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

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

September 14, 2015

Exemption No. 12841
Regulatory Docket No. FAA−2015−2079

Ms. Patricia J. Rithamel
Chief Financial Officer
Redhawk Aerial Imaging, Inc.
341 Harden Street
Antioch, IL 60002

Dear Ms. Rithamel:

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 May 19, 2015, you petitioned the Federal Aviation Administration (FAA) on behalf of Redhawk Aerial Imaging, Inc. (hereinafter petitioner or operator) for an exemption. The petitioner requested to operate an unmanned aircraft system (UAS) to conduct aerial photography, videography, and data acquisition.

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.

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, Redhawk Aerial Imaging, Inc. 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, Redhawk Aerial Imaging, Inc. 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 September 30, 2017, unless sooner superseded or rescinded.
Sincerely,
/s/

John S. Duncan
Director, Flight Standards Service

Enclosures

UNITED STATES OF AMERICA
DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
WASHINGTON, DC
Regulatory Docket No. _____

**IN THE MATTER OF THE PETITION FOR EXEMPTION OF:**
**REDHAWK AERIAL IMAGING, INC.,**
**FOR AN EXEMPTION SEEKING RELIEF FROM THE REQUIREMENTS OF**
**TITLE 14 OF THE CODE OF FEDERAL REGULATIONS**
**14 C.F.R §§ 35 Part 21; and 45.23(b); 61.113(a)&(b); 91.7; 91.103(b); 91.109; 91.119; 91.121; 91.151; 91.405(a); 91.407(a)(1); 91.409(a)(1) & (a)(2); AND 91.417(a) &(b); 91.7(a)**
**CONCERNING COMMERCIAL OPERATION OF THE**
**DJI PHANTOM 2 UNMANNED AIRCRAFT SYSTEM**
**PURSUANT TO SECTION 333 OF**
**THE FAA MODERNIZATION AND REFORM ACT OF 2012 (PUBLIC LAW 112-95)**

Submitted on May 19, 2015
PATRICIA J. RITHAMEL,
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Antioch, IL 60002
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Chief Financial Officer

**TABLE OF CONTENTS**

Page

## SUMMARY

Pursuant to Section 333 of the FAA Modernization and Reform Act of 2012 (the “Reform Act”) and 14 C.F.R. Part 11, Redhawk Aerial Imaging, Inc., seeks an exemption from Federal Aviation Regulations (“FARs”); C.F.R. 45.23(b); 14 C.F.R. Part 21; 14 C.F.R. 61.113(a)&(b); 91.7(a); 91.9(b) (2); 91.103(b); 91.105;(2) and (b) 91.109; 119.121; 91.151(a); 91.203(a)&(b); 91.405(a); 91.407(a) (1); 91.409(a) (2); 91.417(a)&(b). This exemption will permit Redhawk Aerial Imaging, Inc., (hereinafter referred to as “Redhawk Aerial Imaging”) to provide unmanned aircraft solutions with services for state, local, and commercial clients. Redhawk Aerial Imaging is focused on providing solutions for utilizing unmanned aircraft for aerial data acquisition, photography and videography in the areas of Construction, Agriculture, Infrastructure, Real Estate, and other applicable areas.

## INTRODUCTION

Patricia J. Rithamel, and The Company formed by her, Redhawk Aerial Imaging, Inc, (both Patricia J. Rithamel and Redhawk Aerial Imaging, Inc., hereinafter known as Redhawk Aerial Imaging) seeks an exemption to operate the DJI Phantom 2, for compensation or hire within the national airspace system (NAS).

The DJI Phantom 2 unmanned aircraft system (UAS) is an advanced consumer flight platform manufactured by DJI, a multi-rotor manufacturer established in 2006 that has a history of producing leading edge UAS platforms and safety systems for the professional UAS operator.

