



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

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

June 26, 2015

Exemption No. 11928  
Regulatory Docket No. FAA-2015-0097

Mr. Michael Brewer  
B & N Aerial Innovations  
170 Queso Place  
Fremont, CA 94539

Dear Mr. Brewer:

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.

### **The Basis for Our Decision**

By letter dated January 13, 2015, you petitioned the Federal Aviation Administration (FAA) on behalf of B & N Aerial Innovations (hereinafter petitioner or operator) for an exemption. The exemption would allow the petitioner to operate an unmanned aircraft system (UAS) to conduct aerial photographic and surveying services.

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. However, the FAA received one comment in support of the petition made to the docket.

### **Airworthiness Certification**

The UAS proposed by the petitioner is a DJI Phantom 2 Vision +.

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>1</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.

### **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, B & N Aerial Innovations 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)

---

<sup>1</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.

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, B & N Aerial Innovations 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 DJI Phantom 2 Vision + 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 Colombia, 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 June 30, 2017, unless sooner superseded or rescinded.

Sincerely,

/s/

John S. Duncan

Director, Flight Standards Service

Enclosures



B & N Aerial Innovations, January 13, 2015

Re: Exemption Request Pursuant To Section 333 of the FAA Reform Act of 2012

Pursuant to §333 of the FAA Modernization and Reform Act of 2012 (the Reform Act) and 14 C.F.R. Part 11, B & N Aerial Innovations, operator of Small Unmanned Aircraft Systems (sUASs) equipped to conduct aerial photography for the Real Estate, media and advertising industries for pre-planned, controlled area, photographic and surveying services, hereby applies for an exemption from the listed Federal Aviation Regulations (FARs) to allow commercial operation of its UAS's, so long as such operations are conducted within and under the conditions outlined herein or as may be established by the Federal Aviation Administration (FAA) as required by §333. B & N Aerial Innovations' current operation of sUASs for commercial purposes has been halted to comply with recently enacted federal aviation regulations pertaining to UAS's. As described more fully below, the requested exemption would permit the operation of small, unmanned and relatively inexpensive multirotor aircraft under controlled conditions in airspace that is 1) contained 2) predetermined 3) has on-site safety personnel controlling access, and 4) would provide increased safety and enhancements to clients' business operations.

Exemption Request Pursuant To Section 333 of the FAA Reform Act of 2012

B & N Aerial Innovations respectfully requests a grant of an exemption of the following sections of Title 14 of the Code of

Federal Regulations:

- 14 CFR 21;
- 14 CFR 91, et seq.;
- 14 CFR 45.23 (b); Re: Exemption Request Pursuant To Section 333 of the FAA Reform Act of 2012
- 14 CFR 61.113 (a) & (b);
- 14 CFR 407 (a)(I);
- 14 CFR 409 (a)(2);
- 14CFR417(a)&(b).

B & N Aerial Innovations also respectfully requests an Exemption from Section 333 of the FAA Reform Act and Part 11 of the Federal Aviation Regulations from:

- 14 CFR 45.23(b);
- 14 CFR Part 21;
- 14 CFR 61.1 13 (a) & (b);
- 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).

I. The Extent of Relief B & N Aerial Innovations Seeks and the Reason It Seeks Such Relief:

B & N Aerial Innovations submits this application in accordance with the Reform Act, 112 P.L. 95 §§331-334, seeking relief from any currently applicable federal aviation regulations PARs pertaining to UASs (unmanned aircraft systems) and operating to prevent B & N Aerial Innovations contemplated commercial photographic, mapping, and other flight operations within the U.S. national airspace system. The Reform Act in §332 provides for such integration of civil UASs into our national airspace system as it is in the public's interest to do so. B & N Aerial Innovations' lightweight UASs meet the definition of "small unmanned aircraft" as set forth in §331 and combined with a sterling safety record in similar industries, B & N Aerial Innovations' light duty UASs are ideal recipients of exemption by the intent of the Reform Act. Considerations for relief include a combination of sUAS physical characteristics, safety features, and safe practices identified in §333:

- sUAS weight,
- sUAS overall size,
- sUAS speed over ground,
- sUAS flight zone characteristics,
- Non-operation near airports (civilian or military),
- Tightly controlled operation in populated areas,
- Operation of the UAS by VLOS.
- Coordination by a minimum of 4 persons, three staff members of B & N Aerial Innovations and one safety official from the client.

