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

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

June 30, 2015

Exemption No. 11946
Regulatory Docket No. FAA–2015–1455

Mr. Matthew J. Clark
Counsel for RTI Group LLC
McKenna Long & Aldridge LLP
1676 International Drive, Penthouse
McLean, VA 22102

Dear Mr. Clark:

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

By letter dated April 21, 2015, you petitioned the Federal Aviation Administration (FAA) on behalf of RTI Group, LLC (hereinafter petitioner or operator) for an exemption. The petitioner requested to operate an unmanned aircraft system (UAS) to conduct aerial data collection.

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 DJI Phantom 2 Vision and DJI Inspire 1.

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 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, RTI Group, LLC 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, RTI Group, LLC 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 and DJI Inspire 1 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 July 31, 2017, unless sooner superseded or rescinded.

Sincerely,

John S. Duncan
Director, Flight Standards Service

Enclosures

Project Officer: _____

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April 21, 2015

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

Re: Petition of RTI Group, LLC, for an Exemption Pursuant to Section 333 of the FAA Modernization and Reform Act of 2012

To Whom it May Concern:

Pursuant to Section 333 of the FAA Modernization and Reform Act of 2012 ("Reform Act") and 14 C.F.R. Part 11, RTI Group, LLC ("RTI"), hereby applies for an exemption from the Federal Aviation Regulations ("FARs") identified below, to operate small unmanned aerial vehicles (*i.e.*, "small unmanned aircraft" or "UAS") for aerial data collection. The data will be used in support of, *inter alia*, RTI's forensic evaluation and infrastructure inspection work. The FAA has previously issued grants of exemption in circumstances similar to those presented in this Petition for Exemption.

In addition to this Petition for Exemption, RTI will also submit the following supporting documents (hereinafter referred to as "operating documents"):

- RTI UAS Operations Manual;
- DJI Phantom 2 Vision User's Manual;
- Smart Flight Battery Safety Guidelines;
- DJI Quick Start Guide;
- DJI Pilot Training Guide;
- DJI Inspire 1 User's Manual
- DJI Inspire 1 Safety Guidelines
- DJI Inspire 1 Maintenance Manual
- DJI Intelligent Flight Battery Safety Guidelines

RTI submits these operating documents as confidential documents pursuant to 14 C.F.R. § 11.35(b), as the materials contain confidential commercial and proprietary information that RTI has not and will not share with others. The information contained in these documents is not generally available to the public and is protected from release under the Freedom of Information Act, 5 U.S.C. § 552 *et seq.*

For your convenience, this Petition is organized as follows:

I. DESCRIPTION OF PETITIONER

Headquartered in Stevensville, Maryland, RTI is a pioneering, global accident and failure investigation and safety management consultancy serving the legal and insurance markets. With origins dating back to 1975, RTI provides forensic engineering services to high-risk industries and transportation operations, including aviation, marine, rail, utilities, nuclear, and construction.

The RTI group of companies is a well-established multidisciplinary technical services consultancy specializing in accident and failure investigation as well as safety-related applications and education. RTI professionals are innovative leaders in the technical analysis and reconstruction of transportation and industrial accidents, offering well over thirty years of experience in conducting forensic investigations. Cases have ranged from small to large loss matters, including complex claims and litigation, conducted on behalf of corporations, attorneys, insurance companies, and government agencies. RTI is an established international resource of highly qualified experts who provide each client with bespoke forensic engineering and scientific investigations, laboratory testing, system safety analysis, computer accident reconstructions, and forensic visual presentations.

Following decades of experience serving clients worldwide, RTI has developed a solid reputation for excellence across the forensic engineering field. Consistent with that reputation, RTI continually seeks new and innovative ways to better serve its clients. New UAS technologies have tremendous potential in the field of forensic engineering and related infrastructure inspections. UASs provide a versatile platform for capturing high-resolution imagery of infrastructure, and also provide a means to survey large areas quickly and safely. For these reasons, RTI seeks an exemption allowing commercial operation of UASs for aerial data collection.

In accordance with 14 C.F.R. § 11.81(a), RTI provides the following information in support of its Petition for Exemption.

The contact information for Petitioner is as follows:

Jeremy Reynolds, Chief Operations Officer
RTI Group, LLC
401 Log Canoe Circle
Stevensville, MD 21666
Phone: 410.571.0712
Fax:. 410.571.0713
Email: jeremy.reynolds@rtiforensics.com

II. DESCRIPTION PROPOSED OPERATION

RTI seeks an exemption pursuant to Section 333 of the Reform Act to use the DJI Phantom 2 Vision and the DJI Inspire 1 UASs for aerial data collection in support of RTI's forensic evaluation infrastructure inspection work. The proposed operations will occur under tightly controlled conditions on private property where RTI has received permission to fly from the landowner or

his/her authorized representative. The UAS will be operated in accordance with the requirements contained in the accompanying RTI operating documents, and in accordance with the requirements of an applicable Certificate of Waiver or Authorization ("COA").

Examples of the type of work the aerial data will support include:

- Assisting Accident First Responders: RTI anticipates using UASs to assist first responders in documenting and surveying accident scenes.

- Aviation and Rail Accident Investigation: RTI intends to use UASs to conduct site and debris field mapping in the aftermath of aviation, railroad and other transportation related accidents.

- Accident Investigations/Analysis: RTI intends to employ UASs to survey and map broad views of large areas in support of its accident investigation/analysis activities. UASs would also be used to survey and map areas affected by catastrophic events such as tornados, hurricanes, earthquakes, flooding, and collapse of large structures. Additionally, UASs may be used to survey and inspect fire and explosion damages.