The DJI Phantom 2 is comprised of a radio controlled four motor, multi-rotor UAS. The DJI Phantom 2 has direct pilot intervention at all times. Automated systems are in place to assist the pilot and ensure that at no time is safety compromised by a lost link situation. The DJI Phantom 2 UAS has a maximum gross weight of approximately thirteen hundred (1300) grams, while having a diameter of three hundred fifty (350) millimeters. The UAS is equipped

with four propellers and four motors driven by lithium polymer batteries. Maximum speed of approximately 33mph and a maximum rate of climb of 1181fpm. Maximum flight times of twentyfive (25) minutes with the capability to hover, and move in the vertical and horizontal plane simultaneously. Maximum altitude is four hundred (400) feet limited by Redhawk Aerial Imaging, vertical line of sight (VLOS) requirements.

To maintain vertical line of sight (VLOS) requirements, the UAS is equipped with distance limiting programs to ensure that the UAS and /or the pilot do not operate the aircraft beyond a predetermined range.

The radio frequencies and equipment utilize the 2.4GHz spectrum. All equipment has the appropriate FCC authorization / approval to transmit on the radio frequencies used for UAS uplink and downlink of control, telemetry, and payload information.

## BACKGROUND OF PETITIONER

I, Patricia J. Rithamel, <corporate title> of Redhawk Aerial Imaging, am writing pursuant to the FAA Modernization and Reform Act of 2012 and the procedures contained within 14 C.F.R. 11, to request that Redhawk Aerial Imaging, an aerial data acquisition, photography and videography business, be exempted from the Federal Aviation Regulations (FARs) listed below so that we may operate an unmanned aircraft system (UAS) commercially in airspace regulated by the Federal Aviation Administration (“FAA”).

I recognize the importance of safety as the first and foremost consideration in aviation. There are many operators of small unmanned aircraft systems that are either unaware or unwilling to adhere to the strict safety guidelines that the FAA has instituted over the years to ensure the safety of the National Airspace System as well as persons and property on the ground. With these issues in mind, Redhawk Aerial Imaging, Inc., seeks to offer safe and legal unmanned aerial options for data collection, mapping and surveying, photography, and agriculture services for state, local and commercial clients.

Redhawk Aerial Imaging is committed to safety in all of its operations, as such, Redhawk Aerial Imaging will implement multiple safety protocols, both in its operations and its flight platforms to ensure every level of safety and minimize the risk of damage to persons or property on the ground or in the air (NAS) and to comply with all state, local, and FAA regulations.

## PUBLIC INTEREST

Currently, aircraft for aerial data acquisition, photography and videography and other aerial operations, utilize manned aircraft, fixed wing or helicopters, that weigh thousands of pounds

and can carry upwards of two hundred gallons of fuel. To perform aerial operations as described herein, these aircraft must fly at lower altitudes, increasing the risk to those on the ground and in the airspace, and contribute to a high level of noise pollution which can disturb citizens or animals while performing these operations. Redhawk Aerial Imaging is concerned with safety and the impact on the community and environment. Utilizing small unmanned aerial systems, minimizes the impact to the environment and to the community as a whole. Operating small electric powered UAS's, poses no risk of fuel spillage or contamination in the event of an accident. In the unlikely event of an accident, the small size of the UAS eliminates the risk to health and safety to onboard pilots and passengers and minimizes if not altogether removes the hazards to persons on the ground. Sound pollution is almost nonexistent, due to clean, quiet electric operation. Redhawk Aerial Imaging believes that responsible and safe UAS operations must be utilized to allow for UAS operations to continue.

## SPECIFIC SECTIONS OF 14 CFR WHICH REDHAWK AERIAL IMAGING SEEKS EXEMPTION

Petitioner, Redhawk Aerial Imaging Aviation, pursuant to the provisions of the Federal Aviation Regulations (14 C.F.R. § 11.61) and the FAA Modernization and Reform Act of 2012, Section 333, Special Rules for Certain Unmanned Aircraft Systems, hereby petitions the Administrator to operate the DJI Phantom 2 UAS in the national airspace system, and for an exemption from the requirements of 14 C.F.R Part 21 subpart H, §§ 45.23(b), 61.113(a) & (b), 91.103(b) 91.119, 91.121, 91.151, 91.405(a), 91.407(a)(1), 91.409(a)(1) & (a)(2), and 91.417(a) & (b).

