controlling ATO and two way radio communication has been established with that controlling ATO prior to/and maintained during the flight. A deviation request (if required), to operate an aircraft that is not equipped with a transponder in Class B Airspace has been approved.
  - (b) Altitudes are limited to 100 ft AGL, PIC will maintain visual separation from all aircraft, and not operate off the extended center line of the active runway unless given clearance from the controlling ATO.
11. The UAS will not be operated less than 500 feet below or less than 2,000 feet horizontally from a cloud or when visibility is less than 3 statute miles from the PIC.
12. UAS will be flown in the GPS Attitude mode during all operational flights.
13. If the UAS loses communications or loses its GPS signal, it will return to a pre-determined location within the planned operating area and land or be recovered in accordance with the AOH.
14. The PIC will not begin a flight unless (considering wind and forecast weather conditions) there is enough power to fly at normal cruising speed to the intended landing point and land the UAS with 25% battery power remaining.
15. All aircraft operated in accordance with this exemption will be identified by serial number, registered in accordance with 14 CFR part 47, and have identification (N-Number) markings in accordance with 14 CFR part 45, Subpart C. Markings will be as large as practicable.

16. Before conducting operations, the radio frequency spectrum used for operation and control of the UAS will comply with the Federal Communications Commission (FCC) or other appropriate government oversight agency requirements.
17. The documents required under 14 CFR 91.9 and 91.203 will be available to the PIC at the Ground Control Station of the UAS any time the UAS is operating. These documents will be made available to the Administrator or any law enforcement official upon request.
18. The UAS will remain clear and yield the right of way to all manned aviation operations and activities at all times.
19. The UAS may not be operated by the PIC from any moving device or vehicle unless:
  - (a) The PIC has made a safety assessment of the risk of operating and determined that it does not present an undue hazard.
20. Flight operations will be conducted at least 150 feet from all nonparticipating persons, vessels, vehicles, and structures unless:
  - (a) Barriers or structures are present that sufficiently protect nonparticipating persons from the UAS and/or debris in the event of an accident. The operator will ensure that nonparticipating persons remain under such protection. If a situation arises where nonparticipating persons leave such protection and are within 150 feet of the UAS, flight operations will cease immediately and/or;
  - (b) The aircraft is operated near vessels, vehicles or structures where the owner/controller of such vessels, vehicles or structures has granted permission or the PIC has made a safety assessment of the risk of operating closer to those objects and determined that it does not present an undue hazard, and;
  - (c) Operations nearer to the PIC, VO, operator trainees or essential persons do not present an undue hazard to those persons per § 91.119(a).
21. All operations will be conducted over private or controlled-access property with permission from the land owner/controller or authorized representative.

#### **14 C.F.R. Part 21, Subpart H: Airworthiness Certificates 14 C.F.R. §91.203 (a) (1)**

Subpart H, entitled Airworthiness Certificates, establishes the procedural requirements for the issuance of airworthiness certificates as required by FAR §91.203 (a) (1). Given the size and limited operating area associated with the aircraft to be utilized by the Applicant, an exemption from Part 21 Subpart H meets the requirements of an equivalent level of safety under Part 11 and Section 333 of the Reform Act. The Federal Aviation Act (49 U.S.C. §44701 (f)) and Section 333 of the Reform Act both authorize the FAA to exempt aircraft from the requirement for an airworthiness certificate, upon

consideration of the size, weight, speed, operational capability, and proximity to airports and populated areas of the particular UAS. In all cases, an analysis of these criteria demonstrates that the UAS operated without an airworthiness certificate, in the restricted environment and under the conditions proposed will be at least as safe, or safer, than a conventional aircraft (fixed wing or rotorcraft) operating with an airworthiness certificate without the restrictions and conditions proposed.

