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

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

August 14, 2015

Exemption No. 12453
Regulatory Docket No. FAA–2015–0608

Mr. Adam J. Dorn, P.E.
Professional Engineer
281 Grannis Road
Constantia, NY 13044

Dear Mr. Dorn:

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

By letter posted on the public docket on March 16, 2015, you petitioned the Federal Aviation Administration (FAA) for an exemption. The petitioner requested to operate an unmanned aircraft system (UAS) to conduct environmental, construction, utility, storm water management, and general engineering inspections.

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 Phantom Vision 2, DJI Inspire 1, and DJI Spreading Wings S900.

The petitioner requested relief from 14 CFR part 21, *Certification procedures for products and parts, Subpart H—Airworthiness Certificates*. In accordance with the statutory criteria provided in Section 333 of Public Law 112−95 in reference to 49 U.S.C. § 44704, and in

consideration of the size, weight, speed, and limited operating area associated with the aircraft and its operation, the Secretary of Transportation has determined that this aircraft meets the conditions of Section 333. Therefore, the FAA finds that the requested relief from 14 CFR part 21, *Certification procedures for products and parts, Subpart H—Airworthiness Certificates,* and any associated noise certification and testing requirements of part 36, is not necessary.

The Basis for Our Decision

You have requested to use a UAS for aerial data collection[1]. The FAA has issued grants of exemption in circumstances similar in all material respects to those presented in your petition. In Grants of Exemption Nos. 11062 to Astraeus Aerial (*see* Docket No. FAA−2014−0352), 11109 to Clayco, Inc. (*see* Docket No. FAA−2014−0507), 11112 to VDOS Global, LLC (*see* Docket No. FAA−2014−0382), and 11213 to Aeryon Labs, Inc. (*see* Docket No. FAA−2014−0642), the FAA found that the enhanced safety achieved using an unmanned aircraft (UA) with the specifications described by the petitioner and carrying no passengers or crew, rather than a manned aircraft of significantly greater proportions, carrying crew in addition to flammable fuel, gives the FAA good cause to find that the UAS operation enabled by this exemption is in the public interest.

Having reviewed your reasons for requesting an exemption, I find that—

- They are similar in all material respects to relief previously requested in Grant of Exemption Nos. 11062, 11109, 11112, and 11213;
- The reasons stated by the FAA for granting Exemption Nos. 11062, 11109, 11112, and 11213 also apply to the situation you present; and
- A grant of exemption is in the public interest.

Our Decision

In consideration of the foregoing, I find that a grant of exemption is in the public interest. Therefore, pursuant to the authority contained in 49 U.S.C. 106(f), 40113, and 44701, delegated to me by the Administrator, Mr. Adam J. Dorn, P.E. is granted an exemption from 14 CFR §§ 61.23(a) and (c), 61.101(e)(4) and (5), 61.113(a), 61.315(a), 91.7(a), 91.119(c), 91.121, 91.151(a)(1), 91.405(a), 91.407(a)(1), 91.409(a)(1) and (2), and 91.417(a) and (b), to the extent necessary to allow the petitioner to operate a UAS to perform aerial data collection. This exemption is subject to the conditions and limitations listed below.

[1] Aerial data collection includes any remote sensing and measuring by an instrument(s) aboard the UA. Examples include imagery (photography, video, infrared, etc.), electronic measurement (precision surveying, RF analysis, etc.), chemical measurement (particulate measurement, etc.), or any other gathering of data by instruments aboard the UA.

Conditions and Limitations

In this grant of exemption, Mr. Adam J. Dorn, P.E. 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 Phantom Vision 2, DJI Inspire 1, and DJI Spreading Wings S900 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 August 31, 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

Reg. Docket No. _____

In the Matter of Petition for Exemption of:

Adam J Dorn, P.E.
(Sole Proprietor)

For an Exemption from the requirements of the
Code of Federal Regulations Sections Concerning
Operation of an Unmanned Aircraft System

Pursuant to Section 333 of the
FAA Modernization and Reform Act of 2012

Exemption Request Section 333 of the FAA Reform Act of the Federal Aviation Regulations from 14 C.F.R. 45.23(b); 14 C.F.R. Part 21; 14 C.F.R. Part 27; 14 C.F.R. 61.113(a)&(b); 91.7(a); 91.9(b) (2); 91.103; 91.109(a); 91.121; 91.119 91.151(a); 91.203(a)&(b); 91.405(a)(1); 91.407(a)(1); 91.409(a)(1) (2); 91.417(a)&(b); 91.9(c)

CONTENTS

Pursuant to Section 333 of the FAA Modernization and Reform Act of 2012 ("Reform Act")[1] and 14 C.F.R. 11, Adam J. Dorn, P.E. ("Petitioner") hereby applies for an exemption from Federal Aviation Regulations ("FARs") identified below, to allow commercial operation of small ultralight weight unmanned aerial vehicles (i.e. small unmanned aircraft systems or "UAS") in airspace regulated by the Federal Aviation Administration ("FAA").