Redhawk Aerial Imaging requests relief from 14 C.F.R. 45.23: *Display of marks; general*.

Pursuant to 14 C.F.R. 45.23(b), all aircraft operators are required to mark their aircraft according to certain specifications. Redhawk Aerial Imaging's DJI Phantom 2 is, by definition, unmanned and does not have a cabin, cockpit or pilot station on which to mark certain words or phrases. Furthermore, two-inch lettering is difficult to place on small scale aircraft with dimensions smaller than the minimal lettering requirement.

Therefore, Redhawk Aerial Imaging requests relief from 14 C.F.R. 45.23(b).

Redhawk Aerial Imaging requests relief from 14 C.F.R. 61.113: *Private Pilot Privileges and Limitations: Pilot In Command* (PIC).

Pursuant to 14 C.F.R. 61.113 (a) & (b), private pilots are limited to non-commercial operations. Redhawk Aerial Imaging can achieve an equivalent level of safety as achieved by current Regulations. The PIC will have a Private Pilot certificate with a current Medical, and will meet the flight review requirements specified in 14 CFR 61.56. The DJI Phantom 2 UAS

will only be utilized for business incidental to Redhawk Aerial Imaging and is incapable of carrying passengers.

Therefore, Redhawk Aerial Imaging requests relief from 14 C.F.R. 61.113(a) & (b).

Redhawk Aerial Imaging requests relief from 14 C.F.R. 91.7(a), Airworthiness Certificate.

In consideration of the limited size, weight, operating conditions, design safety features, and the imposed conditions and limitations by Redhawk Aerial Imaging, with the unmanned aircraft and its operation, Redhawk Aerial Imaging's operation of the DJI Phantom 2 UAS meets the conditions of Section 333 and should not require an airworthiness certificate in accordance with 14 C.F.R. Part 21, Subpart H.

14 C.F.R. 91.7(a) prohibits the operation of an aircraft without an airworthiness certificate. As no such certificate will be applicable in the form contemplated by the Federal Aviation Regulations (FARs), this Regulation is inapplicable. No standard exists for airworthiness of the DJI Phantom 2 at this time, an equivalent level of safety will be achieved by insuring compliance with the Redhawk Aerial Imaging's Flight Operations and Procedure Manual with Safety Checklists, and the DJI Phantom 2 User manual as well as inspection and / or maintenance. Redhawk Aerial Imaging believes that compliance with the DJI Phantom 2 User Manual and Redhawk Aerial Imaging's Flight Operations and Procedure Manual, including checklists, and inspection and / or maintenance, that a very high level of safety can be achieved in ensuring the airworthiness of Redhawk Aerial Imaging's DJI Phantom 2 UAS. The policies and procedures in place by Redhawk Aerial Imaging and the equipment utilized on the UAS for Risk Mitigation, provide an Acceptable Level of Safety (ALoS).

Therefore, Redhawk Aerial Imaging requests relief from 14 C.F.R. 91.7(a).

Redhawk Aerial Imaging requests relief from 91.103(b) Pre-Flight Action, specifically "*For any flight, runway lengths at airports of intended use.*"

Per the preflight section in Redhawk Aerial Imaging Flight Operations and Procedure Manual, certain preflight actions by the PIC are required including, but not limited to;

- Aircraft safety and flight worthiness inspection.
- Ground station inspection.
- Site assessment and inspection.
- The PIC will take all actions including reviewing weather, including visibility and standoff distances from clouds.
- Flight battery requirements.

Considering that operations will probably not occur at any airport, the requirement for knowledge of runway lengths at the airport of intended use, is not appropriate in this case.

Therefore, Redhawk Aerial Imaging requests relief from 91.103(b).

Redhawk Aerial Imaging requests relief from 91.105(2) and (b), *Flight crewmembers at stations*.

The UAS operated by Redhawk Aerial Imaging has no cockpit, the requirement for seatbelts is not applicable.

Therefore, Redhawk Aerial Imaging requests relief from 91.105(2) and (b).

Redhawk Aerial Imaging requests relief from 91.119, *Minimum safe altitudes*.

