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

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

September 9, 2015

Exemption No. 12800
Regulatory Docket No. FAA−2015−2610

Mr. William English
3853 Inverness Road
Fairfax, VA 22033

Dear Mr. English:

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 June 3, 2015, you petitioned the Federal Aviation Administration (FAA) for an exemption. You requested to operate an unmanned aircraft system (UAS) to conduct aerial imagery and research and development of techniques and methods for the use of sUAS to support multi-modal transportation accident investigations.

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 are the 3DRobotics DYI Quad, DJI Phantom 2 Vision, DJI Inspire 1, DJI Phantom 3, 3DRobotics Solo, and 3DRobotics X8.

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[1]. 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. William English 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.

[1] 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.

Conditions and Limitations

In this grant of exemption, Mr. William English 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 3DRobotics DYI Quad, DJI Phantom 2 Vision, DJI Inspire 1, DJI Phantom 3, 3DRobotics Solo, and 3DRobotics X8 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 September 30, 2017, unless sooner superseded or rescinded.

Sincerely,

/s/
John S. Duncan
Director, Flight Standards Service

Enclosures

June 3, 2015

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

Re: Exemption Request under Section 333 of the FAA Reform Act and Part 11 of the Federal Aviation Regulations

Dear Sir or Madam:

Pursuant to Section 333 of the FAA Modernization and Reform Act of 2012 (the "Reform Act"), William English, an aircraft accident investigator, (the "Applicant"), planned operator of small Unmanned Aircraft Systems ("sUAS") hereby applies for an exemption from the listed Federal Aviation Regulations (FARs) to allow commercial operation of sUAS to gather aerial imagery and perform research and development of techniques and methods for the use of sUAS to support multi-modal transportation accident investigations.

The requested exemption would allow the Applicant to safely, efficiently, and economically use commercial sUAS in the National Airspace System (NAS), 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.

Public Interest Justification:

As detailed in this document and appendices, the proposed operations would permit the use of small and relatively inexpensive sUAS under controlled conditions in airspace that is: (1) limited; (2) predetermined; (3) controlled as to access, and; (4) would provide an increased level of safety beyond that existing when manned aircraft are used to accomplish the same purpose.

Approval of this exemption would thereby enhance safety and fulfill the Secretary of Transportation's responsibilities to "…establish requirements for the safe operation of such aircraft systems in the national airspace system."

As described more fully below, the requested exemption would authorize the Applicant to perform commercial operations with sUAS that will provide the following benefits:

Perform aerial imaging to research and develop best practices and techniques to aid government entities and transportation industry stakeholders in the use of sUAS to better document and control transportation mishap sites. Dissemination of, and training on such research can reduce cost and increase efficiency and effectivity of mishap investigations, benefitting taxpayers and industry both economically and with increased safety.

Data gathered via these operations will enable the use of sUAS to support transportation mishap

site documentation, and will decrease congestion in the NAS along with reducing the noise and air pollution generated during traditional manned aircraft flight operations.

Manned aircraft image gathering creates a greater risk because the craft are much larger, have combustible fuel, and carry an onboard human pilot. In contrast, a sUAS weighing 15 pounds or less and powered by batteries eliminates virtually all of that risk given the reduced mass and lack of combustible fuel carried on board. The sUAS will carry no passengers or crew and, therefore, will not expose them to the risks associated with manned aircraft flights.

Use of sUAS reduces safety concerns when gathering data from inaccessible or unstable/unsafe areas. Operation of sUAS will substantially reduce the risk to life and property in the air, and on the ground, which is commonly associated with traditional manned aircraft flight operations or use of elevated work platforms (aka bucket lift, cherry-picker).

Similar to the current manned aircraft flight operations that have been conducted for many decades, sUAS used for similar tasks will not generate any new privacy issues.

The Applicant is experienced and qualified in transportation accident investigation as a current employee of the National Transportation Safety Board, however the Applicant is pursuing this request as a private citizen sole proprietor, not as a government agency or representative thereof, and will not operate under the provisions of Public Aircraft as described in 49 USC § 40125.