Specific consideration is outline below.

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 sUASs, an exemption from Part 21 Subpart H meets the

requirements of an equivalent level of safety under Part 11 and §333 of the Reform Act. 111e Federal Aviation Act (49 U.S.C. §4470 1 (f)) and §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 sUAS. 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 sUAS to be operated by B & N Aerial Innovations is less than 11kg. with maximal payload consisting of remote sensing instrumentation, carries neither no persons, carries no explosive or flammable materials including combustible fuels, and operates exclusively within a secured area. Unlike other civil aircraft, operations under this exemption will be tightly controlled and monitored by both the pilot (PIC), 'spotter' role designated to act as both the remote sensing controller and secondary monitor for safety issues, and a technician, which assists in matters related to maintaining the sUAS and also monitors for safety concerns and liaisons to the on-site safety officials. These enhancements to current safety practices and regulations, which already apply to civil aircraft, provide a greater degree of safety to the public and property owners than conventional aircraft 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 intrinsic credible threat to national security posed by the UAS, due to its size, speed of operation, location of operation, lack of intrinsic 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 must 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 sUAS will have no airworthiness certificate, an exemption may be needed as the sUAS will have no entrance to the cabin, cockpit or pilot station on which the word "Experimental" can be placed. Given the size of the sUAS, two-inch lettering will be impossible. The word "Experimental" will be placed on the frame in compliance with §45.29 (f) at a size suitable for the available space. The equivalent level of safety will be provided by having the sUAS marked on its fuselage as required by §45.29 (f) where the pilot, observer and others working with the sUAV 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. Further markings include the use of flashing green LED illumination on the underside of the sUAS frame which stands at contrast against a blue or white sky

#### 14 C.P.R. §61.113 (a) & (b): Private Pilot Privileges and Limitations: Pilot in Command.

§61.113 (a) & (b) limit private pilots to non-commercial operations. Because the sUAS will not carry a pilot or passengers, the proposed operations can achieve the equivalent level of safety of current operations by requiring a ground crew member to have a private pilot's license rather than a commercial pilot's license to operate this sUAS. Unlike a conventional aircraft that carries the pilot and passengers, the sUAS is remotely controlled with no persons on board. The area of operation is controlled and restricted, and all flights are planned and coordinated in advance. The risks associated with the operation of the sUAS are so diminished from the level of risk associated with commercial

operations contemplated by Part 61 when drafted, that allowing operations as requested with a private pilot in the ground crew exceeds the present level of safety achieved by 14 C.F.R. §61.13 (a) & (b).

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 Manual for maintenance and use of safety check lists prior to each flight, a subset of which are provided in enclosed Supplemental material, an equivalent level of safety will be provided. 14 C.F.R. §91.9 (b) (2): Civil Aircraft Flight Manual in the Aircraft. §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 sUAS, given its size and configuration has no ability to carry a physical flight manual 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 sUAS will have immediate access to it. The FAA has issued the following exemptions to this regulation: Exemption Nos. 8607,8737,8738,9299, 9299A, 9565,95658, 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 rotorcraft flight manuals will not be provided for the aircraft an exemption will be needed. The PIC will take all actions including reviewing weather, flight battery requirements, landing and takeoff distances and aircraft performance data before initiation of flight. Further, we have proprietary manuals created with the help of sUAS experts, the manufacturer, the regional sUAS vendor and policy holding insurer and continue to work with these organizations to ensure best safe practices are adhered to. 14 C.F.R. §91.109: Flight instruction §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. sUASs 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. Enhancing this safety is the technology inherent in the remote controls utilizing digital communications which is paired to the sUAS making it nearly impossible to unintentionally or intentionally have the control communications interrupted.