The UAS to be operated hereunder is less than seven (7) lbs. fully loaded, carries neither a pilot nor passenger, carries no explosive materials or flammable liquid fuels, and operates as set out in the AOH. Unlike other civil aircraft, operations under this exemption will be tightly controlled and monitored by both the operator/PIC, pursuant to the AOH's requirements, and under the requirements and in compliance with local public safety requirements, to provide security for the area of operation as is now done with conventional operations. The FAA will have advance notice of all operations. These safety enhancements, which already apply to civil aircraft operated in connection with these types of operations, provide a greater degree of safety to the public and property owners than conventional operations conducted with airworthiness certificates issued under 14 C.F.R. Part 21, Subpart H. Lastly, application of these same criteria demonstrates that there is no credible threat to national security posed by the UAS, due to its size, speed of operation, location of operation, lack of explosive materials or flammable liquid fuels, and inability to carry a substantial external load.

#### **14 C.F.R. § 45.23 (b). Marking of the Aircraft**

The regulation requires:

When marks include only the Roman capital letter "N" and the registration number is displayed on limited, restricted or light-sport category aircraft or experimental or provisionally certificated aircraft, the operator will also display on that aircraft near each entrance to the cabin, cockpit, or pilot station, in letters not less than 2 inches nor more than 6 inches high, the words "limited," "restricted," "light-sport," "experimental," or "provisional," as applicable.

Even though the UAS will have no airworthiness certificate, an exemption may be needed as the UAS will have no entrance to the cabin, cockpit or pilot station on which the word "Experimental" can be placed. Given the size of the UAV, two-inch lettering will be impossible. The word "Experimental" will be placed on the fuselage in compliance with §45.29 (f).

The equivalent level of safety will be provided by having the UAV marked on its fuselage as required by §45.29 (f) where the pilot, observer and others working with the UAV will see the identification of the UAS as "Experimental." The FAA has issued the following exemptions to this regulation to Exemptions Nos. 10700, 8738, 10167 and 10167A.

#### **14 C.F.R. §91.7(a): Civil aircraft airworthiness.**

The regulation requires that no person may operate a civil aircraft unless it is in airworthy condition. As there will be no airworthiness certificate issued for the aircraft, should this exemption be granted, no FAA regulatory standard will exist for determining airworthiness. Given the size of the aircraft and the requirements contained in the AOH for maintenance and use of safety check lists prior

to each flight, an equivalent level of safety will be provided.

**14 C.F.R. § 91.9 (b) (2): Civil Aircraft Flight Manual in the Aircraft.**

Section 91.9 (b) (2) provides:

No person may operate a U.S.-registered civil aircraft ...

- (2) For which an Airplane or Rotorcraft Flight Manual is not required by §21.5 of this chapter, unless there is available in the aircraft a current approved airplane or Rotorcraft Flight Manual, approved manual material, markings, and placards, or any combination thereof.

The UAS, given its size and configuration has no ability or place to carry such a flight manual on the aircraft, not only because there is no pilot on board, but because there is no room or capacity to carry such an item on the aircraft.

The equivalent level of safety will be maintained by keeping the flight manual at the ground control point where the pilot flying the UAS will have immediate access to it. The FAA has issued the following exemptions to this regulation: Exemption Nos. 8607, 8737, 8738, 9299, 9299A, 9565, 9565B, 10167, 10167A, 10602, 32827, and 10700.

**14 C.F.R. § 91.103: Preflight action:**

This regulation requires each PIC to take certain actions before flight to insure the safety of flight. As FAA approved flight manuals will not be provided for the aircraft an exemption will be needed. An equivalent level of safety will be provided as set forth in the AOH. The PIC will take all actions including reviewing weather, flight battery requirements, landing and takeoff distances and aircraft performance data before initiation of flight.

**14 C.F.R. §91.109: Flight instruction:**

Section 91.103 provides that no person may operate a civil aircraft (except a manned free balloon) that is being used for flight instruction unless that aircraft has fully functioning dual controls.

UAS and remotely piloted aircraft, by their design do not have fully functional dual controls. Flight control is accomplished through the use of a control box that communicates with the aircraft via radio communications. The FAA has approved exemptions for flight training without fully functional dual controls for a number of aircraft and for flight instruction in experimental aircraft. See Exemption Nos. 5778K & 9862A. The equivalent level of safety provided by the fact that neither a pilot nor passengers will be carried in the aircraft and by the size and speed of the aircraft.