This exemption is in accordance with protocols outlined in this petition for exemption, the enclosed UAS Flight Operations, Maintenance, & Safety Manual ("Manual")[2], the UAS manufacturers operations and maintenance manual(s) (*Phantom 2 Vision User Manual V1.04*, *Inspire 1 User Manual V1.0*, *DJI Spreading Wings S900 User Manual V1.2*), and any other requirements established by the FAA pursuant to Section 333 of the Reform Act.

I. PETITIONER'S DESCRIPTION

Petitioner is a multi-state Licensed Professional Engineer (P.E.) located near Syracuse, NY that has provided various Environmental, Structural, Civil, Power Delivery, Process Engineering, Inspection & Commissioning services to Civilian, Government and large Public Utility customers for approximately 10-years. Additionally, the Petitioner is experienced in flying mid to upper level hobby grade multi-rotor-copters for recreation purposes.

The Petitioner's UAS operational and maintenance experience, in addition to the Petitioner's Professional Engineering Practice makes for a natural, and seamless, transition into the environmental, construction, and infrastructure inspection market employing UAS's to provide an economic advantage, and offer a viable, alternative solution where circumstances prevent conventional data collection. Along with the Petitioner's education, experience, and professional licensure, the Petitioner demonstrates an intimate knowledge of design, traditional inspection techniques, and safety regulations associated environmental, construction, utility, stormwater, and infrastructure inspection programs. The Petitioner's experience and professional licensure will ensure that all associated risks to the public and personal/public property shall be minimized while conducting relatively simple, low altitude (normally less than 300ft AGL), short duration flights for inspection purposes.

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[1] Codified at 49 U.S.C. § 40101, as amended by Pub. L. 112-95 Feb. 14, 2012, 126 Stat. 11.

[2] Petitioner submits this manual as a confidential document under 14 C.F.R. § 11.35(b), as the entire Manual contains confidential commercial and proprietary information the Petitioner has not and will not share with others. The Manual contains operating conditions and procedures that are not available to the public and are protected from release under the Freedom of Information Act 5 U.S.C. § 552.

Consistent with the requirements of 14 C.F.R. § 11.81(a), Petitioner provides the following information in support of its petition of exemption:

The Name and Address of the Petitioner is:

Adam J Dorn, P.E.
Professional Engineer
281 Grannis Rd
Constantia, NY 13044
Phone: 315-525-3806
Email: AdamJDorn@Gmail.com

II. PROPOSED OPERATIONS

The Petitioner intends to use the UAS's to support and perform environmental, construction, utility, stormwater management, and general engineering inspections in the greater central/upstate, NY area with high definition video and still imagery documentation for client & agency regulation(s) compliance throughout various construction project life cycles. Not only will the Petitioner's aerial videography/cinematography serve to assist in the documentation of construction progress, asset inventory/inspection and regulation compliance, but will also serve to promote community and academic awareness to those individuals and/or companies interested in further understanding the engineering and scientific principals associated with such design and inspection techniques. All data, aerial imagery, and video shall be made available to local academic institutions, and libraries for research and teaching purposes, as allowed by law.

The Petitioner has operated RC electric hobby grade UAV's without incident. The Petitioner is committed to safety on each flight no matter how short in duration, or how minor the perceived risk level may be. Please refer to Appendix A – "*Adam J Dorn, P.E. UAS Flight Operations, Maintenance, & Safety Manual*" for complete operations and safety details. The Petitioner's exemption permits the operation of relatively inexpensive and ultralight weight UAS's in controlled and limited airspace predefined in areas away from the general public, airports, heliports, and vehicular traffic for the inspection/engineering operations mentioned above. Insofar as UAS operations are relatively new, Petitioner has invested in following current events surrounding the evolution of UAS regulations in an effort to improve personal operational safety and promote a properly regulated UAS industry. Currently, similar lightweight RC UAS's are being illegally operated by unmonitored "hobbyists" with relatively low levels of experience or education. In addition to their lack of basic education and experience requirements, these

individuals are, largely, devoid of any formal safety protocols, operational controls, or risk mitigation systems to prevent loss of life or property. The Petitioner has incorporated safety protocols and standards to prevent and avoid public, and personal hazard, maintain safe and proper flight operations, and to avoid manned aircraft operations. The Petitioner's self-imposed safety protocols and standards shall serve to further develop safety protocols mandated by the FAA as they pertain to UAS safety and operations. In addition, the Petitioner shall record any and all flight data and other pertinent information gained through permitted UAS flight operations and is willing to share with the FAA via required reporting avenues to assist and promote future FAA UAS regulation(s) development.

