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

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

June 16, 2015

Exemption No. 11833
Regulatory Docket No. FAA–2015–1121

Mr. James D. Blondheim
Coleman Engineering Company
635 Circle Drive
Iron Mountain, MI 49801

Dear Mr. Blondheim:

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 13, 2015, you petitioned the Federal Aviation Administration (FAA) on behalf of Coleman Engineering Company (hereinafter petitioner or operator) for an exemption. The petitioner requested to operate an unmanned aircraft system (UAS) to conduct aerial photography, videography, and 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 is a DJI Phantom 2.

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, Coleman Engineering Company is granted an exemption from 14 CFR §§ 61.23(a) and (c), 61.101(e)(4) and (5), 61.113(a), 61.315(a), 91.7(a), 91.119(c), 91.121, 91.151(a)(1), 91.405(a), 91.407(a)(1), 91.409(a)(1) and (2), and 91.417(a) and (b), to the extent necessary to allow the petitioner to operate a UAS to perform aerial data collection. This exemption is subject to the conditions and limitations listed below.

Conditions and Limitations

In this grant of exemption, Coleman Engineering Company is hereafter referred to as the operator.

[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.

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 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 June 30, 2017, unless sooner superseded or rescinded.

Sincerely,

/s/

John S. Duncan
Director, Flight Standards Service

Enclosures

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April 13, 2015

U.S. Department of Transportation, Docket Operations
West Building Ground Floor, Room w12-140
1200 New Jersey Ave., SE Washington, DC 20590

Re: Petition of Coleman Engineering Company for an Exemption Pursuant to Section 333 of the FAA Modernization and Reform Act of 2012

Dear Madam/Sir,

Pursuant to Section 333 of the FAA Modernization and Reform Act of 2012 ("Reform Act") and 14 C.P.R. Part 11, Coleman Engineering hereby applies for an exemption from the Federal Aviation Regulations identified below, to allow commercial operations of small unmanned aerial vehicles.

This exemption is made based on information outlined in this petition, as well as the accompanying DJI Phantom 2 Operators Manual (Appendix B) and the Coleman Engineering Operational Limitations (Appendix C). The DJI Phantom 2 UAS was selected because it has a proven capability for controlled flight as well as a gyro stabilized flight mode, GPS aided navigation, a compass, blinking LED's on the bottom, a failsafe mode for returning home, and prop guards. These devices are offered for general sale around the world and have often been used as Model Aircraft in the USA.

The Requested exemption would authorize commercial operations using the DJI Phantom 2 for mapping and surveying applications. These operations will be subject to strict operating requirements defined in the user manual and conditions defined by the Safety Code of the Academy of Model Aeronautics (see Annex B), in order to ensure at least an equivalent level of safety to currently authorized operations using manned aircrafts.

Specifically, the UAS is:

A lightweight (< 7.0 lb gross weight with all on-board equipment), battery operated 4-motor rotorcraft in the form of a quadcopter that takes off and lands vertically, manufactured by DJI, Model Phantom 2 , with the following equipment:

- An on-board flight computer with GPS navigation and location ability that receives signals for flight controls from a ground-based transmitter/controller;
- An on-board camera capable of capturing imagery in the form of full color, high definition still photos and video;
- An on-board telemetry system that delivers flight data from the on-board flight

computer to the on-board radio transmitter including altitude AGL, horizontal and vertical speed, compass direction of flight and direction back to its launch site;
- A 600mW, 5.8GHz on-board radio transmitter that transmits live video from the on-board camera plus all the flight data from the telemetry system described above;

The Ground Station Includes:

- A Pilot in Command (PIC) in operational control of a flight operation from beginning to end and who controls the UAS while in the air;
- A 100mW, 2.4GHz radio transmitter/controller operated by the PIC to control the UAS while in flight;
- A radio receiver receiving live video and flight data from the on-board camera and computer projects it all together onto a screen for the PIC to view during flight;
- A Visual Observer (VO) is a person who provides a second pair of eyes to visually track the UAS while in flight.

Proposed Operations

Coleman Engineering intends to use UAS in two general areas. First, Coleman Engineering seeks an exemption to perform video filming and photographing by air for public and private use. The purpose of this photography will be to aid in topographic mapping of ground based features on the earth. Second, it will employ UAS's to inspect land, residential, commercial, industrial structures and property.

Specifically, Coleman Engineering will use UAS's that are equipped with cameras and sensors in order to engage in the following commercial activities:

(a) Taking photographs to support professional operations in engineering, land surveying, architecture, real estate and other related professional activities.

(b) Inspections by air of agricultural areas.

(c) Inspections by air of infrastructure such as bridges, highways, electrical installations, dams, aqueducts, photovoltaic power stations, wind farms and pipes. These inspections will only be done under contract with the owners or with any local government authority.