The name and address of the applicant are:

William English
3853 Inverness Rd
Fairfax VA 22033
703-447-5598
bill_english@verizon.net

Unmanned System Characteristics

The Applicant proposes to use a 3DRobotics Quad 2013, and a DJI Phantom 2 Vision, both small quad-rotor aircraft. Maximum gross takeoff weight of these aircraft does not exceed 15 pounds. Normal maximum operating speed of both aircraft does not exceed 20 knots. The aircraft are powered by four (4) electric motors, supplied by a 3-cell Lithium-Polymer battery providing maximum 12.6 volts with capacity not to exceed 7000 maH. The 3DRobotics aircraft carries an additional 3-cell, Lithium-Polymer battery, not to exceed 1000 maH to supply power for the payload gimbal and video transmitter. Both aircraft are equipped with telemetry allowing the pilot to monitor critical flight data in real time. Further details are described in the applicable regulation exemption requested and attached operating and maintenance procedures.

The sUAS will operate only in the pilot's visual line of sight at all times. Such operations will

insure that the sUAS will "not create a hazard to users of the national airspace system or the public " per PL 112-95 Section 333(b).

Given the small size and low speed of the sUAS involved and the restricted environment within which they will operate, the application falls within the equivalent level of safety in which Congress envisioned that the FAA must, by exemption, allow commercial operations of sUASs to commence immediately. Also due to the small size of the sUAS and the low altitudes in which the sUAS will operate, approval of the application presents no national security issue.

Pilot in Command (PIC) and support personnel

Applicant is the only PIC sought under this request. Applicant holds an FAA commercial pilot certificate, airplane single and multi-engine land, with instrument rating. Applicant holds an FAA Certified Flight Instructor certificate (expired), single and multi engine, and instrument ratings. Applicant has also recorded over 60 hours of flight time with the listed small quadcopter aircraft. Applicant has received training on sUAS operations from Unmanned Vehicle University. Applicant holds a current FAA second class medical certificate. Additionally, the applicant is employed as an air safety investigator with over 15 years experience, and was formerly employed as an Air Traffic Controller by the FAA.

The Applicant's certifications and experience clearly mitigate many safety risks associated with the exemption, and will be referenced in the applicable regulations listed below.

During the proposed operations, additional personnel may be used as Visual Observers and/or Payload Operators depending on the mission. All personnel used in these roles will have at least one of the below qualifications:

1. FAA or military pilot certificate
2. FAA or military ATC qualification
3. Air Safety Investigator qualification

The Visual Observer(s) will be responsible for monitoring the operating area for non-participating persons or vehicles, scanning for animal hazards, and scanning for air traffic. The VO(s) will also monitor mission participants to avoid hazards.

The Payload Operator (PO) will monitor the camera video feed via a dedicated display, and will have controls allowing manipulation of the camera gimbal. Additionally, the PO control includes an emergency "Return to Launch" switch, in the event the PO observes a hazard or non-participant via the video feed.

Operational Procedures and Limitations

The sUAS planned to be operated are multi-rotor aircraft each weighing less than 15 lbs., including payload. They would operate, under normal conditions, at a speed of no more than 20

knots. The principal construction materials of the sUAS aircraft are plastic and aluminum. Operations will be performed by the Applicant, as outlined below, to insure that the sUAS will "not create a hazard to users of the national airspace system or the public."

The operation of sUAS by a knowledgeable professional will serve to enhance safety, add to the public benefit, and reduce environmental impacts related to current methods of manned aircraft flight operations. The Applicant will be bound by these limitations and conditions when conducting commercial operations under an FAA issued exemption:

Safety will be the first and foremost consideration in any sUAS operation. The applicant will be responsible for safe operation of the flight, and will be responsible for supervision of any support or participating personnel.

The operation is intended to conform to the provisions of the FAA "blanket COA" unless otherwise specifically approved by the FAA. Flights will be operated within visual line of sight of the pilot, and never at a distance greater than 600 feet. Operations will be conducted during daylight hours, under visual meteorological conditions (VMC) only.

Maximum altitude will not exceed 200 feet and maximum operating speed will not exceed 20 knots.

