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

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

May 11, 2015

Exemption No. 11529
Regulatory Docket No. FAA–2015–0425

Mr. Joshua A. Strunk
359 Norwich Westerly Road
North Stonington, CT 06359

Dear Mr. Strunk:

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 posted February 20, 2015, you petitioned the Federal Aviation Administration (FAA) for an exemption. The exemption would allow the petitioner to operate an unmanned aircraft system (UAS) to conduct aerial photography and cinematography to perform geographic studies and to augment real estate listings.

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.

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. 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, Mr. Joshua A. Strunk 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, Mr. Joshua A. Strunk 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 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.ntsb.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 May 31, 2017, unless sooner superseded or rescinded.

Sincerely,

/s/

John S. Duncan
Director, Flight Standards Service

Joshua A. Strunk

359 Norwich Westerly Road

North Stonington, CT 06359

C: 860.460.2501

I, Joshua Strunk, am petitioning the Federal Aviation Administration for exemption from part 21, subpart H; and Sections 45.23(b), 61.113(a) and (b), 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), and 91.417(a) and (b) of Title 14, Code of Federal Regulations (14 CFR).

Summary:

The exemption would allow me to operate a DJI PHANTOM 2 Vision+ quad-copter unmanned aircraft system (UAS) to conduct aerial photography and cinematography to perform geographic studies of the Southeastern New England Region pertaining to coastal geomorphology and fluvial change in coastal regions and augment real estate listings to show boundaries and proximity to the natural and anthropogenic surroundings.

Description:

I have taken 4 hours of flight training as a private pilot to date and plan to continue working to earn my private pilot's license. With this said there is very little, if anything, in common while flying a small aircraft with enclosed cabin and a 3.5 pound UAS. The flight characteristics, control schemes, methods of preflight and everything from take off until landing are different. To keep the various craft from intruding into each other's airspace is the most important goal. Knowing the appropriate airspace and approach routes for various craft is extremely important and the most important trans-craft knowledge to be had.

As such the exemptions from the following sections would permit me to operate a UAS in a safe and controlled manner away from the airspace that aircraft are permitted to use; or if the UAS is to enter the same airspace all property authorities shall be notified to ensure all required persons are aware of the UAS. The following statements and exemption requests will detail how the safety precautions will be met. Permitting exemption to the following would allow the public to see how a UAS can be used to promote public awareness and demonstrate the usefulness of small UAS to photograph areas and regions in circumstances where large aircraft are not feasible due to geographic or monetary reasons. Examples would be detailed, high resolution images of rivers, beaches, and estuaries showing the changes due to sea level rise, storm events and anthropogenic acts like jetties and breach ways.

Sections for requested Exemption:

Responses to the following sections are in italics.

Part 21 prescribes the procedural requirements for issuing and changing design approvals, productions approvals, airworthiness certificates, and airworthiness approvals.

Section 45.23(b) prescribes that 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.

The size of the UAS is too small to fit the required markings on the fuselage. A smaller type or different designation could be used.

Section 61.113(a) and (b) prescribes that—

> (a) no person who holds a private pilot certificate may act as a pilot in command of an aircraft that is carrying passengers or property for compensation or hire; nor may that person, for compensation or hire, act as pilot in command of an aircraft.
>
> (b) a private pilot may, for compensation or hire, act as pilot in command of an aircraft in connection with any business or employment if:
>
> (1) The flight is only incidental to that business or employment; and
>
> (2) The aircraft does not carry passengers or property for compensation or hire.

The UAS is not capable of carrying passengers or is able to carry cargo aside from the mentioned gimbal mounted camera.

Section 91.7(a) prescribes that no person may operate a civil aircraft unless it is in an airworthy condition.

There are no specifications on what makes a UAS airworthy, during the preflight checks all propellers and mountings are checked for damage and operation.

Section 91.7(b) prescribes that the pilot in command of a civil aircraft is responsible for determining whether that aircraft is in condition for safe flight and that the PIC shall discontinue the flight when unairworthy mechanical, electrical, or structural conditions occur.

Preflight checks shall be completed before lift off and continuous monitoring of in-flight systems shall be performed from the ground station from the moment of powering up for preflight until

shutting down at the end of the operation.