At current juncture, the petitioner has added, or intends to use three models/types of quad-copters for commercial use following exemption and approval from the FAA. These following UAS's intended to be used by the petitioner are as follows:

- D.J.I. Phantom Vision 2[3]
- D.J.I. Inspire 1[4]
- DJI Spreading Wings S900[5]

The enclosed "Manual" describes, in detail, the policies and safety procedures for the Petitioner's proposed UAS operations. To assist the FAA in its safety assessment of the Petitioner's proposed UAS operations, below is a summary of the operational limitations and conditions which the Petitioner intends to ensure an equivalent or higher level of safety to operations conducted under current regulatory guidelines:

- The UAV weighs less than 20 pounds including payload.
- Flights will be operated within line-of-sight of Operator and observer during daylight hours only.
- Maximum total flight time for each operational flight will be 30 minutes. Flights will be terminated at 25% battery power reserve should that occur prior to the 30 minute limit.
- Flights will be operated at an altitude of no more than 400 feet above ground level (typically no greater than 300ft AGL shall be required).
- Minimum crew for each operation will consist of the UAS Operator, and observer/spotter.
- The UAS will only operate within a confined "Specified Inspection Area" as defined in the Manual.
- A briefing will be conducted in regard to the planned UAS operations prior to each day's activities. It will be mandatory that all personnel who will be performing duties within the boundaries of the safety perimeter be present for this briefing.

[3] Appendix B – D.J.I. Phantom 2 Vision – User Manual V1.04
[4] Appendix C – D.J.I. Inspire 1 – User Manual V1.0
[5] Appendix D – D.J.I. Spreading Wings S900 Unser Manual V1.2

- Operator and Observer will be trained in the operation of UAS and will have received up-to date information on the particular UAS to be operated, as required in the Manual.
- Observer and Operator will at all times be able to communicate by voice and text.
- Any and all required permission and permits will be obtained from territorial, state, county or city jurisdictions, including local law enforcement, fire, or other appropriate governmental agencies and persons.
- The UAS Operator shall have the capability to abort a flight in case of unpredicted obstacles or emergencies.
- The UAS shall only be operated in optimal weather conditions.

III. RELEVANT AUTHORITY TO PETITIONER'S EXEMPTION REQUEST

This petition for exemption is submitted to advance Congress' goal of integrating UAS's safely into the NAS. In the Reform Act, Congress directed the FAA "to safely accelerate the integration of civil unmanned aircraft systems in the national airspace system," and, under Section 333 of that law, directed the Secretary of Transportation ("FAA Administrator") to consider whether certain unmanned aircraft systems may operate safely in the National Airspace System before completion of the rule making required under Section 332 of the Reform Act[6].

Granting my, Adam J Dorn, P.E.'s, request comports with the Secretary of Transportation's (FAA Administrator's) responsibilities and authority to not only integrate UAS's into the national airspace system, but to "...establish requirements for the safe operation of such aircraft systems [UAS's] in the national airspace system" under Section 333(c) of the Reform Act specific to the use of UAS's for engineering related commercial applications and inspections. Further I, Adam J Dorn, P.E., shall conduct my operations in compliance with the protocols described herein or as otherwise established by the FAA.

The FAA Administrator has general authority to grant exemptions from FAA safety regulations and minimum standards when the Administrator decides a requested exemption is in the public interest[7]. 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[8] Therefore, the Petitioner will demonstrate how implementing the proposed UAS's for environmental, engineering and infrastructure inspection will benefit the public and that the proposed operation will not adversely affect safety of the public and to those operating in the NAS.

[6] Reform Act, *supra* note 1.
[7] *See* 49 U.S.C. § 44701(f) (authorizing the grant of exemptions from a requirement of regulations prescribed pursuant to section 44701 (a) - (b) and sections 44702-44716)
[8] *See* 14 C.F.R. § 11.81; FAA, Petition for Exemptions.

IV. Public Interest

For the reasons stated in this petition I, Adam J Dorn, P.E., respectfully request the grant of an exemption allowing operations of light weight, remote controlled UAS's for the operations listed in Section II of this petition; all of which will promote environmental regulatory compliance, thus a greater protection of the environment, safer construction sites, and a more economical, and efficient means to inspect critical infrastructure while providing real-time data and engineering analysis to alleviate or eliminate potentially hazardous circumstance generally associated with manned inspection operations, among other things.

First, granting the Petitioner's exemption helps fulfill Congress' goal in passing Section 333(a) through (c) of the Reform Act, namely, the FAA Administrator's assessment of whether certain UAS may operate safely in the National Airspace System before completion of the rule making required under Section 332 of the Reform Act.