**14 C.F.R. §91.119: Minimum safe altitudes**

Section 91.119 establishes safe altitudes for operation of civil aircraft. Section 91.119 (d) allows helicopters to be operated at less than the minimums prescribed, provided the person operating the

helicopter complies with any route or altitudes prescribed for helicopters by the FAA. As this exemption is for a UAS that is a helicopter and the exemption requests authority to operate at altitudes up to 200 AGL. As set forth herein, the UAS will never operate at higher than 200 AGL.

The equivalent level of safety will be achieved given the size, weight, speed of the UAS as well as the location where it is operated. No flight will be taken without the permission of the property owner or local officials. Because of the advance notice to the property owner and participants in the aerial photography/cinematography/aerial data collection and UAS pilot training activity, all affected individuals will be aware of the planned flight operations as set forth in AOH. Compared to flight operations with aircraft or rotorcraft weighing far more than the maximum seven (7) lbs. proposed herein and the lack of flammable fuel, any risk associated with these operations is far less than those presently presented with conventional aircraft operating at or below 500 AGL in similar industry. In addition, the low-altitude operations of the UAS will ensure separation between these UAS operations and the operations of conventional aircraft that will comply with Section 91.119.

#### **14 C.F.R. §91.121 Altimeter Settings**

This regulation requires each person operating an aircraft to maintain cruising altitude by reference to an altimeter that is set "...to the elevation of the departure airport or an appropriate altimeter setting available before departure." As the UAS may not have a barometric altimeter, but instead a GPS altitude hold, an exemption may be needed. An equivalent level of safety will be achieved by the operator, pursuant to the AOH and safety check list.

#### **14 C.F.R. § 91.151(a): Fuel Requirements for Flight in VFR Conditions**

Section 91.151 (a) prohibits an individual from beginning "a flight in an airplane under VFR conditions unless (considering wind and forecast weather conditions) there is enough fuel to fly to the first point of intended landing, and, assuming normal cruising speed – (1) During the day, to fly after that for at least 30 minutes; or (2) At night, to fly after that for at least 45 minutes."

The battery powering the UAS provides approximately 12 minutes of powered flight. To meet the 30 minute reserve requirement in 14 CFR §91.151, UAS flights would be limited to approximately nine (9) minutes in length. Given the limitations on the UAS proposed flight area and the UAS can be landed within a very short time frame a nine (9) minute flight time seems reasonable.

Applicant believes that an equivalent level of safety can be achieved by limiting flights to nine (9) minutes or 25% of battery power whichever happens first. This restriction would be more than adequate to return the UAS to its planned landing zone from anywhere in its limited operating area.

Similar exemptions have been granted to other operations, including Exemptions 2689F, 5745, 10673, 11138 and 10808.

#### **14 C.F.R. §91.203 (a) and (b): Carrying Civil Aircraft Certification and Registration**

The regulation provides in pertinent part:

(a) Except as provided in § 91.715, no person may operate a civil aircraft unless it



has within it the following:

(1) An appropriate and current airworthiness certificate. . . .

(b) No person may operate a civil aircraft unless the airworthiness certificate required by paragraph (a) of this section or a special flight authorization issued under §91.715 is displayed at the cabin or cockpit entrance so that it is legible to passengers or crew.

The UAS fully loaded weighs no more than seven (7) lbs and is operated without an on-board pilot. As such, there is no ability or place to carry certification and registration documents or to display them on the UAS.

An equivalent level of safety will be achieved by keeping these documents at the ground control point where the pilot flying the UAS will have immediate access to them, to the extent they are applicable to the UAS. The FAA has issued numerous exemptions to this regulation. A representative sample of other exceptions includes Exemption Nos. 9565, 9665, 9789, 9789A, 9797, 9797A, 9816A, and 10700.

#### **14 C.F.R. §91.405 (a); 407 (a) (1); 409 (a) (2); 417(a) & (b): Maintenance Inspections**

These regulations require that an aircraft operator or owner “shall have that aircraft inspected as prescribed in subpart E of this part and shall between required inspections, except as provided in paragraph (c) of this section, have discrepancies repaired as prescribed in part 43 of this chapter...,” and others shall inspect or maintain the aircraft in compliance with Part 43.