(d) Inspections by air of land and residential, commercial and industrial structures, only under contract with the owners or with any local government authority.

(e) Inspections by air to detect sources of pollution and gas emissions, under contract with the owners in the area or with any local government authority.

(f) Support provided to search and rescue operations and reconnaissance in cases of need, emergency or natural disasters and only when government authorities have requested it by contract or donation.

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 National Air Space ("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).

Coleman Engineering's Proposed UAS Operations Meet the Requirements of Section 333 of the Reform Act

Coleman Engineering'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.

Approval is Warranted Based on the UAS Size, Weight, Speed, and Operational Capability

Coleman Engineering will employ the DJI Phantom 2 quadcopters for the operations specified in this Petition for exemption. The Phantom 2 UASs have a maximum take-off weight of less than 7 pounds, the flight speed will not exceed 35 miles per hour, and it will not be flown in controlled airspace or at an altitude that exceeds 400 feet AGL. All flights will be flown in such a way that they can be safely terminated with a reserve battery power of 25% of the battery's maximum charge. The DJI Phantom 2 UAS do not carry any flammable propellant or fuel. The Phantom 2 UAS also has an integrated GPS system that calculates the UAS's position and height and relays that information via a secure connection to the operator. Additionally, the Phantom 2 UAS contain a failsafe mode if its connection to the remote control is lost, and this system permits the UAS to return to a predetermined location and land without injury or damage.

Approval is Warranted Based on the Operational Restrictions Set Forth in the Operations Manual.

Colman Engineering's Operations Limitations and the DJI's operators manual contain all of the procedures and limitations necessary to successfully perform the operations specified in this Petition for Exemption. (Appendices B & C).

Public Interest

The public interest will be served by granting Coleman Engineering's Petition for Exemption. Congress has established a national policy that favors early integration of UAS's into the NAS in controlled, safe working environments such as those proposed in this Petition. In addition, the public also has an interest in reducing the hazards associated with alternate methods of conducting similar operations. Currently operations are conducted using teams that physically climb onto structures using ladders, using low flying helicopters or aircraft, or simply not available by traditional means. By using UAS, exposure to physical hazards will be reduced of conducting the operation while remaining safely on the ground.

Additionally, Coleman Engineering's intended uses for the UAS's have identifiable safety benefits that include reducing the danger and emissions associated with full size helicopters. UAS have no fuel to ignite or explode, no crew, adds a greater degree of flexibility which supplements the current capabilities offered by manned aircraft, and public interest for a ground impact of a small lightweight UAS is further minimized from an ecological and safety standpoint.

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:

Coleman Engineering seeks an exemption from the following rules:

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)

The exemption will enhance safety by reducing risk to the general public and property owners from the substantial hazards associated with performing equivalent work with conventional aircraft, rotorcraft, or other methods.

Conclusion

Coleman Engineering'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 visual line of sight and national security. Additionally, the Petition provides more than adequate justification for the grant of the requested exemptions to permit Coleman Engineering to operate the selected UAS for the operations specified herein.

Granting the exemption will benefit the public interest as a whole in several ways, including (1) significantly improving safety and reducing risk by alleviating human exposure to danger, and (2) improving the quality of services and decreasing operating costs compared with conventional flight operations.

With the advent and availability of this technology surveying and mapping functions are changing from a traditional ground based operations to the aerial platform. Coleman Engineering will have the ability to collect a tremendous amount of data in a small fraction of the time that would be needed for ground based efforts. As project sizes increase, the savings to both Coleman Engineering and our Clients will increase greatly. The cost of purchasing our DJI Phantom 2 is next to nothing in

comparison to that of a traditional manned aircraft. A major advantage of the low operational expenses is that Coleman Engineering can provide these aerial acquisition services at a much lower cost to the consumer while remaining competitive and profitable. This will in turn lead to economic growth and stability at a local, state and federal lever.

Coleman realizes that other survey and engineering firms have already been granted an exemption to use there UAS for commercial purposes, as shown in FAA exemption No. 11266, Docket No. FAA-2014-0733 & FAA exemption No. 11285, Docket No. FAA-2014-1015 & FAA exemption No. 11299, Docket No. FAA-2014-1008 & FAA exemption No. 11302, Docket No. FAA-2014-1032.

With the DJI Phantom 2's small and lightweight design it can be assembled and deployed in a manner of only a few minutes once the survey crews arrive on site. It will perform its mission effectively and efficiently and land directly at our feet. The data we collect will be able to be processed immediately. All of these factors prove to be a huge benefit to the consumer, and help advance the land surveying profession to a whole new level.