Further, the Petitioner's proposed operation significantly improves safety and reduces risk concerning infrastructure inspection by alleviating human exposure to dangers associated with current manned aerial survey and inspection methods. Manned helicopters performing utility-power lines, generation facilities, general maintenance inspections and patrols have experienced an exceedingly high number of accidents and fatalities. The use of UAS's for these type inspections shall dramatically reduce fatalities, and property loss.

Next, the Petitioner's proposed operation(s) significantly improves documentation and regulatory compliance for environmental, stormwater, and construction site safety concerns by providing a low risk, high benefit means to permanently document progress, compliance, and potential, regulatory infractions and deviations from regulatory agency decrees. This shall allow project owners, the general public, and any affiliated regulatory agency to quickly and effectively remedy violations with reduced impact to public waterways, property, and to the general public.

Additionally, the Petitioner's UASs are battery powered and create no toxic or carbon emissions. In the event that Petitioner's UAS crashes; there is no fuel to ignite and explode causing additional public safety hazard(s). Any impact of Petitioner's lightweight UASs is far less than a full size helicopter, or small scale gas powered helicopters. The public's interest is furthered by minimizing ecological impact of an accident and by reducing human exposure to potentially harmful emissions associated with manned aircraft.

Finally, aerial surveys are valuable tools for utility and power generation facility

inspections. However, concerns with safety, cost efficiency to public, and logistics continue to impede aerial surveys and inspections from conventional manned aircraft. The use of UASs addresses these problems exists as a powerful tool for performing a wide-range of utility-power generation, and general engineering inspection and patrol applications. The public as a whole will benefit from safer and more cost-effective aerial services that UAS's operations provide.

V. Qualifications for Approval Under Section 333 of The Reform Act

A. The Petitioner's Proposed Usage Does not Create a Hazard to Users of the NAS or the Public Because of the Reduced Size, Weight, Speed, and Operational Capability of the UAS.

The proposed operations in this petition for exemption qualify for expedited approval under Section 333 of the Reform Act. Each of the statutory criteria and other potential relevant factors are satisfied.

The proposed operations would permit use of small and relatively inexpensive UAS under controlled conditions in airspace that is: (1) limited; (2) predetermined; (3) controlled as to access, and; (4) would pose an increased level of safety beyond what exists when climbers/manned crews are asked to inspect infrastructure.

Petitioner's UAS is a rotorcraft aircraft, weighing less than 20 pounds, including payload. It operates, under normal weather conditions, at a speed of no more than 30 knots and has the capability to hover, and move in vertical and horizontal planes simultaneously under fully stabilized GPS control.

Petitioner's UAS will operate in line-of-sight and only in a Specified Inspection Area as described in the Proposed Operations section (Section II) outlined here and in the Petitioner's Manual. Such operations will insure that the UAS will "not create a hazard to users of the National Airspace System or the public." [9]

Given the small size of the UAS's involved and the restricted environment within which they will operate; this petition for exemption falls squarely within that zone of safety in which Congress envisioned that the FAA must, by exemption, allow commercial operations of UASs to commence immediately.

VI. REGULATIONS FROM WHICH EXEMPTION IS REQUESTED

The Federal Aviation Act expressly grants the FAA Administrator the authority to issue exemptions. By its terms, this statutory authority 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.[10]

The Petitioner asks an exemption from several interrelated provisions of 14 C.F.R. Parts 21, 45 and 91 for purposes of conducting aerial surveys and inspections using UASs. 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 equal to or more stringent than the rules from which exemption is sought.[11]

The Specific Sections of Title 14 of the Code of Federal Aviation Regulations from Which Adam J Dorn, P.E. Requests Exemption are:

A. 14 C.F.R. Part 21, Subpart H - Airworthiness Certificates and 14 C.F.R. § 91.203(a)(1).
B. 14 C.F.R. Part 27: Airworthiness Standards: Normal Category Rotorcraft.
C. Aircraft Marking and Identification Requirements: 14 C.F.R. §§ 91.9(c), 45.23(b) and 45.27(a).
D. 14 C.F.R. § 61.113 (a) and (b): Private Pilot Privileges and Limitations: Pilot in Command.
E. 14 C.F.R. § 91.9(B)(2): Civil Aircraft Flight Manual in the Aircraft.
F. 14 C.F.R. § 91.7(a): Civil Aircraft Airworthiness.
G. 14 C.F.R. § 91.103: Preflight Action.
H. 14 C.F.R. § 91.109(a): Flight Instruction.
I. 14 C.F.R. § 91.119: Minimum Safe Altitudes.
J. 14 C.F.R. § 91.121: Altimeter Settings.
K. 14 C.F.R. § 91.151(a): Fuel Requirements for Flight in VFR Conditions
L. 14 C.F.R. § 91.203(a) and (b): Carrying Civilian Aircraft Certification and Registration.

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[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."

