



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

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

May 29, 2015

Exemption No. 11715
Regulatory Docket No. FAA–2015–0835

Mr. Lyle Hardin
CDG Engineers
One Campbell Plaza, Suite 3A
St. Louis, MO 63139

Dear Mr. Hardin:

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 March 25, 2015, you petitioned the Federal Aviation Administration (FAA) on behalf of CDG Engineers (hereinafter petitioner or operator) for an exemption. The petitioner requested to operate an unmanned aircraft system (UAS) to conduct aerial inspections or surveys that consist of still photographs or video.

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 Vision.

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 collection¹. 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 Astraesus 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, CDG Engineers 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, CDG Engineers is hereafter referred to as the operator.

Failure to comply with any of the conditions and limitations of this grant of exemption will be grounds for the immediate suspension or rescission of this exemption.

1. Operations authorized by this grant of exemption are limited to the DJI Phantom 2 Vision when weighing less than 55 pounds including payload. Proposed operations of any other aircraft will require a new petition or a petition to amend this exemption.
2. Operations for the purpose of closed-set motion picture and television filming are not permitted.
3. The UA may not be operated at a speed exceeding 87 knots (100 miles per hour). The exemption holder may use either groundspeed or calibrated airspeed to determine compliance with the 87 knot speed restriction. In no case will the UA be operated at airspeeds greater than the maximum UA operating airspeed recommended by the aircraft manufacturer.
4. The UA must be operated at an altitude of no more than 400 feet above ground level (AGL). Altitude must be reported in feet AGL.
5. The UA must be operated within visual line of sight (VLOS) of the PIC at all times. This requires the PIC to be able to use human vision unaided by any device other than corrective lenses, as specified on the PIC's FAA-issued airman medical certificate or U.S. driver's license.
6. All operations must utilize a visual observer (VO). The UA must be operated within the visual line of sight (VLOS) of the PIC and VO at all times. The VO may be used to satisfy the VLOS requirement as long as the PIC always maintains VLOS capability. The VO and PIC must be able to communicate verbally at all times; electronic messaging or texting is not permitted during flight operations. The PIC must be designated before the flight and cannot transfer his or her designation for the duration of the flight. The PIC must ensure that the VO can perform the duties required of the VO.
7. This exemption and all documents needed to operate the UAS and conduct its operations in accordance with the conditions and limitations stated in this grant of exemption, are hereinafter referred to as the operating documents. The operating documents must be accessible during UAS operations and made available to the Administrator upon request. If a discrepancy exists between the conditions and limitations in this exemption and the procedures outlined in the operating documents, the conditions and limitations herein take precedence and must be followed.

Otherwise, the operator must follow the procedures as outlined in its operating documents. The operator may update or revise its operating documents. It is the operator's responsibility to track such revisions and present updated and revised documents to the Administrator or any law enforcement official upon request. The operator must also present updated and revised documents if it petitions for extension or amendment to this grant of exemption. If the operator determines that any update or revision would affect the basis upon which the FAA granted this exemption, then the operator must petition for an amendment to its grant of exemption. The FAA's UAS Integration Office (AFS-80) may be contacted if questions arise regarding updates or revisions to the operating documents.

8. Any UAS that has undergone maintenance or alterations that affect the UAS operation or flight characteristics, e.g., replacement of a flight critical component, must undergo a functional test flight prior to conducting further operations under this exemption. Functional test flights may only be conducted by a PIC with a VO and must remain at least 500 feet from other people. The functional test flight must be conducted in such a manner so as to not pose an undue hazard to persons and property.
9. The operator is responsible for maintaining and inspecting the UAS to ensure that it is in a condition for safe operation.
10. Prior to each flight, the PIC must conduct a pre-flight inspection and determine the UAS is in a condition for safe flight. The pre-flight inspection must account for all potential discrepancies, e.g., inoperable components, items, or equipment. If the inspection reveals a condition that affects the safe operation of the UAS, the aircraft is prohibited from operating until the necessary maintenance has been performed and the UAS is found to be in a condition for safe flight.
11. The operator must follow the UAS manufacturer's maintenance, overhaul, replacement, inspection, and life limit requirements for the aircraft and aircraft components.
12. Each UAS operated under this exemption must comply with all manufacturer safety bulletins.
13. Under this grant of exemption, a PIC must hold either an airline transport, commercial, private, recreational, or sport pilot certificate. The PIC must also hold a current FAA airman medical certificate or a valid U.S. driver's license issued by a state, the District of Columbia, Puerto Rico, a territory, a possession, or the Federal government. The PIC must also meet the flight review requirements specified in 14 CFR § 61.56 in an aircraft in which the PIC is rated on his or her pilot certificate.
14. The operator may not permit any PIC to operate unless the PIC demonstrates the ability to safely operate the UAS in a manner consistent with how the UAS will be