- Infrastructure Inspections: RTI intends to use UASs to capture high-resolution imagery of infrastructure to include items such as flare stacks, elevated oil/gas pipelines, powerlines/power infrastructure, wells, tanks, columns, tower structures, antenna systems, tall monuments, water towers, dams, power transmission or communication systems, wind turbines, agricultural silos, signs/billboards, light poles, bridges, rooftops, building façades, and other industrial plant/site infrastructure. While some of this infrastructure is accessible using specialized climbing gear, ladders and man lifts, these methods expose inspecting engineers and consultants to significant falling risks and the possibility of causing damage to the structure being inspected. In other instances, structural features are inaccessible using these conventional inspection methods, and the structure is located in an area where full-scale aircraft cannot fly. UASs will aid in documenting the observable infrastructure conditions that are simply not accessible by any other safe or practical means.

The FAA has previously issued grants of exemption in circumstances substantially similar to those presented in this Petition for Exemption, including, but not limited to:

- Exemption No. 11230 to Montico, Inc. (Tower inspections and mapping operations to an existing tower structure) (Docket No. FAA-2014-0604);

- Exemption No. 11225 to Oceaneering International, Inc. (Safety inspection and aerial surveying);

- Exemption No. 11217 to Notus Access Group (Aerial inspections of wind turbine blades and towers) (Docket No. FAA-2014-0954);

- Exemption No. 11206 to BNSF Railway Co. (Remote aerial viewing of railroad infrastructure and operations) (Docket No. FAA-2014-0704);

- Exemption No. 11191 to Singer's Creation (Aerial photography for inspection of home exteriors) (Docket No. FAA-2014-0915);

- Exemption No. 11185 to Commonwealth Edison Company (Electric transmission and distribution utility system monitoring, powerline inspections, and damage assessments) (Docket No. FAA-2014-0855);

- Exemption No. 11175 to State Farm Automobile Insurance (Roof inspections) (Docket No. FAA-2014-0876);

- Exemption No. 11156 to Total Safety U.S., Inc. (Flare stack inspections) (Docket No. FAA-2014-0610); and

- Exemption No. 11109 to Clayco (Aerial imaging, surveying and monitoring of construction sites) (Docket No. FAA-2014-0507).

III. RELEVANT STATUTORY AUTHORITY

This Petition for Exemption is submitted pursuant to Section 333(a) through (c) of the FAA Modernization and Reform Act of 2012 ("Reform Act"). Congress has directed the FAA "to safely accelerate the integration of civil unmanned aircraft systems into the national airspace system." Pursuant to Section 333 of the Reform Act, the FAA Administrator is to permit unmanned aircraft systems to operate in the NAS where it is safe to do so based on the following considerations:

- The UAS's size, weight, speed and operational capability;

- Operation of the UAS in close proximity to airports and populated areas; and

- Operation of the UAS within the visual line of sight of the operator.

Additionally, the FAA Administrator has general authority to grant exemptions from the agency's safety regulations and minimum standards when the Administrator decides a requested exemption is in the public interest. *See* 49 U.S.C. § 106(f) (defining the authority of the Administrator); 49 U.S.C. § 44701(f) (permitting exemptions from §§ 44701(a), (b) and §§ 44702 – 44716, *et seq.*). A party requesting an exemption must explain the reasons why the exemption: (1) would benefit the public as a whole, and (2) would not adversely affect safety (or how it would provide a level of safety at least equal to the existing rules). *See* 14 C.F.R. § 11.81 (petitions for exemption).

IV. RTI'S PROPOSED UAS OPERATIONS MEET THE REQUIREMENTS OF SECTION 333 OF THE REFORM ACT

RTI's proposed operations in this Petition for Exemption qualify for expedited approval pursuant to Section 333 of the Reform Act as each of the statutory criteria and relevant factors are satisfied.

A. Approval is Warranted Based on the UAS's Size, Weight, Speed, and Operational Capability

The FAA has previously determined that a Grant of Exemption is appropriate for operations conducted using the DJI Inspire 1 and the DJI Phantom 2 (including the Vision and Vision+ models), due to their size, weight, speed, and operational capability. *See e.g.*,

- Exemption No. 11224 to NextEra Energy, Inc. (DJI Phantom 2 Vision+ and DJI Inspire 1)
- Exemption No. 11230 to Montico, Inc. (DJI Phantom 2 Vision+)
- Exemption No. 11228 to Steven Zeets (DJI Phantom 2 and DJI Phantom 2 Vision+)
- Exemption No. 11218 to Saratoga Aerial Vehicle (DJI Phantom 2 Vision+)
- Exemption No. 11215 to Mike Johnson (DJI Phantom 2 Vision+)

Specifically, the FAA has found the following characteristics of the DJI Phantom 2[1] and DJI Inspire 1[2] to warrant approval for a Grant of Exemption:

- The DJI Phantom 2 Vision weighs less than 3 lbs (including the battery).
- The DJI Inspire 1 weighs less than 6 lbs (including the battery).
- Maximum flight speed for the DJI Phantom 2 Vision is 15 m/s (29 knots).[3]
- Maximum flight speed for the DJI Inspire 1 is 22 m/s (~43 knots).
- Both the DJI Inspire 1 and the DJI Phantom 2 Vision has the capability to operate safely after experiencing certain in-flight contingencies or failures and uses an auto-pilot system to maintain UAS stability and control. The UASs are also able to respond to a loss of GPS or a lost-link event with a pre-coordinated, predictable, automated flight maneuver. These safety features provide an equivalent level of safety compared to a manned aircraft performing a similar operation and mitigate the risk of command and control link failures.[4] The Inspire 1

[1] Manufacturer specifications for the DJI Phantom 2 Vision are located in ***Attachment A***.

[2] Manufacturer specifications for the DJI Inspire 1 are located in ***Attachment B***.

[3] Exemption No. 11195 to FalconSkyCam at pg. 10.

[4] *Id.* at pg. 3.

also has geofencing capabilities to ensure the aircraft remains within a defined area of operation.