Flight operations will maintain the following distances from airports:

- 5 nautical miles (NM) from an airport having an operational control tower; or
- 3 NM from an airport with a published instrument flight procedure, but not an operational tower; or
- 2 NM from an airport without a published instrument flight procedure or an operational tower; or
- 2 NM from a heliport with a published instrument flight procedure

Operations will not be conducted in restricted airspace and other areas, such as major cities, where the FAA prohibits UAS operations. Operations will not be conducted in areas in which the FAA does not recommend UAS operations, such as FDC NOTAM 4/3621 restricting flight in the vicinity of major sporting events, or FDC NOTAM 4/0811 avoiding flight near power plants and other critical infrastructure.

Flights will be operated in Class G airspace whenever possible. If operation in other airspace is required, the relevant controlling agency will be notified and any necessary permission obtained.

Operations will give right of way to all manned aircraft and will land as soon as safely possible if manned aircraft come within proximity of the operating area. Operations will avoid areas where manned aircraft can be expected to be descending through 500ft.

Aircraft will maintain a minimum horizontal separation of no less than one (1) mile from all

other manned or unmanned airborne aircraft unless that other aircraft is maintaining level flight or climbing at an altitude above 1500ft AGL.

Minimum crew for each operation will consist of the sUAS PIC. A Visual Observer and a Payload Operator will be utilized as appropriate for the mission. The VO and PIC will at all times be able to communicate by voice or walkie-talkie. The VO and PO will be briefed on how to initiate an emergency return-to-launch.

Prior to an sUAS flight, an area of operation will be established. This area of operation will include a defined lateral and vertical area where the sUAS will operate. Safety procedures will be established for persons, property and applicable airspace within the area of operation. A buffer zone of 200 feet will be establish outside the operating area to remain clear of non-participating persons. The sUAS shall operate from a takeoff/landing site within the operating area, in close but safe proximity to the PIC or VO.

Flight planning will include establishing an appropriate geo-fence in the sUAS software to limit the lateral and vertical flight; ensure that the most current maps of the operating area are loaded into the GCS computer or tablet, the battery monitor is configured correctly for the size of flight battery used, and the length of mission timed for completion with at least 20% battery power remaining. Both sUAS initiate an automatic return-to-launch on loss of signal from the controller, enabling simple and rapid safety mitigation.

The sUAS are equipped with:

1. APM 2.6 autopilot system with version 3.1.5 firmware.
2. DJI NAZA autopilot with version 2.04 firmware (includes geo-fence)

These systems are similar or equivalent to other approved systems including those in Exemptions 11138, 11206, and 11617. Each sUAS will utilize GPS navigation, battery failsafes, return-to-launch (RTL), and lost-link safety features, among other built-in safety features. The GCS or tablet display will be connected, by radio communication, to the sUAS during the entire flight, which will give the PIC flight information such as GPS position, altitude, battery remaining, and other telemetry information.

A briefing will be conducted in regard to the planned sUAS operations prior to operation at each new location. All personnel who will be performing duties within the boundaries of the area of operation will be present for this briefing.

All required permissions and permits will be obtained from appropriate state, county or city jurisdictions, including local law enforcement, fire, or other appropriate governmental agencies. Written, to include electronic, and/or oral permission from the relevant property owners will be obtained prior to an operation.

These operating procedures, keeping the sUAS operation well clear of any non-participating

persons or property, well clear of airports and other aircraft, and minimizing the risk to participants on the ground, provides an equivalent level of safety to manned aircraft.

Privacy Policy

All flights will occur over private or controlled access property with the property owner's prior consent and knowledge. Any individuals whose images are taken will have expressed consent to being filmed or otherwise have agreed to be in the area where aerial photography will take place.

EXEMPTION REQUESTS AND EQUIVALENT LEVEL OF SAFETY

William English, an accident investigator, hereby provides pursuant to 14 CFR Part 11 an exemption application to allow commercial operation of sUAS to gather aerial imagery and perform research and development of techniques and methods for the use of sUAS to support multi-modal transportation accident investigations. All of which are critical to the well-being of the general public.