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

§91.119 establishes safe altitudes for operation of civil aircraft. §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 sUAS that closely mimics the behavior of a helicopter, and the exemption requests authority to operate at altitudes up to 400 AGL, an exemption may be needed to allow such operations. As set forth herein, the UAS will never operate at higher than 400 AGL or beyond unaided visual line of sight, whichever is closer. It will however be operated in a restricted area with security officials tasked with ensuring public safety, and where buildings and people will not be exposed to operations without their pre-obtained

consent and training. 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 operation will be taken without the permission of the property owner in the case of private property or local officials in the case of public property or private property with public interests. Because of the advance notice to the property owner and participants in the remote sensing activity, all affected individuals will be aware of the planned flight operations. Compared to flight operations with aircraft or rotorcraft weighing far more than the maximum 11kg of B & N Aerial Innovations' sUASs 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 addition, the low-altitude operations of the sUAS will ensure separation between these small- UAS operations and the operations of conventional aircraft that must comply with §91.119.

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

§91.121 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 sUAS may not have a barometric altimeter, but instead a GPS altitude read out, an exemption may be needed. An equivalent level of safety will be achieved by the operator, confirming the altitude of the launch site shown on the GPS altitude indicator before flight. The PIC and Technician will also ensure effective pairing with multiple GPS sources to guarantee accurate detection of height. 14 C.F.R. §91.151(a): Fuel Requirements for Flight in VFR Conditions §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 sUAS provides approximately 15 minutes of powered flight in hover mode without payload. B & N Aerial Innovations' sUAS will not be able to meet the 30 minute reserve requirement in 14 CFR §91.151. Operating the small UAS, in a tightly controlled area where only people and property owners or official representatives who have signed waivers will be allowed, with less than 30 minutes of reserve power, does not engender the type of risks that Section 91.151(a) was intended to alleviate given the size and speed of the small UAS. B & N Aerial Innovations believes that an equivalent level of safety can be achieved by limiting flights to » 10 minutes or 25% of battery power whichever happens first. This restriction would be more than adequate to return the sUAS 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, and 10808

#### 14 C.F.R. §91.203 (a) & (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 sUAS fully loaded weighs no more than 11 kg and is operated without an onboard pilot. As such, there is no ability or place to carry certification and

registration documents or to display them on the sUAS. An equivalent level of safety will be achieved by keeping these documents at the ground control point where the pilot flying the sUAS will have immediate access to them, to the extent they are applicable to the sUAS. 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 these 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 pursuant to the flight manual. An equivalent level of safety will be achieved because these small UASs are very limited in size and will carry a small payload and operate only in restricted areas for limited periods of time. If mechanical issues arise the UAS can land immediately and will be operating from no higher than 400 feet AGL. The operator 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. An exemption granted to B & N Aerial Innovations would permit its operation of lightweight, unmanned, remotely controlled, sUASs in a tightly controlled environment with limited airspace. B & N Aerial Innovations utilizes local business' safety officers in specifically determined areas (designed flight zone) to mitigate injury and property damage while fulfilling clients' goals. Technical enhancements to current safety controls will allow B & N Aerial Innovations to operate exceeding current safety specifications, and stay ahead of, or meet, new ones being implemented by the FAA and Department of Transportation. Further, B & N Aerial Innovations conducts its operations in compliance with protocols described herein or as otherwise established by the FAA.

## II. Commercial and Public Benefits

We at B & N Aerial Innovations believe that granting this exemption request furthers the public interest by providing safe (by way of an unmanned system) and efficient means to meet technical problems solvable by elevated data collection instruments. B & N Aerial Innovations client base are typically small to medium sized business' looking to increase their awareness of structures or landscape on their respective properties through data collection by photographic, videographic or lidar based surveying. By moving these functions onto sUAS based aircraft, the potential for loss of life or property is diminished due to the greater control in a smaller and safer aircraft that holds no persons. Second, there are no reactive or combustible materials on board the sUAS and thus the potential for fire or explosions is greatly diminished. Third, the small size and extreme maneuverability of B & N Aerial Innovations UASs allow the PIC to avoid hazards. Lastly, due to the nature of the remote sensing instrumentation onboard, the sUAS can maintain quite a safe distance between the aircraft and the object(s) undergoing scrutiny. Accordingly, B & N Aerial Innovations' UASs have operated and will continue to operate at and above current safety levels.