Very Respectfully,
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Appendix A

The regulations from which the exemption is requested are listed below. Beside each regulation number is the page of the attached Appendix A upon which each may be found together with our proposed equivalent level of safety for each regulation:

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)

Exemptions Requested

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.

Coleman Engineering seeks an exemption from several interrelated provisions of 14 C.F.R. Parts 21, 27, 45, 61 and 91 for purposes of conducting the requested operations using a UAS. Listed below are the specific sections of 14 C.F.R. for which exemption is sought:

14 C.F.R. Part 21, Subpart H – Airworthiness Certificates

The FAA has stated that no exemption is needed from this section if a finding is made under the Reform Act that the UAS selected provides an equivalent level of safety when compared to aircraft normally used for the same application. (Regulatory Docket No. FAA-2014-0352). These criteria are met, and therefore no exemption is needed.

Equivalent Level of Safety

The UAS selected by Coleman Engineering is safe when taking into account their size, weight, speed, and operational capability. The UAS weighs less than 7 pounds and will be flown at less than 35 miles per hour and completely outside controlled airspace. Additionally, the UAS carry neither pilots nor passengers, carry no explosive materials and or flammable liquid fuels, and operate exclusively within the parameters stated in the Operator's Manual and Operations Limitations.

Operations under this exemption will be closely controlled and monitored by the operator and will be conducted in compliance with local public safety requirements, to provide security for the area of operation. Coleman Engineering will also, if necessary, provide the FAA with advance notice of all operations via NOTAMS and in coordination with the local FSDO. In all cases, the UAS operated under the proposed conditions will be at least as safe as, or safer than, conventional rotorcraft operating with an airworthiness certificate without the restrictions and conditions of the proposed UAS operations.

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

14 C.P.R. Part 27 sets forth the procedural requirements for airworthiness certification of normal category rotorcraft. To the extent that Coleman Engineering UAS would otherwise require certification under Part 27, we seek an exemption from Part 27's airworthiness standards for the same reasons identified in the request for exemption from 14 C.F.R. Part 21, Subpart H.

14 C.F.R. §§45.23(b), Display of marks; general

These regulations provide that each aircraft must display "N" and the aircraft's registration number in letters at least 2 inches high. Additionally, the aircraft must display the word "EXPERIMENTAL" in letters at least 2 inches high near the entrance to the cabin, cockpit, or pilot station. The UAS does not have an entrance in which the word "EXPERIMENTAL" can be placed, and may not have a registration number assigned to it by the FAA.

Coleman Engineering proposes to achieve an equivalent level of safety by including the word "EXPERIMENTAL" as large as practicable on the top of the aircraft, where the PIC, VO and others in the vicinity of the aircraft while it is preparing for launch will be able to see the designation. Finally, the ground station will display a high contrast flag or banner that contains the words "Unmanned Aircraft Ground Station" in letters 3 inches high or greater. Since the aircraft will operate within 3/4 NM of the ground station, the banner should be visible to anyone that observes the aircraft and chooses to investigate its point of origin.

In a previous Grant of Exemption, Regulatory Docket No. FAA-2014-0352**,** 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."

14 CFR § 61.113 (a) and (b); 61.3 (c,2-v): Private Pilot Privileges and Limitations, Medical Certificate

In addition, Coleman Engineering seeks exemption from 14 C.F.R § 61.113, which restricts private pilot certificate holders from flying aircraft for compensation or hire, and which would also require a second class medical certificate. The purpose of this section is to ensure the skill and competency of any PIC where the aircraft is carrying passengers or cargo for hire. In this case, while the UAS will be operated as part of a commercial operation, it carries neither passengers nor cargo. In the Grant of Exemption in FAA Docket No. FAA-2014-0352, the FAA determined that the unique characteristics of UAS operation outside of controlled airspace did not warrant the additional cost and restrictions attendant with requiring the PIC to have a commercial pilot certificate and class II medical certificate. Additionally, instead of having a second or third class medical, we suggest that the PIC exercise the privileges similar to that of a sport pilot, requiring only a valid US driver's license.

Safety Mitigation

Coleman Engineering seeks to ensure safe operation by ensuring that any PIC is thoroughly versed in airspace and communication issues pertaining to all aircraft operators but also in the unique aspects of UAS flight.

We believe the combination of aeronautical knowledge, UAS airmanship skills, and verification through remaining current is a sufficient method to evaluate a pilot's qualifications, given that operations will be conducted within the limitations outlined in this petition. Like with any required skill, the more flight time the PIC gains, the more proficient the PIC becomes.

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

Coleman Engineering seeks an exemption from 14 C.F.R. § 91.7(a), which requires that a civil aircraft be in airworthy condition to be operated. The FAA has stated (Regulatory Docket No. FAA-2014-0352) that no exemption is required to the extent that the requirements of Part 21 are waived or found inapplicable.