- Altitude information will be generated by equipment onboard the UAs as specified using GPS triangulation, digitally encoded barometric altimeter, radio altimeter, or any combination thereof. This information will be transmitted to the pilot via telemetric data feed.
- The radio frequencies used for operations and control of the UASs comply with the Federal Communications Commission ("FCC") and other appropriate government oversight agency requirements. Both UASs operate within the 2.4 GHz frequency band.

If the same proposed operations were conducted using a helicopter, the aircraft's take-off weight would likely exceed 6,000 pounds. The difference in weight between the DJI Phantom 2 and DJI Inspire 1 (which carries no passengers, crew, or flammable fuel), significantly reduces the potential harm to the participating and non-participating individuals or property in the event of an accident or incident.

B. Approval is Warranted Based on the Operational Restrictions in RTI's Operating Documents

RTI's operating documents contain all the procedures and limitations necessary to safely and successfully perform the proposed operations. To assist the FAA in making a safety assessment of RTI's proposed operations, below is a summary of operational limitations and conditions that RTI will adhere to, and which will ensure an equivalent or higher level of safety to operations conducted under current regulatory guidelines:

1. Operations authorized by the grant of exemption will be limited to the DJI Phantom 2 Vision and the DJI Inspire 1 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 grant.

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 a functional test flight prior to conducting further operations under this exemption. Functional test flights may only be conducted by a PIC with a VO and must remain at least 500 feet from other people. The functional test flight must be conducted in such a manner so as to not pose an undue hazard to persons and property.

9. The operator is responsible for maintaining and inspecting the UAS to ensure that it is in a condition for safe operation.

10. Prior to each flight, the PIC must conduct a pre-flight inspection and determine the UAS is in a condition for safe flight. The pre-flight inspection must account for all potential discrepancies, e.g. inoperable components, items, or equipment. If the inspection reveals a condition that affects the safe operation of the UAS, the aircraft is prohibited from operating until the necessary maintenance has been performed and the UAS is found to be in a condition for safe flight.

11. The operator must follow the UAS manufacturer's maintenance, overhaul, replacement, inspection, and life limit requirements for the aircraft and aircraft components.

12. Each UAS operated under this exemption must comply with all manufacturer safety bulletins.

13. Under this grant of exemption, a PIC must hold either an airline transport, commercial, private, recreational, or sport pilot certificate. The PIC must also hold a current FAA airman medical certificate or a valid U.S. driver's license issued by a state, the District of Colombia, Puerto Rico, a territory, a possession, or the Federal government. The PIC must also meet the flight review requirements specified in 14 CFR § 61.56 in an aircraft in which the PIC is rated on his or her pilot certificate.

14. The operator may not permit any PIC to operate unless the PIC demonstrates the ability to safely operate the UAS in a manner consistent with how the UAS will be operated under this exemption, including evasive and emergency maneuvers and maintaining appropriate distances from persons, vessels, vehicles and structures. PIC qualification flight hours and currency must be logged in a manner consistent with 14 CFR § 61.51(b). Flights for the purposes of training the operator's PICs and VOs (training, proficiency, and experience-building) and determining the PIC's ability to safely operate the UAS in a manner consistent with how the UAS will be operated under this exemption are permitted under the terms of this exemption. However, training operations may only be conducted during dedicated training sessions. During training, proficiency, and experience-building flights, all persons not essential for flight operations are considered nonparticipants, and the PIC must operate the UA with appropriate distance from nonparticipants in accordance with 14 CFR § 91.119.

15. UAS operations may not be conducted during night, as defined in 14 CFR § 1.1. All operations must be conducted under visual meteorological conditions (VMC). Flights under special visual flight rules (SVFR) are not authorized.

16. The UA may not operate within 5 nautical miles of an airport reference point (ARP) as denoted in the current FAA Airport/Facility Directory (AFD) or for airports not denoted with an ARP, the center of the airport symbol as denoted on the current FAA-published aeronautical chart, unless a letter of agreement with that airport's management is obtained or otherwise permitted by a COA issued to the exemption holder. The letter of agreement with the airport management must be made available to the Administrator or any law enforcement official upon request.

17. The UA may not be operated less than 500 feet below or less than 2,000 feet horizontally from a cloud or when visibility is less than 3 statute miles from the PIC.

18. If the UAS loses communications or loses its GPS signal, the UA must return to a pre-determined location within the private or controlled-access property.

19. The PIC must abort the flight in the event of unpredicted obstacles or emergencies.

20. The PIC is prohibited from beginning a flight unless (considering wind and forecast weather conditions) there is enough available power for the UA to conduct the intended operation and to operate after that for at least five minutes or with the reserve power recommended by the manufacturer if greater.

21. Air Traffic Organization (ATO) Certificate of Waiver or Authorization (COA). All operations shall be conducted in accordance with an ATO-issued COA. The exemption holder may apply for a new or amended COA if it intends to conduct operations that cannot be conducted under the terms of the attached COA.

22. All aircraft operated in accordance with this exemption must be identified by serial number, registered in accordance with 14 CFR part 47, and have identification (N-Number) markings in accordance with 14 CFR part 45, Subpart C. Markings must be as large as practicable.

23. Documents used by the operator to ensure the safe operation and flight of the UAS and any documents required under 14 CFR §§ 91.9 and 91.203 must be available to the PIC at the Ground Control Station of the UAS any time the aircraft is operating. These documents must be made available to the Administrator or any law enforcement official upon request.

24. The UA must remain clear and give way to all manned aviation operations and activities at all times.

25. The UAS may not be operated by the PIC from any moving device or vehicle.

26. All flight operations conducted closer to nonparticipating persons (persons other than the PIC or VO), vessels, vehicles, and structures, than the minimum distance requirements of § 91.119 (b)[5] and (c)[6], must be conducted using a tether. The operator must ensure that nonparticipating persons remain at least 25 feet away from the maximum distance the UAS can travel. If a situation arises where nonparticipating persons comes with 25 feet from the maximum distance the UAS can travel, flight operations must cease immediately.[7] The PIC must make a safety assessment of the risk of operating closer to those objects and determine that it does not present an undue hazard.