[10] *See* 49 U.S.C. § 44701(f) authorizing the grant of exemptions from requirements of regulations prescribed pursuant to §§ 44710(a) and (b), §§ 44702 – 44716.

[11] *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."

M. 14 C.F.R. §§ 91.405(a)(1); 91.407(a)(1); 91.409(a)(1); 91.417(a) and (b): Maintenance Inspections

A. 14 C.F.R. Part 21, Subpart H - Airworthiness Certificates and 14 C.F.R. § 91.203(a)(1).

The Petitioner seeks an exemption from 14 C.F.R. Part 21, Subpart H, which establishes the procedural requirements for the issuance of airworthiness certificates as required by 14 C.F.R § 91.203(a)(1). Given the size and limited operating area associated with the UAS to be utilized by the Petitioner, an exemption from Part 21, Subpart H meets the requirements of an equivalent level of safety under Part 11 and Section 333 of the Reform Act.

The Federal Aviation Act[12] and Section 333 of the Reform Act[13] both authorize the FAA to exempt aircraft from the requirement for an airworthiness certificate, upon consideration of the size, weight, speed, operational capability, and proximity to airports and populated areas of the particular UAS operation. In all cases, an analysis of these criteria demonstrates that the UAS operated without an airworthiness certificate, in the restricted environment and under the conditions proposed will be at least as safe, or safer, than a conventional rotorcraft operating with an airworthiness certificate without the restrictions and conditions of the proposed UAS operations.

Equivalent Level of Safety

The UAS to be operated hereunder is less than 20 lbs. fully loaded, carries neither a pilot nor passenger, carries no explosive materials or flammable liquid fuels, and operates exclusively within a specified area as set forth in the Manual. Unlike other civil aircraft, the proposed operations in this petition for exemption will be controlled and monitored by the operator, pursuant to the Manual's requirements.

These safety enhancements, which already apply to civil aircraft operated in connection with existing inspection operations, provide a greater degree of safety to the public and property owners than conventional operations conducted with airworthiness certificates issued under 14 C.F.R. Part 21, Subpart H. Lastly, application of these same criteria demonstrates that there is no credible threat to national security posed by the UAS, due to its size, speed of operation, location of operation, lack of explosive materials or flammable liquid fuels, and inability to carry a substantial external load.

B. 14 C.F.R. Part 27: Airworthiness Standards: Normal Category Rotorcraft.

14 C.F.R. Part 27 sets forth the procedural requirements for airworthiness certification of Normal Category Rotorcraft. To the extent the Petitioner's UASs would otherwise require certification under Part 27, as a rotorcraft, Petitioner requests an exemption from Part 27's airworthiness standards for the same reasons identified in the exemption request from 14 C.F.R. Part 21, Subpart H.

C. Aircraft Marking and Identification Requirements: 14 C.F.R. §§ 91.9(c), 45.23(b), and 45.27(a).

This petition seeks an exemption from the aircraft marking and identification requirements of 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]

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.[15]

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

> 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.[16]

Exemption from § 45.23(b) is warranted because the UAS has no entrance to the cabin, cockpit, or pilot station on which the registration number can be placed. Moreover, given the size of the UAS, two-inch lettering would inhibit proper function of the UAS, and be quite difficult to

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[12] *See* 49 U.S.C. § 44701(f).
[13] *See* Reform Act, *supra* note 1.
[14] 14 C.F.R. § 91.9(c).
[15] 14 C.F.R. § 45.23(b).
[16] 14 C.F.R. § 45.27(a).

adhere to. The aircraft registration, or "N Number'" will be placed on the fuselage in compliance with § 45.29(f).

Given the nature of the specific relief sought by this exemption request, Petitioner requires relief from the associated marking and identification requirements of § 45.27(a) and § 91.9(c), which would require compliance with § 45.23(b).

Equivalent Level of Safety

An equivalent level of safety for exemptions to the aircraft marking and identification requirements of §§ 91.9(c), 45.23(b), and 45.27(a), will be provided by having the UAS marked on its fuselage as required by § 45.29(f) where the Operator, Visual Observer, and others working with the UAS will see the identification of the UAS as "Experimental." Additionally, Petitioner will ensure compliance with any requests of UAS marking by the FAA.

The FAA has issued the following exemptions to the aircraft marking requirements of § 45.23(b): Exemptions Nos. 10700, 8738, 10167 and 10167A.