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

Given its size, configuration, and load capacity, the Phantom 2 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.

Safety Mitigation

The safety related purpose of this manual requirement can be equally satisfied by maintaining the Phantom 2 Manual at the ground control point where the pilot flying the Phantom 2 will have immediate access to it. Accordingly, we request an exemption from § 91.9(b) (2)'s flight manual requirements, on the condition that the Phantom 2 flight manual be available at the point of control during each operation.

14 C.F.R. § 91.103: Preflight Action

Coleman Engineering seeks an exemption from 14 C.P.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.

Safety Mitigation

An equivalent level of safety will be provided by following the Aircraft Operations Manual and flight manual provided by the manufacturer. The PIC will take all required preflight actions, including performing all required checklists and reviewing weather, flight requirements, battery charge, landing and takeoff distance, aircraft performance data, and contingency landing areas before initiation of flight. The Operators Manual and Operational Limitations will be kept at the ground station with the operator at all times.

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

Coleman Engineering 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 functioning dual controls." UAS 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.

Safety Mitigation

Given the size and speed of the UAS employed by Coleman Engineering, 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 in the event that the UAS encounters any difficulties during flight instruction. In addition, we will conduct flight training at our Research and Development test sites, which are located on our own property. These training flights will be conducted in a sterile area and will otherwise comply with the provisions in the Operator's Manual for flights at the R&D facility. The FAA has stated (Regulatory Docket No. FAA-2014-0352) that no exemption is required.

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

Coleman Engineering requests an exemption from the minimum safe altitude requirements of 14 C.F.R. § 91.119. Section 91.119 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. See 14 C.F.R. § 91.119(c). Section 91.119(d) 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 helicopter by the FAA."

Safety Mitigation

Compared to flight operations with rotorcraft weighing far more than the maximum weights proposed herein, and given the lack of flammable fuel, any risk associated with these operations is far less than those that presently exist with conventional aircraft. An equivalent level of safety will be achieved given the size, weight, and speed of the UAS, as well as the location where it is operated. In order to avoid any risk to aircraft, flight operations will be restricted to 400' AGL or below.

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

This petition 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. An exemption is required to the extent that the UAS does not have a barometric altimeter, but rather a GPS altitude read out.

Safety Mitigation

The FAA has stated that an equivalent level of safety can be achieved if the UAS will be operated at 400' AGL or below and within visual line-of-sight in addition to GPS based altitude information relayed in real time to the operator. See Grant of Exemption to Astraeus Aerial, Docket No. FAA-2014-0352. As the attached Operations Manual indicates, the chosen UAS meets these requirements, and a zero altitude initiation point will be obtained prior to flight

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

Coleman Engineering requests an exemption from 14 C.F.R. § 91.15l(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
>
> (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 reserve. Coleman Engineering proposes that all flights comply with this requirement by mandating that the aircraft be safely landed with no less than 25% of battery life remaining.

Safety Mitigation

The FAA has stated that an equivalent level of safety is provided if the UAS flight is terminated with at least 25% reserve battery power still available. See Grant of Exemption to Astraeus Aerial, Docket No. PAA-2014-0352. The Operations Manual conforms to this limit, providing an equivalent level of safety.

14 CFR 91.203(a) & (b) Civil aircraft: Certifications required.

The regulation provides that an airworthiness certificate, with the registration number assigned to the aircraft and a registration certificate must be aboard the aircraft. Additionally, subparagraph (b) provides that the airworthiness certificate be "displayed at the cabin or cockpit entrance so that it is legible to passengers or crew."

At a maximum gross weight of less than 7 pounds, the UAS is too small to carry documentation, does not have an entrance, and is not capable of carrying passengers or crew. To obtain an equivalent level of safety and meet the intent of 91.203, we propose that documents deemed appropriate for this aircraft by the FAA will be co-located with the crew at the ground control station and available for inspection upon request. The FAA has stated (Regulatory Docket No. FAA-2014-0352) that no exemption is required.

14 C.F.R. 91.405(a); 91.407(a)(1); 91.409(a)(2); and 91.417(a) and (b) Maintenance Required

Coleman Engineering seeks an exemption from the maintenance inspection requirements contained in 14 C.P.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.P.R. Part 43. See, e.g., 14 C.P.R. § 91.405(a) (stating that each owner or operator of an aircraft "shall 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"). An exemption from these regulations is needed because Part 43 and these sections only apply to aircraft with an airworthiness certificate, which the UAS's will not have.

Safety Mitigation

An equivalent level of safety will be achieved because maintenance and inspections will be performed in accordance with the Operators Manual. As provided in the Operators Manual, flights will not be conducted unless a flight operations checklist is performed that includes all of the aircraft's components.