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[5] (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.

[6] (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.

[7] *See* discussion of tethered UAS operations in Section V(H), *supra*.

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 prior to the beginning of every flight.

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.

V. REGULATIONS FROM WHICH EXEMPTION IS SOUGHT

The Federal Aviation Act expressly grants the FAA the authority to issue exemptions. This statutory authority, by its terms, includes exempting civil aircraft, as the term is defined under § 40101 of the Act, including UASs, from its safety regulations and minimum standards when the Administrator decides a requested exemption is in the public interest.[8]

RTI seeks an exemption from several interrelated provisions of 14 C.F.R. Parts 45, 61 and 91 for purposes of conducting the requested operations using small UASs, including:

FAR	Description
91.9(c); 45.23(b) and 45.27(a)	Aircraft Marking and Identification Requirements
91.405(a); 91.407(a)(1); 91.409(a)(1) and (2); 91.417(a) and (b)	Maintenance and Inspection Requirements
61.113; 61.101(e)(4) and (5)	Private and Recreational Pilot Privileges and Limitations
91.7(a)	Civil Aircraft Airworthiness
91.9(b)(2); 91.203(a) and (b)	Carrying Aircraft Flight Manual, Certification and Registration in the Aircraft
91.103	Preflight Action

[8] *See* 49 U.S.C. § 44701(f) (authorizing the grant of exemptions from requirements of regulations prescribed pursuant to Sections 44701(a) and (b) and Sections 44702 - 44716).

91.109(a)	Flight Instruction
91.119 (b)	Minimum Safe Altitudes – Over Congested Areas
91.119(c)	Minimum Safe Altitudes - Over Other than Congested Areas
91.121	Altimeter Settings
91.151(a)	Fuel Requirements for Flight in VFR Conditions

Listed below are the specific sections of 14 C.F.R. for which exemption is sought, and the operating procedures and safeguards that Petitioner has established which will ensure a level of safety better than or equal to the rules from which exemption is sought.[9]

A. 91.9(c), 45.23(b) and 45.27(a): Aircraft Marking and Identification Requirements

RTI seeks an exemption from the aircraft marking and identification requirements contained in 14 C.F.R. §§ 91.9(c), 45.23(b) and 45.27(a).

- 14 C.F.R. § 91.9(c), Civil Aircraft Flight Manual, Marking and Placard requirements, 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.

- 14 C.F.R. § 45.23(b), Markings of the Aircraft, states:

  > 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.

- 14 C.F.R. § 45.27(a), Rotorcraft, states:

[9] *See* 14 C.F.R. § 11.81(e), which requires a petition for exemption to include:

> The reasons why granting the exemption would not adversely affect safety, or how the exemption would provide a level of safety at least equal to that provided by the rule from which you seek exemption.

> Each operator of a rotorcraft must display on that rotorcraft horizontally on both surfaces of the cabin, fuselage, boom, or tail the marks required by § 45.23.

In a prior grants of exemption under Section 333 of the Reform Act, the FAA determined that exemption from these requirements was warranted provided that the aircraft "have identification (N-Number) markings in accordance with 14 C.F.R Part 45, Subpart C if the markings are as large as practicable."[10] All UA flown by Petitioner will bear N-number markings that are as large as practicable in accordance with 14 C.F.R. Part 45, Subpart C.[11]

B. 91.405(a), 91.407(a)(1), 91.409(a)(1) and (2); 91.417(a) and (b): Maintenance Inspections

Petitioner seeks an exemption from the maintenance inspection requirements contained in 14 C.F.R. § 91.405(a), 91.407(a)(1), 91.409(a)(1) and (2); 91.417(a) and (b). These regulations specify maintenance and inspection standards in reference to 14 C.F.R. Part 43.[12] An exemption from these regulations is needed because Part 43 and these sections only apply to aircraft with an airworthiness certificate, which the UAS to be operated under this grant of exemption will not have.

An equivalent level of safety will be achieved because maintenance and inspections will be performed in accordance with the operating documents and any required manufacturer Safety or Service Bulletins. Further, as required by the operating documents, the PIC will conduct a pre-flight inspection of the UAS and all associated equipment to account for all discrepancies and/or inoperable components. Maintenance will be performed and verified to address any conditions potentially affecting safe operation of the UAS and no flights will occur unless, and until, all flight critical components of the UAS have been found to be airworthy and in a condition safe for operation. A functional test flight will be conducted following the replacement of any flight-critical components. As required by the operating documents, the PIC who conducts the functional test flight will make an entry in the UAS aircraft records of the flight.

The operating documents also includes requirements to follow the UAS manufacturer's maintenance, overhaul, replacement, inspection, and life limit requirements for the aircraft and aircraft components. Moreover, the operating documents also include procedures to document and maintain a record of the UAS maintenance, preventative maintenance, alterations, status of replacement /overhaul component parts, and the total time in service of Petitioner's UASs. As a whole, the maintenance and inspection procedures required by Petitioner's operating documents ensure that an equivalent or higher level of safety will be achieved.

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[10] FAA Docket No. FAA-2014-0352.

[11] *See, e.g.,* FAA Docket No. FAA-2014-0352, at 14.

[12] *See, e.g.,* 14 C.F.R. § 91.405(a) (stating that each owner or operator of an aircraft "[s]hall have the aircraft inspected as prescribed in subpart E of this part and shall between required inspections …have discrepancies repaired as prescribed in part 43 of this chapter").

C. 61.113, 61.101(e)(4) and (5): Private and Recreational Pilot Privileges and Limitations

RTI seeks exemption from 14 CFR § 61.113, which restricts private pilot certificate holders from flying aircraft for compensation or hire, and would also require a second class medical certificate. The purpose of Part 61 is to ensure that the skill and competency of any PIC matches the airspace in which the PIC will be operating, as well as requiring certifications if the private pilot is carrying passengers or cargo for hire. In this case, while the UASs will be operated as part of a commercial operation, it carries neither passengers nor cargo.