D. 14 C.F.R. § 61.113 (a) and (b): Private Pilot Privileges and Limitations: Pilot in Command.

This petition seeks an exemption from the private pilot privileges and limitations of §§ 61.113 (a) and (b), which states:

> (a) Except as provided in paragraphs (b) through (h) of this section, no person who holds a private pilot certificate may act as pilot in command of an aircraft that is carrying passengers or property for compensation or hire; nor may that person, for compensation or hire, act as pilot in command of an aircraft.
>
> (b) A private pilot may, for compensation or hire, act as pilot in command of an aircraft in connection with any business or employment if:
>
> (1) The flight is only incidental to that business or employment; and
>
> (2) The aircraft does not carry passengers or property for compensation or hire.[17]

14 C.F.R. § 61.113(a) limits private pilots to being in command of non-commercial flights. 14 C.F.R. § 61.113(b)(1) provides an exception that allows a private pilot to command an aircraft without

passengers or property, in connection with business or employment if "[t]the flight is only incidental to that business or employment." The stated exception likely does not apply to the proposed operations under this petition for exemption, as the flights are not incidental to the proposed aerial surveys and inspections but rather essential to it. Accordingly, the Petitioner seeks an exemption to 14 C.F.R. § 61.113(a)'s commercial limitation and/or 14 C.F.R. § 61.113(b)(1)'s requirement that the flight be incidental to the business to benefit from the exception.

Equivalent Level of Safety

As required by the Manual, because the UAS will not carry a pilot or passengers, the proposed operations can achieve the equivalent level of safety to 14 C.F.R. §§ 61.113 (a) and (b). Unlike a conventional aircraft that carries the pilot and passengers, the UAS is remotely controlled with no passengers on board. Moreover, the area of operation is controlled and restricted, and all flights are planned, coordinated, and briefed to the appropriate official in advance as set forth in the Manual.

E. 14 C.F.R. § 91.9(B)(2): Civil Aircraft Flight Manual in the Aircraft.

The Petitioner seeks an exemption from the flight manual requirements of 14 C.F.R. § 91.9(b)(2), which states:

> (b) No person may operate a U.S.-registered civil aircraft
>
> (2) For which an Airplane or Rotorcraft Flight Manual is not required by § 21.5 of this chapter, unless there is available in the aircraft a current approved airplane or Rotorcraft Flight Manual, approved manual material, markings, and placards, or any combination thereof.[18]

Given its size, configuration, and load capacity, the UAS has no ability to carry such a manual on the aircraft, not only because there is no pilot on board, but because there is simply no room or capacity to carry such an item on the aircraft.

Equivalent Level of Safety

The safety related purpose of this manual requirement can be equally satisfied by maintaining the UAF flight manual at the ground control point where the Operator flying the UAS

[17] 14 C.F.R. § 61.113 (a) and (b).
[18] 14 C.F.R. § 91.9(B)(2).

shall have immediate access to said manual. Accordingly, Petitioner requests an exemption from § 91.9(b)(2)'s flight manual requirements, on the condition that the UAS flight manual be available at the control point during each operation.

The FAA has issued the following exemptions to this regulation: Exemption Nos. 8607, 8737, 8738, 9299, 9299A, 9565, 9565B, 10167, 10167A, 10602, 32827, and 10700.

F. 14 C.F.R. § 91.7(a): Civil Aircraft Airworthiness.

This petition 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. Inasmuch there will be no airworthiness certificate issued for the UAS, should this exemption be granted, no FAA regulatory standard will exist for determining airworthiness.

Equivalent Level of Safety

Given the size of the UAS and the requirements contained in the Petitioner's Manual for maintenance and use of safety checklists prior to each flight, an equivalent level of safety will be provided.

The FAA has issued the following exemptions to this regulation: Exemption Nos. 8607, 8737, 8738, 9299, 9299A, 9565, 9565B, 10167, 10167A, 10602, 32827, and 10700.

G. 14 C.F.R. § 91.103: Preflight Action.

This petition seeks an exemption from § 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.[19] Inasmuch as an FAA approved flight manual will not be provided for the sUAS, an exemption is requested.

Equivalent Level of Safety

An equivalent level of safety will be provided by following the Aircraft Operations Manual comprehensive preflight checklist. The Operator shall take all actions, including reviewing weather, flight battery requirements, landing and takeoff distances, and aircraft performance data, before initiation of flight operations.

[19] 14 C.F.R. § 91.103

H. 14 C.F.R. § 91.109(a): Flight Instruction.

The Petitioner seeks an exemption from 14 C.F.R. § 91.109(a), which provides that "no person may operate a civil aircraft (except a manned free balloon) that is being used for flight instruction unless that aircraft has fully functional dual controls."[20] UASs and remotely piloted aircraft, by their design do not have fully functional dual controls. Instead, flight control is accomplished through the use of a control box communicating with the UAS via radio communications.

Equivalent Level of Safety

Given the size and speed of the UAS, an equivalent level of safe training can still be performed without dual controls because no pilot or passengers are aboard the UAS, and all persons will be a safe distance away from the operations area should the UAS experience any difficulties during flight instruction.