Section 91.9(b)(2) prohibits operation of U.S.-registered civil aircraft 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.

Supplemental materials will include equipment and flight manuals issued with the UAS.

Section 91.103(b) prescribes that a pilot shall for any flight, become familiar with runway lengths at airports of intended use, and takeoff and landing distance information.

All landing zones will be thoroughly checked and flight areas reviewed before any flights are made.

Section 91.109(a) prescribes, in pertinent part, 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.

The system is not available with dual controls, though with the UAS size and training in safe areas the instruction could be contained to a safe altitude and area where safety can be optimized for all involved.

Section 91.119 prescribes that, except when necessary for takeoff or landing, no person may operate an aircraft below the following altitudes:

> (a) Anywhere. An altitude allowing, if a power unit fails, an emergency landing without undue hazard to persons or property on the surface.
>
> (b) Over congested areas. Over any congested area of a city, town, or settlement, or over any open air assembly of persons, an altitude of 1,000 feet above the highest obstacle within a horizontal radius of 2,000 feet of the aircraft.
>
> (c) Over other than congested areas. An altitude of 500 feet above the surface, except over open water or sparsely populated areas. In those cases, the aircraft may not be operated closer than 500 feet to any person, vessel, vehicle, or structure.
>
> (d) Helicopters, powered parachutes, and weight-shift-control aircraft. If the operation is conducted without hazard to persons or property on the surface—
>
> (1) A helicopter may be operated at less than the minimums prescribed in paragraph (b) or (c) of this section, provided each person operating the helicopter complies with any routes or altitudes specifically prescribed for helicopters by the FAA; and
>
> (2) A powered parachute or weight-shift-control aircraft may be operated at less than the minimums prescribed in paragraph (c) of this section.

Due to altitude limitations and the desire to avoid passenger carrying aircraft it is requested to maintain a maximum ceiling of 400' with typical heights being below that dependent on angles and shots for photographic use.

Section 91.405(a) requires, in pertinent part, that an aircraft operator or owner shall have that aircraft inspected as prescribed in subpart E of the same part and shall, between required inspections, except as provided in paragraph (c) of the same section, have discrepancies repaired as prescribed in part 43 of the chapter.

As there are no current maintenance requirements for UAS of this type it is not possible to meet this requirement at this time.

Section 91.121 requires, in pertinent part, 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."

The UAS is single operator only with no dual controls so there will be only one pilot during flight, the GPS system will reference the altitude at the launch point for every flight. This will also be the point that the UAS will return to upon completion.

Section 91.151(a) prescribes that no person may begin 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 [emphasis added].

Section 91.203(a) prohibits, in pertinent part, any person from operating a civil aircraft unless it has within it (1) an appropriate and current airworthiness certificate; and (2) an effective U.S. registration certificate issued to its owner or, for operation within the United States, the second copy of the Aircraft registration Application as provided for in § 47.31(c).

Section 91.203(b) prescribes, in pertinent part, that no person may operate a civil aircraft unless the airworthiness certificate 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.

Section 91.407(a)(1) prohibits, in pertinent part, any person from operating an aircraft that has undergone maintenance, preventive maintenance, rebuilding, or alteration unless it has been approved for return to service by a person authorized under § 43.7 of the same chapter.

Section 91.409(a)(2) prescribes, in pertinent part, that no person may operate an aircraft unless, within the preceding 12 calendar months, it has had an inspection for the issuance of an airworthiness certificate in accordance with part 21 of this chapter.

There are currently no airworthiness certificates for the UAS to be used and also as there is no cabin cockpit or passenger compartment on the UAS it is not possible to store certificates on board the craft.

Section 91.417(a) and (b) prescribes, in pertinent part, that—

(a) Each registered owner or operator shall keep the following records for the periods specified in paragraph (b) of this section:

(1) Records of the maintenance, preventive maintenance, and alteration and records of the 100-hour, annual, progressive, and other required or approved inspections, as appropriate, for each aircraft (including the airframe) and each engine, propeller, rotor, and appliance of an aircraft. The records must include—

(i) A description (or reference to data acceptable to the Administrator) of the work performed; and

(ii) The date of completion of the work performed; and

(iii) The signature, and certificate number of the person approving the aircraft for return to service.