In the FAA's Section 333 Grant of Exemption to Astraeus Aerial[13], the FAA determined that the unique characteristics of UAS operation outside of controlled airspace did not warrant the addition cost and restrictions attendant with requiring a the PIC to have a Commercial Pilot Certificate and Class II Medical Certificate. The fulfillment of the additional requirements for a private pilot to become qualified as a commercial pilot would not lead to any additional safety benefits when UAS operations are involved.

More recently, the FAA determined that holders of recreational and sport pilot certificates would also have adequate aeronautical knowledge to pilot a UAS. Accordingly, because these individuals would also be subject to security screening by the Department of Homeland Security ("DHS"), the FAA determined that holders of recreational and sport pilot certificates would be qualified to serve as the PIC for UAS operations.[14]

The restrictions Petitioner has placed on its UAS operations meet or exceed the restrictions similarly imposed on Astraeus Aerial and other operators in more recently granted exemptions under Section 333 of the FAA Reform Act. RTI will operate on private property away from persons and property not involved in the operation. RTI will also require all PICs to be thoroughly trained in the unique aspects of UAS flight. As set forth in the operating documents, pilots will have experience not only in UAS operations generally but have logged flight time in the specific make and model used for the operations before they are permitted to participate in commercial flights on behalf of RTI. The pilot qualification, training, and currency requirements in the operating documents ensure that Petitioner's pilots are competent and proficient in the UAS they are operating. The Petitioner's training and qualification requirements are consistent with those contained in prior FAA issued grants of exemption, and will provide a higher level of competency and proficiency for its pilots and will ensure at least an equivalent level of safety.

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[13] Grant of Exemption No. 11062 (FAA Docket No. FAA-2014-0352).

[14] *See* Grant of Exemption No. 11213 to Aeryon Labs, Inc. (Docket No. FAA-2014-0642 at pgs. 8-9).

D. 91.7(a): Civil Aircraft Airworthiness

Inasmuch as there will be no airworthiness certificate issued for the UASs, RTI seeks an exemption from 14 C.F.R. § 91.7(a), which requires that a civil aircraft be in an airworthy condition to be operated. While the petitioner's UASs will not have an airworthiness certificate, the FAA has determined that for the purposes of this exemption the pilot may determine the aircraft is in an airworthy condition prior to flight. The operating documents contain procedures which allow the PIC to determine whether the aircraft is in a condition safe for flight, and an exemption from § 91.7(a) is therefore warranted.

E. 91.9(b)(2): Civil Aircraft Flight Manual in the Aircraft and 91.203(a) and (b): Carrying Civil Aircraft Certification and Registration

Title 14 C.F.R. § 91.9(b)(2) and § 91.203(a) and (b) require the operator to carry airworthiness documents and other aircraft manuals onboard the aircraft.

Pursuant to 14 C.F.R. § 91.9(b)(2):

> (b) No person may operate a U.S.-registered civil aircraft –
> …
> (2) For which an Airplane or Rotorcraft Flight Manual is 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.

Pursuant to 14 C.F.R. § 91.203(a) and (b):

> (a) Except as provided in § 91.715, no person may operate a civil aircraft unless it has within it the following:
>
> (1) An appropriate and current airworthiness certificate…
>
> (b) No person may operate a civil aircraft unless the airworthiness certificate required by paragraph (a) of this section or a special flight authorization issued under § 91.715 is displayed at the cabin or cockpit entrance so that it is legible to passengers or crew.

Given the small size and configuration of the UASs, it would be impossible to keep airworthiness documents and other aircraft manuals on board the UAS because there is simply no room and the UAS has no cabin or cockpit.

In an FAA Office of Chief Counsel's Opinion dated August 8, 2014, and prepared by Dean E. Griffith, Attorney, AGC-220, it was acknowledged that the intent of 14 C.F.R. 91.9(b) and 91.203(a) and (b) is met if the pilot of the unmanned aircraft has access to the UAS flight manual, registration certificate, and other required documents from the ground control station from which he or she is

operating the aircraft.[15] As this FAA Office of Chief Counsel Opinion clarifies, the intent of the rule is to ensure the pilot has access to these key documents during flight. Therefore, an equivalent level of safety will be achieved by ensuring that the pilot has access to the documents at the ground control station from which he or she is piloting the UAS.[16]

F. 91.103: Preflight Action

Petitioner seeks an exemption from 14 C.F.R. § 91.103, which requires a PIC to become familiar with specific information before each flight, including information contained in the FAA-approved Flight Manual on board the aircraft. While the PIC will be familiar with all information necessary to safely conduct the flight, an exemption is requested to the extent that an FAA-approved Flight Manual is required.

Adherence to the requirements in the operating documents will ensure that the UAS is in an airworthy condition prior to flight. The PIC will perform a series of checklists designed to identify any defects or inoperable components, which cover pre-flight, take-off, landing and post-flight procedures. The PIC will also be required to review weather, flight requirements, battery charge, landing and takeoff distance, UA performance data, and contingency landing areas—before initiation of flight. Petitioner's operating documents will be kept at the ground control station and will be accessible to the PIC at all times while operating the UAS.

G. 91.109(a): Flight Instruction

Petitioner seeks an exemption from 14 C.F.R. § 91.109(a), which provides in pertinent part that "[n]o 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." UASs and remotely piloted aircraft, by their design, do not have functional dual controls. Instead, flight control is accomplished through the use of a device that communicates with the aircraft via radio communications. Accordingly, an exemption will be required for the flight instruction requirements of 14 C.F.R. § 91.109(a).

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[15] Memorandum from Mark Bury, FAA Assistant Chief Counsel for International Law, Legislation and Regulation, to John Duncan, FAA Flight Standards Service (Aug. 8, 2014); *see also* Docket No. FAA-2014-0352 at 16-18.