The FAA has approved exemptions for flight training without fully functional dual controls for a number of aircraft and for flight instruction in experimental aircraft.[21]

I. 14 C.F.R. § 91.119: Minimum Safe Altitudes.

This petition seeks an exemption from the minimum safe altitude requirements of 14 C.F.R. § 91.119. This Section prescribes the minimum safe altitudes under which aircraft may not operate, including 500 feet above the surface and away from any person, vessel, vehicle, or structure in non-congested areas.[22] Section § 91.119(d)(1) allows for a helicopter to operate at less than those minimum altitudes when it can be operated "without hazard to persons or property on the surface," provided that "each person operating the helicopter complies with any routes or altitudes specifically prescribed for helicopters by the FAA.

To provide the intended inspections, the UAS will normally need to be operated within a range of approximately 50 feet from the infrastructure being inspected. Accordingly, due to the nature of the proposed operations, the Operator and the designated observer may at times be less than 500 feet away from structures during the operation, and an exemption is therefore required.

[20] 14 C.F.R. § 91.109(a).
[21] *See* Exemption Nos. 5778K and 9862A
[22] *See* 14 C.F.R. § 91.119(c)

Equivalent Level of Safety

Compared to flight operations with rotorcraft weighting far more than the maximum 20 pounds proposed herein, and the lack of flammable fuel, any risk associated with these operations is far less than those presently presented with conventional aircraft. An equivalent level of safety will be achieved given the size, weight, speed of the UAS as well as the location where it is operated. As set forth in the Manual, the UAS will be operated in a restricted area, where buildings and people will not be exposed to unnecessary and unplanned operations. Because of the advance notice, all affected individuals will be aware of the planned flight operations as set forth in the Manual. Furthermore, by operating at such lower altitudes, the UAS will not interfere with other aircraft that are subject to the minimum safe altitude regulations.

J. 14 C.F.R. § 91.121: Altimeter Settings.

The Petitioner seeks 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.[23] An exemption is required because the UAS does not have a barometric altimeter, but rather a GPS altitude read out.

Equivalent Level of Safety

An equivalent level of safety will be achieved by following the procedures set forth in the Manual. As prescribed in the Manual, the operator will confirm the altitude of the launch site shown on the GPS altitude indicator before flight. Prior to each flight, the Operator shall reset the altimeter to zero and will fly the UAS below 400 feet AGL. Moreover, the Operator will use the GPS altitude indicator to constantly monitor the UASs height, thus ensuring operation at safe altitudes.

K. 14 C.F.R. § 91.151(a): Fuel Requirements for Flight in VFR Conditions.

The Petitioner seeks an exemption from 14 C.F.R. § 91.151(a)'s fuel requirements for flight in VFR conditions. Section 91.151(a) 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

[23] *See* 14 C.F.R. § 91.121

(1) During the day, to fly after that for at least 30 minutes; or

(2) At night, to fly after that for at least 45 minutes.[24]

The battery powering the UAS provides approximately 25 minutes of powered flight. An exemption from the 30 minute reserve requirement in 14 CFR § 91.151 is therefore required.

Equivalent Level of Safety

An equivalent level of safety can be achieved by limiting flights to 25 minutes or 75% of battery power, whichever happens first. This restriction would be more than adequate to return the UAS to its planned landing zone from anywhere within its Specific Area of Inspection. Operation of the UAS with less than 30 minutes of reserve fuel does not engender the type of risks that Section 91.151(a) was intended to alleviate given the size and speed of the small UAS. Moreover, operations will be limited to controlled areas where only inspectors or official representatives or waivers who have signed waivers will be allowed.

This request for exemption falls within the scope of prior exemptions.[25]

L. 14 C.F.R. §§ 91.203(a) and (b): Carrying Civilian Aircraft Certification and Registration.

This petition seeks an exemption from civil aircraft certification and registration requirements of 14 C.F.R. §§ 91.203 (a) and (b). The regulations provide in pertinent part:

> (a) Except as provided in § 91.715, no person may operate a civil aircraft unless it has within it the following:
>
> (1) An appropriate and current airworthiness certificate
>
> (b) No person may operate a civil aircraft unless the airworthiness certificate required by paragraph (a) of this section or a special flight authorization issued under § 91.715 is displayed at the cabin or cockpit entrance so that it is legible to passengers or crew.[26]

In addition to the fact that Petitioner is seeking an exemption from the airworthiness certificate requirements, an exemption to this regulation is necessary because: (1) the UAS's load capacity and size does not allow it to carry certification and registration documents; (2) the UAS does not have a cabin or

[24] 14 C.F.R. § 91.151(a)

[25] *See e.g.* Exemption 10673 (allowing Lockheed Martin Corporation to operate without compliance with § 91.151 (a)); *see also* FAA Exemptions 2689F, 5745, 10673, and 10808.

cockpit entrance at which the documents could be displayed; and (3) there are no passengers or crew for whom the certificates need be displayed.