- Redhawk Aerial Imaging's DJI Phantom 2 UAS has multiple safety systems integrated within the airframe to minimize the risk of damage to persons or property.
- Redhawk Aerial Imaging's DJI Phantom 2 UAS is electric and there is no risk of fuel spillage or a fire from leaking fuel after an emergency, whereas the typical aircraft utilized in the proposed operations of Redhawk Aerial Imaging can weigh thousands of pounds and carry nearly 200 gallons of fuel.
- Equipped with altitude and distance limiting features that inhibit the UAS from flying above certain altitudes or beyond specified ranges.
- In the unlikely event of a GPS and / or radio control Lost link, the UAS automatically enters into a hover, if GPS and / or radio control link cannot be re-established, the UAS will return back to its departure point (Fail Safe).
- Navigation lights
- Flight operations will only commence with permission of the land owner / controller
- Flight operations will only take place in VLOS.
- Flight operations will always have a Visual Observer (VO) to assist the pilot in any and all sense and avoid concerns regarding airspace as well as any other hazards that may exist within the flight operation envelope.
- Flight operations in Class A or B airspace will not be performed.

Therefore, Redhawk Aerial Imaging requests relief from 91.119(a), 91.119(b), 91.119(c) 91.119 (d)(1) and 91.119(d)(2).

Redhawk Aerial Imaging requests relief from 91.121, *Altimeter Settings*.

Redhawk Aerial Imaging’s DJI Phantom 2 UAS is equipped with barometric pressure and GPS altimeters that provide altitude readings AGL to the UAS pilot via a digitally encoded telemetric data feed, which downlinks from the UAS to a ground-based on-screen display.

Redhawk Aerial Imaging will only conduct flight operations within Visual Line of Sight (VLOS).

In the Astraeus-Aerial Waiver 11062, and Snaproll Waiver 11063, the FAA determined this method to be a sufficient method for ensuring the UAS operations do not adversely affect safety.

Therefore, Redhawk Aerial Imaging requests relief from 91.121.

Redhawk Aerial Imaging requests relief from 91.151, *Fuel Requirements in VFR Conditions*.

Redhawk Aerial Imaging operates an electric powered UAS and ground station equipped with a digitally encoded telemetric data feed that includes feedback data on remaining battery life.

Redhawk Aerial Imaging's DJI Phantom 2 battery can provide up to twentyfive (25) minutes of flight time. As the loads can vary, depending on net weight, so can maximum flight times. Considering the limited flight times possible, to require a reserve of thirty minutes daytime and forty minutes nighttime would not be possible in all situations.

The FAA recognized these limitations with small UAS's and in 2689, 5745, 10650, 8811, 10808, and 10673.

Redhawk Aerial Imaging's DJI Phantom 2 UAS is equipped with multiple fail safe items that minimize the risk of the UAS completely exhausting the battery supply. Should the battery level fall below thirty (30) percent capacity, LED indicators on the UAS will produce red blinking light. Should the capacity fall to fifteen (15) percent capacity, the DJI Phantom 2 UAS will begin to descend and land automatically. If necessary, the PIC can manually override the automatic descent and landing to ensure a safe landing zone free of any persons or property.

Therefore, Redhawk Aerial Imaging requests relief from 91.151.

Redhawk Aerial Imaging requests relief from 14 CFR 91.405(a), *Maintenance required*, 91.407(a)(1), *Operation after maintenance, preventive maintenance, rebuilding, or alteration*, 91.409(a)(2), *Inspections*, and 91.417(a) and (b), *Maintenance records*.

Redhawk Aerial Imaging believes that these sections only apply to aircraft with an airworthiness certificate.

Redhawk Aerial Imaging submits that the requested relief is proper since an equivalent level of safety will be ensured. The PIC, before each mission, will check the manufacturer's internet service pages, and ensure applicable software and hardware is up to date as required, and ensure compliance with any safety bulletins posted. In addition, the Operator's Manual as provided by the UAS manufacturer will be revised to include specific operating procedures and limitations to comply with the exemptions sought. The revised Operator's Manual will be in possession of the crew during operation of the UAS. Furthermore, Redhawk

Aerial Imaging will document and maintain all maintenance records for the DJI Phantom 2 UAS.