(2) Records containing the following information:

(i) The total time in service of the airframe, each engine, each propeller, and each rotor.

(ii) The current status of life-limited parts of each airframe, engine, propeller, rotor, and appliance.

(iii) The time since last overhaul of all items installed on the aircraft which are required to be overhauled on a specified time basis.

(iv) The current inspection status of the aircraft, including the time since the last inspection required by the inspection program under which the aircraft and its appliances are maintained.

(v) The current status of applicable airworthiness directives (AD) and safety directives including, for each, the method of compliance, the AD or safety directive number and revision date. If the AD or safety directive involves recurring action, the time and date when the next action is required.

(vi) Copies of the forms prescribed by § 43.9(d) of this chapter for each major alteration to the airframe and currently installed engines, rotors, propellers, and appliances.

(b) The owner or operator shall retain the following records for the periods prescribed:

(1) The records specified in paragraph (a)(1) of this section shall be retained until the work is

repeated or superseded by other work or for 1 year after the work is performed.

(2) The records specified in paragraph (a)(2) of this section shall be retained and transferred with the aircraft at the time the aircraft is sold.

(3) A list of defects furnished to a registered owner or operator under § 43.11 of this chapter shall be retained until the defects are repaired and the aircraft is approved for return to service.

Records of maintenance and engine replacement can be kept as well as prop changes and any repairs or fixes to the gimbal, electronics, and camera system. Due to the cost of parts and fact that it is cost effective to completely replace parts instead of repair them maintenance records may not apply.

Supporting Information:

The petitioner has provided the following information – contained in his petition and supporting documentation including:

PHANTOM Quick Start Guide, PHANTOM Pilot Training Guide v.1.1, PHANTOM 2 Vision+ User Manual v1.6, Smart Flight Battery Safety Guidelines

Unmanned Aircraft System (UAS)

I plan to operate a UAS, the PHANTOM 2 Vision+, which is comprised of an unmanned aircraft (UA or PHANTOM) and a hand held ground station. The PHANTOM is referred to as a quad-copter with a maximum gross weight of about 3.5 pounds. It is equipped with four rotors that are driven by brush less electric motors powered by a rechargeable smart battery that records discharges and the life of the battery. The UA has a maximum airspeed of 25 mph with no wind. The UAS has a 14mp camera mounted on a powered gimbal beneath the frame.

I plan to operate the UAS in New England (CT, RI, MA, VT, NH, ME) testing the practicality of using a UAS to check coastal change and the evolution of riverine environments. I would also like to photograph real estate and landscapes to demonstrate the aesthetic beauty of New England via photographic and cinema graphic presentations.

The following are safety precautions I will take before each flight and as training for operations:

- To date I have accomplished 46 hours of flight time with the DJI Phantom Vision 2+ and will continue practicing 2-4 hours per week in a safe and controlled manner.
- I will operate the UAS away from densely populated areas and fully examine the regions where flights will take place to check for emergency landing areas.
- I will conduct preflight inspections of the craft and ground station controls to insure a constant connection and set the GPS home base feature prior to launch. The home base feature sets the point of launch as the point of return in case the UAS loses contact with the base station.

- Preflight checks will consist of propeller and motor operation tests as well as ensuring all batteries are charged and control interfaces are talking to each other to confirm complete control during the flight.
- A spotter will be used in any region that requires it, this being areas where tree cover or the placement of buildings could restrict direct LOS between the PIC and UAS. Spotter and PIC will be in constant communication via VHF radio with cellular phones as a backup.
- If a spotter is required the spotter would be fully briefed on the flight operation and what they will be looking for in terms of obstructions, flight patterns, and emergency landing areas.
- The UAS will be operated in the FCC compliance mode.

Given the size, weight, speed, and limited operating area associated with the UAS to be utilized, an exemption from 14 CFR part 21, Subpart H (Airworthiness Certificates) and § 91.203 (a) and (b) (Certifications required), subject to certain conditions and limitations, is warranted and meets the requirements for an equivalent level of safety under 14 CFR part 11 and Section 333 of P.L. 112-95 (Section 333).