Equivalent Level of Safety

To the extent these regulations are applicable to the proposed UAS operations, an equivalent level of safety will be achieved by keeping these documents at the ground control point where the Operator flying the UAS shall have immediate access to them.

The FAA has issued numerous exemptions to this regulation. A representative sample of other exceptions includes Exemption Nos. 9565, 9665, 9789, 9789A, 9797, 9797A, 9816A, and 10700.

M. 14 C.F.R. §§ 91.405(a)(1); 91.407(a)(1); 91.409(a)(1); 91.417(a) and (b): Maintenance Inspections

The Petitioner seeks an exemption from the maintenance inspection requirements of 14 C.F.R. §§ 91.405(a); 91.407(a)(1); 91.409(a)(2); 91.417 (a) and (b). These regulations specify maintenance and inspection standards in reference to 14 C.F.R. Part 43.[27] An exemption to these regulations is needed because Part 43 and the stated sections apply only to aircraft with an airworthiness certificate, which the UAS shall not possess.

Equivalent Level of Safety

An equivalent level of safety will be achieved because maintenance and inspections will be performed in accordance with the Aircraft Operations Manual. As provided in the Manual, the Operator will ensure that the UAS is in working order prior to initiating flight, oversee and assist in performance of required maintenance, and keep a log of any maintenance performed. The Operator is the person most familiar with the aircraft and best suited to maintain the aircraft in an airworthy condition to provide the equivalent level of safety.

If mechanical issues arise, the UAS shall land immediately and will be operating from no higher than 400 feet AGL. Moreover, the UAS's small size, carrying capacity, and the fact that flight operations will only take place in restricted areas for limited periods of time, create less risk than the same factors associated with conventional fixed-wing aircraft and rotorcraft performing

[26] 14 C.F.R. §§ 91.203 (a) and (b)

[27] *See e.g.* 14 C.F.R. § 91.405(a) (stating that each owner or operator of an 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").

the same operation.

VII. PRIVACY

All flights will occur over Operations to be conducted over public or controlled access property. Additionally, all flight operations will be conducted in a "Specified Inspection Area" as described by the Manual, in which all permissions will be gained by all official personnel and organizations present in the Specified Inspection Area.

Additionally, the U.S. Supreme Court has held that "'[a] person traveling in an automobile on public thoroughfares has no reasonable expectation of privacy . . . .'" Therefore, Petitioners use of UAS does not pose a privacy threat to motorists traveling on the roadway inadvertently captured on video because they have no reasonable expectation of privacy. However, to further protect individuals who have had their image captured during an inspection, the Petitioner will sanitize the likenesses of individuals from the final product provided to the customer.

VIII. FEDERAL REGISTER SUMMARY

A. 14 C.F.R. Part 21, Subpart H - Airworthiness Certificates and 14 C.F.R. § 91.203(a)(1).

B. 14 C.F.R. Part 27: Airworthiness Standards: Normal Category Rotorcraft.

C. Aircraft Marking and Identification Requirements: 14 C.F.R. §§ 91.9(c), 45.23(b) and 45.27(a).

D. 14 C.F.R. § 61.113 (a) and (b): Private Pilot Privileges and Limitations: Pilot in Command.

E. 14 C.F.R. § 91.9(B)(2): Civil Aircraft Flight Manual in the Aircraft.

F. 14 C.F.R. § 91.7(a): Civil Aircraft Airworthiness.

G. 14 C.F.R. § 91.103: Preflight Action.

H. 14 C.F.R. § 91.109(a): Flight Instruction.

I. 14 C.F.R. § 91.119: Minimum Safe Altitudes.

J. 14 C.F.R. § 91.121: Altimeter Settings.

K. 14 C.F.R. § 91.151(a): Fuel Requirements for Flight in VFR Conditions

` L. 14 C.F.R. § 91.203(a) and (b): Carrying Civilian Aircraft Certification and Registration.

M. 14 C.F.R. §§ 91.405(a)(1); 91.407(a)(1); 91.409(a)(1); 91.417(a) and (b): Maintenance Inspections

IX. CONCLUSION

The Petitioner moves the FAA Administrator to grant this exemption. Given the foregoing, the Petitioner's proposed usage does not pose a hazard to the NAS or to the public. Considering the clear statutory language in Section 333 of the Reform Act, the authority contained in the Federal Aviation Act, as amended, the equivalent level of safety to the public and to the men and women conducting engineering & infrastructure inspections, and the reduction in environmental effects, the grant of the requested exemptions is in the public interest.

Accordingly, Petitioner respectfully requests that the FAA grant the requested exemption without delay.

Submitted on March, 2015 by:

/s/ Adam J Dorn, P.E.

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