Therefore, Redhawk Aerial Imaging requests relief from 14 CFR 91.405(a), 91.407(a)(1), 91.409(a)(2), and 91.417(a) and (b).

## REASONS REDHAWK AERIAL IMAGING EXEMPTION WILL NOT AFFECT PUBLIC SAFETY

The components installed on the Redhawk Aerial Imaging DJI Phantom 2 to enhance the safety include;

- Direct pilot intervention via remote control.
- Navigation/orientation lighting.
- GPS Based altitude and position sensors and flight stabilization system.
- Barometric pressure and GPS altimeters.
- Equipped with altitude and distance limiting features that inhibit the UAS from flying above certain altitudes or beyond a specified range.
- Lost link integration providing for automatic return to home system ensuring that in the unlikely event of a lost link occurrence (Fail Safe), the DJI Phantom 2 UAS will safely return to the departure point.
- Remote instrumentation at the mobile ground station relaying data back to the pilot, including, altitude, heading, airspeed (relative ground speed), GPS position and battery power levels, as well as warning messages of critical onboard systems.

Redhawk Aerial Imaging will document and maintain all maintenance, overhaul and modification records for its UAS.

Redhawk Aerial Imaging submits that the requested relief under Section 333 is proper in consideration of the limited size, weight, operating conditions, design safety features, and the imposed conditions and limitations by Redhawk Aerial Imaging, that an equivalent level of safety will be ensured.

Redhawk Aerial Imaging in all flight operations will comply with airspace rules. Flight operations will not impede, delay or divert any other aircraft as the Redhawk Aerial Imaging flight operations will be conducted below 400 feet AGL. Any operations in airspace controlled by a control tower, will be coordinated with the tower to ensure there are no hazards to the NAS. A Letter of Authorization will be procured from appropriate airport managers to ensure compliance with airspace and ATC operations. Redhawk Aerial Imaging will adhere to all airspace rules.

Class A No Operations Allowed

Class B No Operations Allowed
Class C per 91.130
Class D per 91.219
Class E per 91.127
Class G per 91.126

Redhawk Aerial Imaging has implemented procedures to address flight termination plans in the unlikely event of an unrecoverable system failure. As flight operation locations will vary considerably, Flight Termination Points (FTP's) will vary for each location (typically FTP's will be the point of departure). Each flight operations site will be assessed for acceptable risk FTP's (in order as follows);

- Airspace classification
- Risk to NAS operations
- Risk impedance, delay or diversion of other aircraft due to flight operations
- Risk to persons or property on the ground
- Site assessment to determine hazards that could cause an unrecoverable system failure

Lost Link Points (LLP's) will be established at each flight operations site. The flight control systems integrated into Redhawk Aerial Imaging's UAS has lost link or Fail Safe procedures that in the event of a lost link, the UAS will return to the origination point. This origination point is the point at which the UAS departs the takeoff position and is recorded automatically as soon as the UAS leaves the ground.

All phases of flight with the UAS are critical, as such 14 CFR 135.100 Flight crewmember duties will be strictly enforced. The areas surrounding where the PIC and the VO are working, including the ground station will be segregated from any non-participating individuals to ensure that distractions are kept at a minimum during all critical phases of flight.

The DJI Phantom 2 UAS that will be operated by Redhawk Aerial Imaging will be registered in accordance with 49 U.S.C. 44103, *Registration of Aircraft*, as well as 14 C.F.R Part 47, *Aircraft Registration.*