An exemption from § 45.23 Marking of the aircraft because the UA will not have a cabin, cockpit or pilot station on which to mark certain words or phrases. Two inch lettering is difficult to place on such a small aircraft with dimensions smaller than the minimal lettering requirement. Regardless of this, the UAS can be marked in the largest possible lettering by placing the word "Experimental" on its fuselage as required by § 45.29(f) so that the pilot or anyone assisting as a spotter will see the markings.

An exemption from §§ 91.405(a), 91.407(a)(1), 91.409(a)(2) and 91.417(a) and (b) *Maintenance inspections* is required since they only apply to aircraft with an airworthiness certificate.

UAS Pilot in Command (PIC)

Under § 61.113 (a) and (b) private pilots are limited to non-commercial operations, however an equivalent level of safety as achieved by current regulations because the UAS does not carry any pilots or passengers. Further, while helpful, a pilot license will not ensure remote control piloting skills. The risks of operating a UAS are far less than the risk levels inherent in the commercial activities outlined in 14 CFR part 61, et seq., thus requests an exemption from § 61.113 *Private Pilot Privileges and Limitations: Pilot in command.*

Regarding UAS operational training, numerous practice flights have been flown in remote areas as a hobbyist simulating flights for future commercial use to gain familiarization with the characteristics of the UAS performance under different temperature and weather conditions.

In a supplemental request to the FAA, the petitioner requests consideration of a 120 day temporary airman certificate in accordance with § 63.13, to allow the FAA time to establish minimum UAS airman certification standards.

UAS Operating Parameters

The following additional operating conditions will be followed:

• operate the UAS below 400 feet and within a radius distance of 1000 feet from the controller to both aid in direct line of sight visual observation;[1]

• operate the UAS for 3-10 minutes per flight, and land before the UAS indicates a battery charge below 30%;

• land the UAS prior to the manufacturer's recommended minimum level of battery power;

• operate UAS only within visual line of sight (VLOS);

• use the UAS' global positioning system (GPS) flight safety feature whereby it hovers and then slowly lands if communication with the remote control pilot is lost;

• conduct all operations under personal and flight safety protocols contained in the operating documents and will actively analyze flight data and other sources of information to constantly update and enhance safety protocols;

• contact respective airports if operations will be within 5 miles to advise them of the estimated flight time, flight duration, elevation of flight and other pertinent information;

• obtain all necessary permissions prior to operation; and

• have procedures in place to abort flights in the event of safety breaches or potential danger.

§ 91.7(a) prohibits the operation of an aircraft without an airworthiness certificate. Since there is currently no certificate applicable to this operation, this regulation is inapplicable at this time.

§ 91.9(b)(2) requires an aircraft flight manual in the aircraft, however since there are no pilots or passengers on board this aircraft and given its size, this regulation is inapplicable. An equivalent level of safety can be achieved by maintaining a safety/flight manual with the UAS ground station.

§ 91.103(b) *Preflight action*, there are no preflight checklists for this UAS but the steps listed previously will be taken before every flight.

§ 91.109 *Flight instruction; simulated instrument flight and certain flight test,* there are no flight examinations for this UAS or certified instructors or certified learning courses at this time.

§ 91.119 prescribes safe altitudes for the operation of civil aircraft, but that it allows helicopters to be operated at lower altitudes in certain conditions. The UAS will not be operated above the altitude of 400 feet above ground level (AGL) and will also only operate in safe areas away from the public and traffic, thus "providing a level of safety at least equivalent to or below those in relation to minimum safe altitudes." Given the size, weight, maneuverability, and speed of the UAS, an equivalent or higher level of safety will be achieved.

§ 91.121 *Altimeter settings* is inapplicable since the UAS utilizes electronic GPS.

§ 91.151(a) *Fuel requirements for flight in VFR conditions*, at any point when the weather does not permit direct visual contact with the UAS via the PIC or spotter the UAS will be landed immediately.