### A. The costs and benefits of your proposed action to society in general and specific groups within society

As described above, B & N Aerial Innovations' past customers have been small to medium business seeking a remote sensing solution to specific issues before a larger effort on their part would come underway. Examples include Real Estate efforts that sought elevated photographic imagery of specific

Estates to minimize cost of efforts to market said homes. The angles that can be achieved by means of sUASs give a home buyer an extended feeling of the property within. The impact to society, financial and otherwise, would be extremely minimal. Indeed, it's been demonstrated that sUASs have the ability to drastically increase the information available to policymakers at a fraction of the cost of measuring this data by terrestrial means. One such impact would be inconvenience to directly proximal and non-essential personnel that would be displaced from public or business owned property if it is deemed to be unsafe. In this case we relay our needs for a flight zone with the requirement that it be safe from casual intrusions and allow the business time to shift operations in order to minimize potential safety issues. This is best performed with the aid of safety personnel that actively steer non-essential persons around the flight zone.

1. The effect of an exemption for B & N Aerial Innovations on the quality of the natural and social environments

Utilizing sUASs minimizes the requirement for conventional aircraft. This eliminates the need for an on board pilot, time consuming adherence to regulations surrounding bookeeping and submission of flight paths to local civilair or military airports, and detrimental effects to the environment caused by operating a combustibile fuel based, large scale aircraft, with restrictions on the proximity to the target for remote sensing.

III. Flight Capabilities and Characteristics of B & N Aerial Innovations' UASs Pursuant to 112 P.L. 95 §333 (a), concerns for public safety are mitigated by the overall capabilities and characteristics of the sUAS. 1 B & N Aerial Innovations UASs utilizes eight (8) counter-rotating propellers paired oppositely to each other for balance, control and stability. The total span of the sUAS is 1.2m allowing for stable flight or landing even with the sudden onset of detrimental environmental conditions. The sUAS's have a maximal unit+ payload mass of 11kg, including cinematic/photographic or other surveying equipment. B & N Aerial Innovations' sUAS is designed to primarily hover in place to capture photographic data and then operate at less than a 35 knot maximum speed to the next point of interest. They are capable of vertical and horizontal operations but, in practice, is operated only within unaided VLOS of the PIC. In addition to the PIC, B & N Aerial Innovations employs a spotter (VOS role) and a technician (secondary VOS and on-site personnel) which are within unaided verbal communication range. These personnel are supplemented by safety officials provided by the client who are instructed to cordon off and otherwise minimize pedestrian access in the flight zone of the client's grounds. In the event of loss of visual of the UAS, the PIC can change flight controls from Cartesian (X,Y,Z) based controls to radial (r, a, h) based controls which allows the PIC to utilize one controller axis to recall the VAS to the PIC's position without concern to the current heading of the sUAS. In the event of loss of sight of the sUAS into an area containing hazards or possible hazards, the spotter has a heads-up-display containing a live video feed which can be used to locate the UAS while it maintains its position in hover mode. The sUAS has demonstrated it's ability to maintain it's position by GPS coordinates in hover mode in 25 kph wind gusts at 25 feet representing an extreme environmental condition beyond the range of conditions within the scope for sUAS operation. All of B & N Aerial Innovations' sUASs utilize LiPo (lithium polymer) battery based power sources, decreasing safety risks from more easily combustibile, fuel based, power sources. Flight times generally last between eight (8) to ten (10) minutes allowing the staff to work with small flight areas per phase. The maximum flight time without payload is 15 minutes, however practical safe operation limits this to 10 to give ample time to control the sUAS to a safe landing zone. B & N Aerial Innovations further restricts flight time by not operating its sUASs with less than twenty five percent battery capacity. Further safety management systems in place include a GPS mode that allows B & N Aerial Innovations sUASs to hover in place if communication with the PIC is lost and optionally follow a set of waypoints at a set speed and height to a 'home base' predesignated safe landing zone. In

the event of unforeseen motor(s) failure, the system will enter into a controlled descent while allowing full use of all UAS flight controls by the PIC. All commands sent via remote controller received during a controlled descent are translated to an 'as meant' paradigm meaning the flight control package will use its real time 3 dimensional position and compensate rotors control the sUAS regardless of spin velocity. Landing gear is also programmed to deploy based on sensing of range to ground from non-GPS based sources. This assures that if one system is compensated a safe and successful landing can still occur.