[16] *See also* Exemption No. 11213 to Aeryon Labs, Inc. at pg. 11:

> The petitioner requested relief from 14 CFR § 91.9(b)(2): *Civil aircraft flight manual, marking, and placard requirements* and § 91.203(a) and (b): *Civil aircraft: Certifications required.* The FAA has previously determined that relief from these sections is not necessary. *See* Exemption No. 11062. Relevant materials may be kept in a location accessible to the PIC in compliance with the regulations.

Given the size and speed of the UASs that Petitioner intends to use, an equivalent level of safe training can still be achieved without dual controls because no pilot or passengers are aboard the UAS, and as required by the operating documents, all persons will be a safe distance away in the event that the UAS experiences any difficulties during flight instruction. Moreover, all flight training will be conducted in controlled and sterile environment. As a whole, the procedures provided for in the operating documents ensure that UAS flight instruction can be performed safely.

H. 91.119(b) and (c): Minimum Safe Altitudes

Petitioner requests an exemption from the minimum safe altitude requirements of 14 C.F.R. § 91.119(b) and 91.119(c), which state:

> Except when necessary for takeoff or landing, no person may operate an aircraft below the following altitudes:
>
> (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.

As set forth in the attached RTI operating documents, RTI has established a set of procedures that adequately mitigate any risk from operating its UAS under tightly controlled conditions that warrant a deviation from the minimum distances set forth in these sections. Accordingly, RTI requests an exemption from this section of the FARs.

In particular, RTI requests that the minimum distance requirements of 2000' under subsection (b) and 500' under subsection (c) be lowered. At any time the UAS needs to be flown closer than these distances to a structure or obstacle that is not the subject of the flight, then RTI will conduct the operation using a tether. As set forth in the operating documents, the flight location will be surveyed before flight, and the distance between the center of the operation (*i.e.* tether point) and all obstacles will be determined. The aircraft will be securely tethered at a point whereby the length of the tether is 25' shorter than the distance from the tether point to the closest obstacle. In this way, at no time will the UAS be capable of contacting the obstacle. In addition, a perimeter security will be set up to ensure that no persons can enter closer than 25' from the maximum distance the UAS can travel. This method will provide a superior method of safety beyond the arbitrary restriction of 500' and 2000' that was designed to ensure the safe operation of helicopters and conventional aircraft.

In making this request, petitioner is cognizant of the Opinions issued by the FAA Chief Counsel's Office addressing the question of what constitutes a "congested area" as that term is used in the FARs. The determination of whether an area is "congested" rests on characteristics of the area, the presence of persons unassociated with the flight operation, and the characteristics of the aircraft. *See* Memorandum from Rebecca MacPherson, Assistant Chief Counsel for Regulations to James Gardner, Manager, Flight Standards Division (June 18, 2012). For example, in that memorandum, an inquiry was made whether a helicopter could be used for a large external lift

operation at an industrial site. The proposed operation would be conducted at the factory, which normally has a large number of persons, as well as over an open field, a parking lot, and over a "busy road" surrounding the factory. The operator asked whether it would be permissible to operate at these locations if they could be turned into "depopulated" areas. The FAA Chief Counsel's Office indicated that this could be done, so long as precautions were in place to remove the population from the area and prevent persons from approaching while it was being conducted.

In summary, the fact that the UASs weighs less than 6 lbs (with payload), will be operating within VLOS of a PIC and VO, at an airspeed of 87 knots or less with no flammable fuel onboard, and the standoff requirements for both participating and nonparticipating persons and property in the operating documents, will ensure the protection of persons and property on the ground—which has been the purpose of the minimum safe altitudes rule in §91.119 since its inception.

I. 91.121: Altimeter Settings

To the extent necessary for RTI to conduct the proposed operations, Petitioner requests an exemption from 14 C.F.R. § 91.121, which 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 FAA has stated that an equivalent level of safety to the requirements of 14 C.F.R. § 91.121 can be achieved in circumstances where: (1) the UASs will be operated below 400 feet AGL or below, (2) within VLOS, (3) where GPS based altitude information is relayed in real time to the operator at a ground-based on-screen display and, (4) where prior to each flight, a zero altitude initiation point is established for the PIC to confirm accuracy of the onboard GPS.[17]

The UASs that Petitioner intends to use for performing the proposed operations meet all these operational characteristics. Moreover, the operating documents require the PIC to calibrate the aircraft's GPS compass prior to each flight operation. As the FAA has determined in circumstances similar to this Petition for Exemption, Petitioner's UASs and the safety mitigation procedures contained in the operating documents, ensure that an equivalent level of safety will be achieved, and a grant of exemption to the requirements of § 191.121 is therefore appropriate.

J. 91.151(a): Fuel Requirements for Flight in VFR Conditions

RTI requests an exemption from 14 C.F.R. § 91.151(a)'s fuel requirements for flight in VFR conditions. Section 91.151 states:

> (a) 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; or

[17] *See* Grant of Exemption No. 11062 to Astraeus Aerial (FAA-2014-0352 at 21).

(2) At night, to fly after that for at least 45 minutes.

Here, the technological limitations on UAS battery power means that no meaningful flight operations can be conducted while still maintaining a 30-minute battery reserve. An exemption from the fuel requirements of 14 C.F.R. § 91.151(a) is therefore required.

The FAA has previously granted relief from the fuel requirements of § 91.151(a) for flight in daytime VFR conditions in circumstances similar to those presented in this Petition for Exemption.[18] In Exemption No. 11213 to Aeryon Labs, Inc.[19], the FAA determined that a requirement prohibiting the PIC from beginning a UAS flight unless (considering wind and forecast weather conditions) there was enough available power for UAS to operate for the intended operational time and to operate after that for at least five minutes or with the reserve power recommended by the manufacturer if greater, would ensure an equivalent level of safety to the fuel requirements of § 91.151(a).[20] Petitioner's operating documents impose this same requirement and an exemption from § 91.151(a)'s fuel requirements for flight in VFR conditions is therefore appropriate.