Public Interest

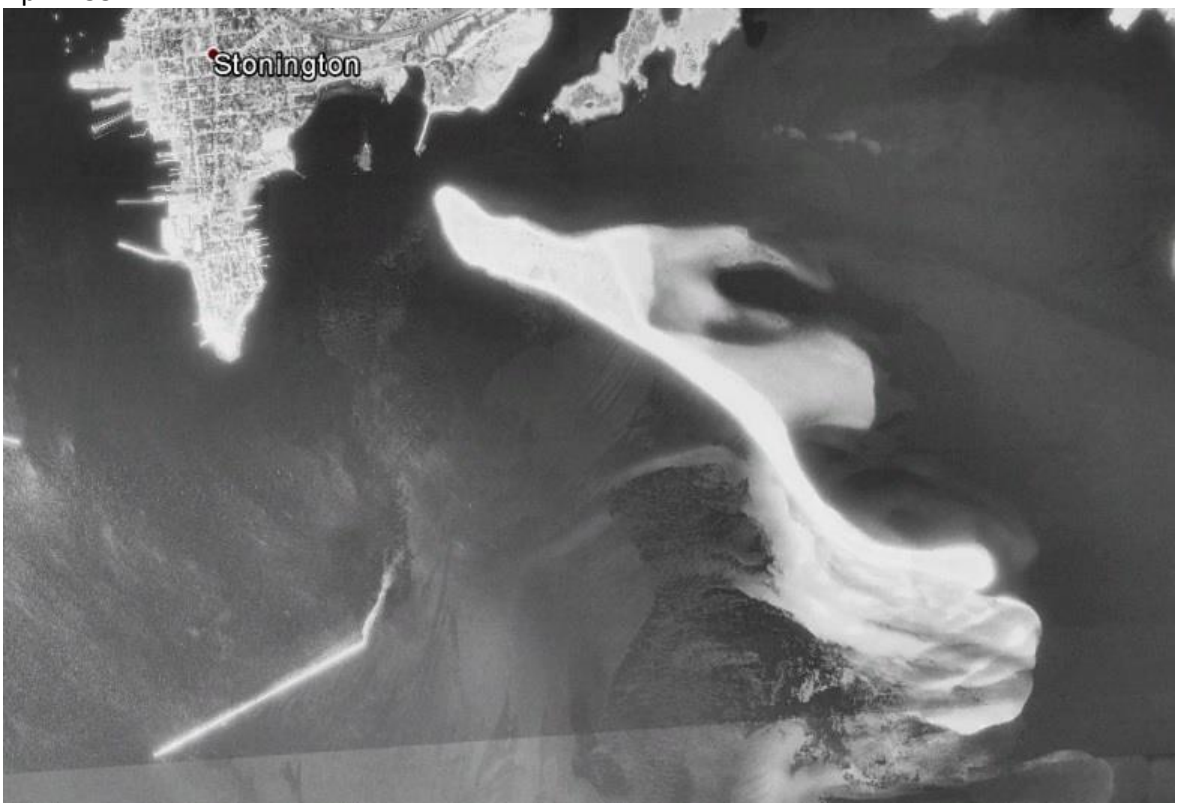
Aerial photography and videography for geographical awareness and for real estate marketing has been around for a long time through manned fixed wing aircraft and helicopters, but for small business owners, its expense has been cost-prohibitive. The cost prohibition does not permit seasonal or repeated over flights for many institutions which could mean several years between a regions being photographed. Small areas of study could be repeatedly photographed permitting in depth study of an areas change in geomorphology through the seasons and after storm events. Granting this exemption would allow this service to be provided at a much lower cost, allowing for a much greater utilization. Further, this small UAS will pose no threat to the public given its small size and lack of combustible fuel when compared to larger manned aircraft.

Example Study Region

The following aerial images display a prospective study region on the Connecticut-Rhode Island border. Sandy Point is a 1.25 mile long variable sand bar at the mouth of the Pawcatuck River. The images are depicted temporally showing the change in the sandbar over the course of 22 years. While it's obvious the bar is shifting the exact cause for the dramatic changes is more difficult to determine; floods, hurricanes, or Nor'easters could be responsible but without more frequent imaging the amount of shift due to a single event is difficult to determine.

The variations visible in the sand bar, especially along the western edge are easily apparent as the images progress. Due to the separation in time it is difficult to attribute the movement to any specific event. Utilizing UAS photography more detailed and frequent images could delineate what events are causing the movement.

April 1991



April 2003

August 2006

July 2008

April 2013