Given that this section and Part 43 apply only to aircraft with an airworthiness certificate, these sections will not apply to the applicant. Maintenance will be accomplished by the operator/PIC pursuant to the AOH. An equivalent level of safety will be achieved because these UAS are very limited in size and will carry a small payload and operate for limited periods of time. If mechanical issues arise the UAS can land immediately and will be operating from no higher than 200 feet AGL. As provided in the AOH, the operator/PIC will ensure that the UAS is in working order prior to initiating flight, perform required maintenance, and keep a log of any maintenance performed. Moreover, the operator is the person most familiar with the aircraft and best suited to maintain the aircraft in an airworthy condition to provide the equivalent level of safety.

Pursuant to 14 C.F.R. Part 11, the following summary is provided for publication in the Federal Register, should it be determined that publication is needed:

Applicant seeks an exemption from the following rules: 14 C.F.R. §21, subpart H; 14 C.F.R. 45.23(b); 14 C.F.R. §§ 91.7 (a); 91.9 (b) (2); 91.103(b); 91.109; 91.119; 91.121; 91.151(a); 91.203(a) and (b); 91.405 (a); 91.407 (a) (1); 91.409 (a) (2); 91.409 (a) (2) and 91.417 (a) & (b) to operate commercially a small unmanned vehicle (55lbs or less) in aerial photography/cinematography/aerial data collection and UAS pilot training operations.

Approval of exemptions allowing commercial operations of UAS in the aerial photography/cinematography/aerial data collection and UAS pilot training industry will enhance safety by reducing risk. Operation of conventional aircraft in these situations, using turbine or piston powered

aircraft, weighing thousands of pounds, carrying large amounts of Jet A or Avgas fuel, and operating in close proximity to people and structures present a far greater risk to people and property than a UAS in the same situation. Manned aircraft have to fly to and from the operations location wasting time and resources that can be used in obtaining product. In addition, customers who are not wealthy enough to pay hundreds of dollars to rent manned aircraft and equipment operators are excluded from obtaining these services. In contrast, UAS flights are of a shorter duration, they weighing fewer than 55 lbs., and are powered by batteries which eliminates virtually all of the above risk given the reduced mass and lack of combustible fuel. UAS operations are not started until the operations area is cleared and operations can be stopped in seconds if none participating personnel enter the operations area. The UAS will carry no passengers or crew and, therefore, will not expose them to the risks associated with manned aircraft flights.

The operation of small UAS, weighting less than 55 lbs., conducted in the conditions outlined above, will provide an equivalent level of safety supporting the grant of the exemptions requested herein, including exempting the applicant from the requirements of Part 21 and allowing commercial operations. These lightweight aircraft operate at slow speeds, close to the ground, are in a supervised environment and, as a result, are far safer than conventional operations conducted with conventional manned aircraft operating in close proximity to the ground and people.

**Note:** The upper Northeast Region of the United States consisting of Vermont, Upper State New York, New Hampshire and Maine, where the majority of Air-X operations will be conducted, are low population areas. However, a large section of the population of these states reside in urban areas that are in close proximity to Class C Airspace. Vermont for example has one (1) airport with Class C Airspace, Burlington International Airport (KBTB). Within the five (5) mile ring of the KBTB Class C Airspace there are seven (7) cities/towns that include approximately 130,000 of Vermont's 625,000 citizens. To exclude that population from affordable aerial photography/cinematography/aerial data collection and UAS pilot training unjustly discriminates that section only because they are located within Class C Airspace. In addition, these restrictions impede operations like Air-X in their ability to solicit business from a large part of the population that would benefit from this service including law enforcement and first responders that cannot maintain a UAS under a public category exemption due to financial or manpower limitations. Air-X has provided a framework for safe operations in Class B or C Airspace that mirrors current FAA regulations. Air-X can provide, upon request, the qualifications of it's Chief Pilot that reflects nearly 37 years of safe operation of manned aircraft in the NAS, extensive training and 18 years specialized experience in aerial photography/cinematography and aerial data collection.