VI. DRUG AND ALCOHOL PROGRAM

RTI will have policies in place to ensure that no person may participate in UAS flight operations if they are under the influence of alcohol or any drug.

VII. PUBLIC INTEREST

The public interest will be served by granting RTI's Petition for Exemption. Congress has established a national policy that favors early integration of UAS into the NAS in controlled, safe working environments such as those proposed in this Petition. Granting this Petition for Exemption helps fulfill Congress' goal in passing Section 333(a) through (c) of the Reform Act—the FAA Administrator's assessment of whether certain UAS may operate safely in the NAS before completion of the statutorily required rulemaking.

More importantly however, and as recognized by the FAA in prior grants of exemption allowing commercial operation of UAS for purposes similar to those described herein, granting the requested exemptions will significantly improve safety and reduce risk by alleviating the public's exposure to danger and emissions associated with using manned aircraft to perform equivalent aerial data collection. Petitioner's UASs are battery powered and create no emissions. Moreover, in the unlikely event that one of Petitioner's UASs crash, there is no fuel to ignite and explode. Any accident involving Petitioner's lightweight UASs will present significantly less danger to the pilot and other individuals on the ground than one involving a full size aircraft. The use of small UASs

[18] *See e.g.*, Exemption Nos. 8811, 10808, and 10673.

[19] Docket No. FAA-2014-0642.

[20] Exemption No. 11213 at pg. 12.

also improves safety by reducing the risk of serious harm or injury to inspecting engineers and consultants.

Moreover, the aerial data collected using RTI UASs will aid in documenting building and structural damage conditions which, if left unchecked, might lead to a falling debris hazard onto the public. The public will also benefit from the superior quality of the inspections resulting from aerial data collected using UASs. Petitioner's UASs will be capable of documenting conditions that may have been otherwise inaccessible using traditional inspection and survey methods. The use of small UASs will also reduce the risk of harm to inspecting engineers and consultants by not exposing them to hazards associated with inspection of dangerous or unsafe physical conditions often present in buildings and structures that have been damaged, exhibit some defect, or are otherwise deteriorating.

VIII. PRIVACY

All RTI UAS operations will be conducted in accordance with applicable federal, state, or local laws regarding privacy. All operations will be conducted over RTI property or private controlled-access property with permission from the land owner/controller or authorized representative. Permission from land owner/controller or authorized representative will be obtained for each flight to be conducted.

IX. NATIONAL SECURITY

No national security issue is presented by the requested exemptions. Given that the UASs are exceedingly small and lightweight, have lost-link and geo-fencing capabilities, will operate at very low speeds, have extremely low payload capacities and carry no flammable, explosive or otherwise dangerous materials, the operations pose no threat to national security.

X. FEDERAL REGISTER SUMMARY

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

Petitioner seeks an exemption from the following rules in Title 14 of the Code of Federal Regulations:

45.23(b); 45.27(a); 61.113; 61.101(e)(4) and (5); 91.7(a); 91.9(b)(2); 91.9(c); 91.103; 91.109(a); 91.119(b) and (c); 91.121; 91.151(a); 91.203 (a) & (b); 91.405(a); 91.407(a)(1); 91.409(a)(1) & (2); 91.417 (a) & (b).

The exemption will enhance safety by reducing risk to the general public and property owners from the substantial hazards associated with using conventional fixed-wing aircraft or, rotorcraft for aerial data collection.

XI. CONCLUSION

RTI's Petition for Exemption satisfies the criteria articulated in Section 333 of the Reform Act of 2012, including weight, speed, operating capabilities, proximity to airports and populated areas, operation within VLOS and national security. The proposed operations in this Petition for Exemption are similar to those in previously issued grants of exemptions, and they would benefit the public as a whole by improving safety. In consideration of the foregoing, this Petition for Exemption provides the FAA with all the necessary justification for granting the requested exemptions allowing RTI to use small UASs for aerial data collection in support of its forensic evaluation and infrastructure inspection work.

We thank you for your prompt consideration of our requested exemptions. Should you have any questions, or if you need additional information to support the requested exemptions, please do not hesitate to contact the undersigned.

Very truly yours,

Matthew J. Clark
Mark E. McKinnon
Lisa M. Ellman

Attachments

ATTACHMENT A: DJI PHANTOM 2 VISION SPECIFICATIONS

Specifications

Aircraft	
Supported Battery	DJI 5200mAh Li-Po Battery
PHANTOM 2 VISION Weight	1160g
Recommend payload	≤1300g
Maximum payload	1350g
Hovering Accuracy (Ready to Fly)	Vertical: 0.8m; Horizontal: 2.5m
Max Yaw Angular Velocity	200°/s
Max Tilt Angle	35°
Max Ascent / Descent Speed	Ascent: 6m/s; Descent: 2m/s
Max Flight Speed	15m/s (Not Recommended)
Wheelbase	350mm
Tilt Range of the Camera	0° - 60°
Remote Controller	
Operating Frequency	5.728 GHz - 5.85 GHz
Communication Distance (open area)	CE Compliance: 300m; FCC Compliance: 500m
Receiver Sensitivity (1%PER)	-93dBm
Transmitting Power (EIRP)	CE Compliance: 25mW; FCC Compliance: 125mW
Working Current/Voltage	80mA@6V
Battery	4 AA Batteries
Camera	
Resolution	14 Megapixels
FOV	120°/ 110° / 85°
Sensor Size	1/2.3"
Functions	Supports multi-capture, continuous capture and timed capture Supports HD Recording (1080p30,1080i60) Supports both RAW and JPEG photo formats
Range Extender	
Operating Frequency	2412MHz - 2462MHz
Communication Distance (open area)	300m
Transmitting Power	17dBm
Power Consumption	1.5W
DJI VISION App	
Supported Mobile Devices	Recommended: iPhone4s, iPhone5, iPhone5s, iPhone5C, iPhone6, iPhone6 Plus, iPod Touch4, iPod Touch5; Available but not recommended: iPad3, iPad4, iPad mini.