The regulations from which the exemption is requested are as follows:

14 C.F.R. Part 21; 14 C.F.R. 45.23(b); 14 C.F.R. 91.7(a); 14 C.F.R. 91.9(b)(2) & (c); 14 C.F.R. 91.103; 14 C.F.R. 91.109(a); 14 C.F.R. 91.119; 14 C.F.R. 91.121; 14 C.F.R. 91.151(a); 14 C.F.R. 91.203(a) & (b); 14 C.F.R. 91.405(a); 14 C.F.R. 91.407(a)(1); 14 C.F.R. 91.409(a)(2); 14 C.F.R. 91.417(a)

This section discusses each rule listed above and explains why exemptions pursuant to the proposal set forth in this letter are appropriate, provide an equivalent level of safety, and are in the public interest.

The FAA has granted similar relief under Exemptions 2689F, 5745, 8607, 8737, 8738, 9299, 9299A, 9565, 9665, 9789, 9789A, 9797, 9797A, 9816A, 10167, 10167A, 10602, 10673, 10700, 10808, 11206, 11213, 11138, 11456, 11617, and 32827.

14 CFR Part 21, Subpart H, and 14 CFR § 91.203(a)(1): Airworthiness Certificates

Section 91.203(a)(1) requires all civil aircraft to have a certificate of airworthiness. Part 21, 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 small size of the aircraft and the limited operating area associated with its utilization, it is unnecessary to go through the certificate of airworthiness process under Part 21 Subpart H to achieve or exceed current safety levels.

Such an exemption meets the requirements of an equivalent level of safety under Part 11 and Section 333 of the Reform Act. The Federal Aviation Act 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 sUAS involved.

In this case, an analysis of these criteria demonstrates that the sUAS operated without an airworthiness certificate, under the conditions proposed herein, will be at least as safe, or safer, than a conventional aircraft (fixed wing or rotorcraft) with an airworthiness certificate. The sUAS weighs typically less than 15 lbs., and always less than 55 lbs. fully loaded. It will not carry a pilot or passenger, will not carry flammable fuel, and will operate exclusively within a controlled access area, monitored by the operator, pursuant to the conditions set forth above, and by local public safety requirements. The sUAS provides at least an equivalent, and most likely exceeds, the level of safety to that of such operations being conducted with conventional aircraft that would be orders-of-magnitude larger, would be carrying passengers, cargo, and flammable fuel, and would make additional transit flights to and from the operating area.

14 CFR § 91.203(b) states that "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 has no cabin, cockpit or pilot station and is operated without an onboard pilot. Therefore, there is no ability or place to carry certification and registration documents or to display them on the aircraft.

As the Ground Control Station is part of the unmanned aircraft system, an equivalent level of safety will be achieved by keeping these documents, to the extent they are applicable to the sUAS, at the ground control station, or electronic copies on the GCS computer, where the pilot flying the sUAS will have immediate access to them.

14 CFR. § 45.23 & 91.9(c): Marking of the Aircraft

14 CFR § 45.23(a) provides that each operator of an aircraft must display on that aircraft marks consisting of the Roman capital letter "N" (denoting United States registration) followed by the registration number of the aircraft. 14 CFR § 91.9(c) provides that no person may operate a U.S.-registered civil aircraft unless that aircraft is identified in accordance with part 45 of this chapter.

The sUAS has no entrance to the cabin, cockpit, or pilot station on which the markings can be placed. Given the size of the sUAS, two-inch lettering will be impossible. Official marking systems for sUAS have not yet been established for operations inside the NAS. The applicant is prepared to mark the sUAS with the registration number if applicable, name of the applicant and contact information, and fulfill any other request by the FAA relevant to this topic in accordance to § 45.29(f) where the pilot, observer, and others working with the sUAS will see the identification.

14 CFR § 91.9(b)(2): Flight Manual

This regulation provides that no person may operate a U.S.-registered civil aircraft 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 has no cabin, cockpit or pilot station and is operated without an onboard pilot. Therefore, there is no ability or place to carry these materials on the aircraft.