#### IV. Reasons Why an Exemption to B & N Aerial Innovations Will Not Adversely Affect Safety Standards

B & N Aerial Innovations' contends that operation of its sUASs will not "create a hazard to users of the national airspace system or the public:" as stated in 112 P.L. 95 §333 (b). Given the diminutive size and weight of B & N Aerial Innovations' sUASs, combined with their operation in cordoned off and well-controlled areas, B & N Aerial Innovations' sUASs falls within Congress's contemplated safety zone. B & N Aerial Innovations sUASs have an established safety record bolstered by multi-point preflight checklist, awareness of their surroundings and intimate knowledge of the behavior of the sUAS platform in many weather conditions. This safety record and implemented operational practices demonstrate an awareness of public safety. B & N Aerial Innovations operations routinely provide a level of safety at least equal to existing rules, and in nearly every instance, exceeds existing rules. B & N Aerial Innovations has worked very closely with the regional vendors and support for this unit to create a tightly integrated and highly fault tolerant platform that has been tested thoroughly by a vendor with a proven record for safety and solid designs. Though it does not mitigate safety it is of note that as of Nov 2014 there are few companies that will insure sUAS operations and sUAS based companies. The sUAS of use at B & N Aerial Innovations is one of two models (by current awareness) that qualify for protection against damages or injury. B & N Aerial Innovations attained the maximal level of insurance to rectify accidental damage or injury. B & N Aerial Innovations also continues to work closely with this organization to identify and mitigate sUAS platform risk due to their expertise in several industries closely related to the aviation and transportation. B & N Aerial Innovations does not operate its UASs on or near airports and generally has only operated its fleet on private grounds with cordoned off areas or areas under the control of the property owner I client with assistance by safety officials employed by the business. B & N Aerial Innovations determines the areas needed to fulfill the clients' goals and only operates its UASs in these flight zones and only in compliance with well regarded safety protocols set forth initially by the RC UAS trade and hobby groups and recently codified by relevant FARs.

B & N Aerial Innovations standardized on the following practices to ensure safe operation of its UASs:

- Work with on-site personnel to plan the flight goals,
- Work with on-site personnel to restrict access to non-essential persons,
- Operation by unaided VLOS operation only,
- Operation in phases 10 minutes in length,
- Operation to minimal 25% battery power,
- Operation of device to GPS aided readout to 300ft at maximum,
- Numerous pre-programmed fail-safes that ensure specific behavior per issue,
- Three main roles supplemented by on-site safety personnel,
- Employ controlled lifecycle management of components to guard against multiple failures,



- Perform a site check day(s) before flight to identify potential issues,
- Subscribe to relevant local weather and safety alerts, Expertly choose data collection instruments and accessories to minimize flight requirements or expertise.

B & N Aerial Innovations has experience in similar fields and has adapted this experience in it's use of UASs to increase safety. In combination to the ever expanding knowlege repositories from hobbyists and experts alike, B & N Aerial Innovations is constantly evolving it's practices when there is a clear benefit to operations or increased safety element.

#### A. Summary

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: B & N Aerial Innovations {applicant} seeks an exemption from the following rules: 14 C.P.R. §21, subpart H; 14 C.F.R 45.23(b); 14 C.P.R. §§61.113( a) & (b); 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); 91.409 (a) {2} and 91.417 (a) & (b) to operate commercially a small unmanned vehicle (11kg or less) in elevated photographic and remote sensing operations. Approval of exemptions allowing commercial operations of sUASs in the media industry will enhance safety by reducing risk associated with conventional aircraft operations and other means of elevated remote sensing involving persons. The public benefit served by approval of this petition is increased awareness of characteristics of difficult imaging targets. A sUAS weighing fewer than 11kg and powered by sealed batteries eliminates virtually all associated risk inherent in operating conventional aircraft in close proximity to buildings or persons or otherwise elevating persons to a position they would be able to collect needed data. The operation of small UASs, weighting less than 55lbs., conducted in the strict 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.

As identified and described herein, Michael Brewer, and her company B & N Aerial Innovations, is an experienced, recognized media services professional in the various photographic industries. Mr. Brewer and his companies have been producing and delivering media and technical solutions for the media service industry for ten (10) years with a spotless safety record. The FAA has been given the authority to issue the exemption to B & N Aerial Innovations pursuant to the Federal Aviation Act, 85 P.L. 726 (1958), and as such, we humbly seek your consideration and approval of this petition.

PIC VLOS Best,

Michael Brewer