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ATTACHMENT B: DJI INSPIRE 1 SPECIFICATIONS

Specifications

Aircraft	
Model	T600
Weight (Battery Included)	2935 g
Hovering Accuracy (P Mode)	Vertical: 0.5 m Horizontal: 2.5 m
Max Angular Velocity	Pitch: 300°/s Yaw: 150°/s
Max Tilt Angle	35°
Max Ascent Speed	5 m/s
Max Descent Speed	4 m/s
Max Speed	22 m/s (ATTI mode, no wind)
Max Flight Altitude	4500 m
Max Wind Speed Resistance	10 m/s
Max Flight Time	Approximately 18 minutes
Motor Model	DJI 3510
Propeller Model	DJI 1345
Indoor Hovering	Enabled by default
Operating Temperature Range	-10° to 40° C
Diagonal Distance	559 to 581 mm
Dimensions	438x451x301 mm
Gimbal	
Model	ZENMUSE X3
Output Power (With Camera)	Static: 9 W;In Motion: 11 W
Operating Current	Station: 750 mA;Motion: 900 mA
Angular Vibration Range	±0.03°
Mounting	Detachable
Controllable Range	Pitch: -90° to +30° Pan: ±320°
Mechanical Range	Pitch: -125° to +45° Pan: ±330°
Max Controllable Speed	Pitch: 120°/s Pan: 180°/s

Camera	
Name	X3
Model	FC350
Total Pixels	12.76M
Effective Pixels	12.4M
Image Max Size	4000x3000
ISO Range	100-3200 (video) 100-1600 (photo)
Electronic Shutter Speed	8 s to 1/8000 s
FOV (Field Of View)	94°
CMOS	Sony EXMOR 1/2.3"
Lens	20mm (35mm format equivalent) f/2.8 focus at ∞) 9 Elements in 9 groups Anti-distortion
Still Photography Modes	Single shoot Burst shooting: 3/5/7 frames Auto Exposure Bracketing (AEB): 3/5 bracketed frames at 0.7EV Bias Time-lapse
Video Recording Modes	UHD (4K): 4096x2160p24/25, 3840x2160p24/25/30 FHD: 1920x1080p24/25/30/48/50/60 HD: 1280x720p24/25/30/48/50/60
Max Bitrate Of Video Storage	60 Mbps
Supported File Formats	FAT32/exFAT Photo: JPEG, DNG Video: MP4/MOV (MPEG-4 AVC/H.264)
Supported SD Card Types	Micro SD Max capacity: 64 GB. Class 10 or UHS-1 rating required.
Operating Temperature Range	0° to 40° C
Remote Controller	
Name	C1
Operating Frequency	922.7MHz~927.7 MHz (Japan Only) 5.725~5.825 GHz;2.400~2.483 GHz
Transmitting Distance	2 km (Outdoor And Unobstructed)
EIRP	10dBm@900m, 13dBm@5.8G, 20dBm@2.4G
Video Output Port	USB, Mini-HDMI
Power Supply	Built-in battery
Charging	DJI charger
Dual User Capability	Host-and-Slave connection

Mobile Device Holder	Tablet or Smart Phone
Output Power	9 W
Operating Temperature Range	-10° to 40° C
Storage Temperature Range	Less than 3 months: -20° to 45° C More than 3 months: 22° to 28° C
Charging Temperature Range	0-40° C
Battery	6000 mAh LiPo 2S
Charger	
Model	A14-100P1A
Voltage	26.3 V
Rated Power	100 W
Battery (Standard)	
Name	Intelligent Flight Battery
Model	TB47
Capacity	4500 mAh
Voltage	22.2 V
Battery Type	LiPo 6S High voltage battery
Energy	99.9 Wh
Net Weight	570 g
Operating Temperature Range	-10° to 40° C
Storage Temperature Range	Less than 3 months: -20° to 45° C More than 3 months: 22° C to 28° C
Charging Temperature Range	0° to 40° C
Max Charging Power	180 W
Battery (Optional)	
Name	Intelligent Flight Battery
Model	TB48
Capacity	5700 mAh
Voltage	22.8 V
Battery Type	LiPo 6S
Energy	129.96 Wh
Net Weight	670 g
Operating Temperature Range	-10 to 40° C
Storage Temperature Range	Less than 3 months: -20 to 45° C More than 3 months: 22° to 28° C
Charging Temperature Range	0° to 40° C

Max Charging Power	180 W
Vision Positioning	
Velocity Range	Below 8 m/s (2 m above ground)
Altitude Range	5-500 cm
Operating Environment	Brightly lit (lux > 15) patterned surfaces
Operating Range	0-250 cm
DJI Pilot App	
Mobile Device System Requirements	iOS version 7.1 or later;Android version 4.1.2 or later
Supported Mobile Devices	* iPhone 6 Plus, iPhone 6, iPhone 5S, iPad Air 2, iPad Mini 3, iPad Air, iPad Mini 2, iPad 4;* Samsung Note 3, Samsung S5, Sony Z3 EXPERIA;* Note: It is recommended that you use a tablet for the best experience

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(The following attached items contain proprietary and commercial information exempt from disclosure under the Freedom of Information Act, 5 U.S.C. § 522 *et seq.*, and should be held in a separate file pursuant to 14 C.F.R. § 11.35(b)).

Attachments:

RTI UAS Operations Manual

DJI Phantom 2 Vision User's Manual

Smart Flight Battery Safety Guidelines

DJI Quick Start Guide

DJI Pilot Training Guide

DJI Inspire 1 User's Manual

DJI Inspire 1 Safety Guidelines

DJI Inspire 1 Maintenance Manual

DJI Intelligent Flight Battery Safety Guidelines