As the Ground Control Station (GCS) is part of the unmanned aircraft system, an equivalent level of safety will be achieved by keeping these documents, to the extent they are applicable to the sUAS, at the GCS, or electronic copies on the GCS computer, where the pilot flying the sUAS will have immediate access to them.

14 CFR § 91.7(a): Civil aircraft airworthiness.

This regulation requires that no person may operate a civil aircraft unless it is in airworthy condition. Should the exemption be granted allowing commercial operation of sUAS without an airworthiness certificate, no standard will exist for airworthiness of the sUAS. Given the size of the sUAS and the previous exemptions issued for similar sUAS, an equivalent level of safety will be achieved by ensuring compliance with the sUAS operating procedures, manuals, and safety checklists prior to each flight.

14 CFR § 91.103: Preflight action

This regulation requires each pilot in command to take certain actions before flight to insure the safety of flight. As FAA approved aircraft flight manuals do not exist for the aircraft an exemption will be needed. An equivalent level of safety will be provided by following a comprehensive preflight checklist. The commercially rated PIC will take all actions including reviewing weather, flight battery requirements, landing and takeoff area suitability, weight and balance, and all other actions specified in the operating instructions before initiation of flight.

14 CFR § 91.119: Minimum Safe Altitudes

Section 91.119 establishes safe altitudes for operation of civil aircraft. Specifically, 91.119(c) limits aircraft flying over areas other than congested areas to 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.

Because aerial photography and inspection work must be accomplished at relatively low altitudes and at altitudes less than 500 feet AGL, an exemption from Section 91.119(c) is needed.

The equivalent level of safety will be achieved given the size, weight, speed, and material with which the sUAS are built. Also, no flight will be taken without the permission of the land owner

or those who control the land. Because of the advance notice to the landowner, all affected individuals will be aware of the flights. Compared to aerial survey operations conducted with aircraft or rotorcraft weighing far more than 55 lbs. and carrying flammable fuel, any risk associated with these operations will be far less than those currently allowed with conventional aircraft operating at or below 500 feet AGL. Indeed, the low-altitude operations of the sUAS will maintain separation between these sUAS operations and the operations of conventional aircraft that must comply with Section 91.119.

The sUAS will never operate at altitude higher than 200 feet AGL and all operations will occur during daylight hours under Visual Meteorological Conditions (VMC) only.

The slow speed and low altitude of the sUAS limit the radius of impact of the vehicle in the case of an inflight failure. Using the maximum altitude of 200 feet, and maximum speed of 20 knots, a maximum ballistically calculated distance from the flight area is 115 feet. Adding a buffer zone for wind effects indicates that a safe buffer zone of 200 feet surrounding the operating area provides an equivalent level of safety. Flight operations will be conducted at least 200 feet from all non-participating persons, vessels, vehicles and structures, unless:

1. Barriers or structures are present that sufficiently protect non-participating persons from debris in the event of an accident. The PIC will ensure that non-participating persons remain under such protection. If a situation arises where non-participating persons leave such protection and are within 200 feet of the sUAS, flight operations will cease immediately. and/or;

2. The aircraft is operated near vessels, vehicles or structures where the owner/controller has granted permission and the PIC has made a safety assessment of the risk of operating closer to those objects.

The sUAS will remain within visual line of sight of the PIC and VO. Flight operations will be conducted in accordance with the FAA "blanket COA" (at least 5 nautical miles (NM) from an airport having an operational control tower; 3 NM from an airport with a published instrument flight procedure, but not an operational tower; 2 NM from an airport without a published instrument flight procedure or an operational tower; or 2 NM from a heliport with a published instrument flight procedure.) Flights will not operate over congested areas or other areas as specified by the FAA.

14 CFR § 91.121: Altimeter Settings

Section 91.121 requires a person operating an aircraft to maintain cruising altitude or flight level by reference to an altimeter that is set to the elevation of the departure airport or barometric pressure. The sUAS proposed under this application use both barometric pressure sensors and, when available, GPS altitude. When the sUAS is armed for takeoff, the altitude is "zeroed" relative to the elevation at the point of take-off, a known point close to the PIC. The sUAS used for this application are equipped with GCS software which indicates the mean sea level elevation

of the takeoff point, and surrounding terrain.