## CONCLUSION

As set forth herein, Redhawk Aerial Imaging seeks an exemption pursuant to 14 C.F.R. §§ 11.61 and Section 333 of the FAA Modernization and Reform Act of 2012 (FMRA), which will permit the safe operation of its DJI Phantom 2 UAS commercially, without an airworthiness certificate, for the limited purpose of conducting aerial acquisitions over certain areas of the United States. By granting this Petition, the FAA Administrator will be fulfilling the Congressional mandate of the FAA Modernization and Reform Act of 2012, while also

advancing the interests of the public. WHEREFORE, in accordance with the Federal Aviation Regulations and the FAA Modernization and Reform Act of 2012, Section 333, Redhawk Aerial Imaging respectfully requests that the Administrator grant this Petition for an exemption from the requirements of 14 C.F.R §§ 35 Part 21; and 91.7; 45.23(b), 61.113(a) & (b), 91.103(b); 91.109; 91.119; 91.121; 91.151; 91.405(a); 91.407(a)(1); 91.409(a)(1) & (a)(2); AND 91.417(a) &(b); 91.7(a) to permit Redhawk Aerial Imaging to operate its DJI Phantom 2 UAS in the NAS for the purpose of safely, efficiently, and economically utilizing unmanned aircraft for aerial data acquisition, photography and videography work in the areas of Construction, Agriculture, Infrastructure, Real Estate, and other applicable areas.

**Appendix A – Redhawk Aerial Imaging Flight Operating Procedures**

Owner and crew must be familiar with, and follow these operating procedures:

1) Owner must:

a. Document all maintenance, alterations, and updates in the aircraft records.
b. Any 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 in accordance with the operator's manual. The PIC who conducts the functional test flight must make an entry in the UAS aircraft records of the flight.

2) Prior to each mission:

The PIC must familiarize him/herself with all possible safety aspects of the mission. This includes but is not limited to:

a. Software versions required (manufacturers web site)
b. Weather
c. Wind (less than 12 knots)
d. NOTAMS
e. Proximity of airports or SUA

3) Prior to each flight:

The PIC must inspect the UAS and Ground Station to ensure they are in a condition for safe flight. 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. This includes, but is not limited to:

a. Batteries (full UAS battery required for each flight, check battery levels for transmitter and range extender)
b. Inspect propellers, motors, wings and lights
c. The 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.

The PIC performs a safety assessment. This includes but is not limited to:

a. If operating within 3 miles of an uncontrolled airport, check that a letter of agreement that covers the current mission with the airport manager is available to the PIC, and that the operation is conducted under a current NOTAM.
b. Inspect flight area for light poles, trees, utility wires, proximity to helipads, hospitals, schools, busy roadways, gatherings of people, SUA.
c. The PIC provides a safety briefing to the spotter. An agreement is made under which conditions the flight must be aborted.
d. Check placement of warning signs: “Caution: Small Unmanned Aircraft Operation in Progress”
e. Identify take off and landing area.

The PIC performs pre-flight checks:

a. Check all controls neutral
b. Turn on Power at transmitter first, then on UAS, and Range Extender
c. Perform GPS alignment according to manufacturer’s operating manual
d. If alignment successful, flight can start from a safe take-off point
e. Immediately after takeoff perform the following checks:
    i. Hover 5-10 feet
    ii. Check data link
    iii. Check video link
    iv. Check altimeter
    v. Check GPS
    vi. Check time

4) During each flight:

a. The UAS may not be operated by the PIC from any moving device or vehicle.
b. The UAS may not be operated at an altitude exceeding 200 feet AGL.
c. The UAS may not be operated at night or at altitudes less than 500 feet below or less than 2,000 feet horizontally from a cloud or when visibility is less than 3 statute miles.
d. The UAS must remain clear and yield the right of way to all other manned operations and activities at all times (including, but not limited to, ultralight vehicles, parachute activities, parasailing activities, hang gliders, etc.).
e. Flight time is limited to maximum fifteen (25) minutes.
f. UAS must remain within line of sight and within 500 feet of PIC.

5) Emergency during flight. This could include but is not limited to:

a. Pilot distracted
b. Spotter signals abort
c. Sudden change in weather or wind
d. Manned aircraft in the vicinity
e. People getting within safety perimeter
f. Birds

Immediately:

a. Determine closest safe landing location to UAS
b. Land

6) After each flight:

a. Check and log flight time and remaining battery level.
b. Turn off power to UAS first, then turn off power to transmitter and range extender
c. Inspect UAS for any damage
d. Remove warning signs

**Attachment A - DJI Phantom 2 User Manual (version 1.4)**

**Attachment B - DJI Phantom 2 Product Release Notes (as of May 19, 2015)**