The equivalent level of safety will be achieved by the PIC confirming the elevation or altitude of the launch site, and evaluating the surrounding terrain and obstacles during pre-flight planning. The altitude of the sUAS will also be displayed via telemetry on the GCS and will be monitored by the PIC during the entire flight operation. Additionally, geo-fencing features in the GCS software prevent the sUAS from climbing higher than a specified altitude above the takeoff point. The evaluation of the elevation of the takeoff point and surrounding terrain, line-of-sight nature of the operations, and monitoring and geo-fencing in the flight controller and GCS provide an equivalent level of safety.

14 CFR § 91.151(a): Fuel Requirements for Flight in VFR Conditions

This regulation outlines fuel requirements for beginning a flight in VFR conditions including a reserve of 30 minutes during the day and 45 minutes at night. The battery powered sUAS used in this application are limited to operations in controlled environments do not have flight endurance to meet this regulation.

The applicant believes that an exemption from 14 CFR § 91.151(a) is safe and within the scope of a prior exemption. Operating the sUAS without 30 minutes of reserve fuel does not engender the type of risks that Section 91.151(a) was meant to prevent given the size and speed at which the sUAS operates. The fact that it carries no pilot, passenger, or cargo also enhances its safety.

The applicant believes that an equivalent level of safety can be achieved by maintaining 20% of reserve battery capacity, which would be more than adequate to return the sUAS to its planned landing zone from anywhere in its operating area. Both of the sUAS proposed in this application are equipped with battery voltage monitoring and current totalizers which constantly display a remaining voltage and percentage to the pilot. Further, automatic fail-safe features are activated at 20% of battery capacity to initiate a return-to-launch, or land, maneuver as appropriate.

Planned flights will be limited to approximately 10-12 minutes depending on weather conditions and maneuvers, and to ensure that the sUAS lands at the ground station with at least 20% of battery power remaining (as determined by the onboard monitoring system and the PIC), whichever happens first. In the unlikely event that the sUAS battery reaches a critical level prior to the launch point, it would simply land. Given its weight and construction material, and the slow speed of the landing maneuver, the risks are less than contemplated by the current regulation.

14 CFR § 91.405(a); 407(a)(1); 409(a)(2); 417(a): Maintenance Inspections

Section 91.405(a) requires 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

..." Section 91.407 similarly makes reference to requirements in Part 43; Section 91.409(a)(2) requires an annual inspection for the issuance of an air worthiness certificate. Section 91.417(a) requires the owner or operator to keep records showing certain maintenance work that has been accomplished by certificated mechanics, under Part 43, or licensed pilots and records of approval of the aircraft for return to service.

Given that these sections and Part 43 apply only to aircraft with an airworthiness certificate, these sections will not apply to this application. Maintenance will be accomplished by the applicant pursuant to the operating manuals and reference material. An equivalent level of safety will be achieved because these sUAS 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 sUAS can land immediately within the pre-determined operating area, and will be operating from no higher than 200 feet AGL. The operator will ensure that the sUAS is in working order prior to initiating flight, perform required maintenance and keep a log of any maintenance performed. Typical failures of small multi-rotor aircraft are related to battery conditioning. The applicant will maintain a log of battery charging cycle to detect diminishing battery health. Additionally, the sUAS used in this application are equipped with numerous built-in health tests for the flight controller, gyros, compass, GPS, radio links, and other critical components. Applicant's familiarity with the aircraft, and experience in flight safety, demonstrates the equivalent level of safety and ability to maintain the aircraft in an airworthy condition.

Conclusion

It is the applicant's belief that the size, weight, speed, operating environment, and operating procedures provide an equivalent level of safety or better when operating a sUAS for the public interest as outlined in Section 333 of the Reform Act. It is requested that the FAA issue an exemption to permit safe, legal, commercial sUAS operation by the applicant.

Respectfully submitted,

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Appendices:
3DRobotics checklists and documentation
DJI Phantom 2 Vision operating manual
FAA pilot certificate
Future aircraft acquisitions