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

15. UAS operations may not be conducted during night, as defined in 14 CFR § 1.1. All operations must be conducted under visual meteorological conditions (VMC). Flights under special visual flight rules (SVFR) are not authorized.
16. The UA may not operate within 5 nautical miles of an airport reference point (ARP) as denoted in the current FAA Airport/Facility Directory (AFD) or for airports not denoted with an ARP, the center of the airport symbol as denoted on the current FAA-published aeronautical chart, unless a letter of agreement with that airport's management is obtained or otherwise permitted by a COA issued to the exemption holder. The letter of agreement with the airport management must be made available to the Administrator or any law enforcement official upon request.
17. The UA may not be operated less than 500 feet below or less than 2,000 feet horizontally from a cloud or when visibility is less than 3 statute miles from the PIC.
18. If the UAS loses communications or loses its GPS signal, the UA must return to a pre-determined location within the private or controlled-access property.
19. The PIC must abort the flight in the event of unpredicted obstacles or emergencies.
20. The PIC is prohibited from beginning a flight unless (considering wind and forecast weather conditions) there is enough available power for the UA to conduct the intended operation and to operate after that for at least five minutes or with the reserve power recommended by the manufacturer if greater.
21. Air Traffic Organization (ATO) Certificate of Waiver or Authorization (COA). All operations shall be conducted in accordance with an ATO-issued COA. The exemption holder may apply for a new or amended COA if it intends to conduct operations that cannot be conducted under the terms of the attached COA.
22. All aircraft operated in accordance with this exemption must be identified by serial number, registered in accordance with 14 CFR part 47, and have identification

(N–Number) markings in accordance with 14 CFR part 45, Subpart C. Markings must be as large as practicable.

23. Documents used by the operator to ensure the safe operation and flight of the UAS and any documents required under 14 CFR §§ 91.9 and 91.203 must be available to the PIC at the Ground Control Station of the UAS any time the aircraft is operating. These documents must be made available to the Administrator or any law enforcement official upon request.
24. The UA must remain clear and give way to all manned aviation operations and activities at all times.
25. The UAS may not be operated by the PIC from any moving device or vehicle.
26. All Flight operations must be conducted at least 500 feet from all nonparticipating persons, vessels, vehicles, and structures unless:
 - a. Barriers or structures are present that sufficiently protect nonparticipating persons from the UA and/or debris in the event of an accident. The operator must ensure that nonparticipating persons remain under such protection. If a situation arises where nonparticipating persons leave such protection and are within 500 feet of the UA, flight operations must cease immediately in a manner ensuring the safety of nonparticipating persons; and
 - b. The owner/controller of any vessels, vehicles or structures has granted permission for operating closer to those objects and the PIC has made a safety assessment of the risk of operating closer to those objects and determined that it does not present an undue hazard.

The PIC, VO, operator trainees or essential persons are not considered nonparticipating persons under this exemption.

27. All operations shall be conducted over private or controlled-access property with permission from the property owner/controller or authorized representative. Permission from property owner/controller or authorized representative will be obtained for each flight to be conducted.
28. Any incident, accident, or flight operation that transgresses the lateral or vertical boundaries of the operational area as defined by the applicable COA must be reported to the FAA's UAS Integration Office (AFS–80) within 24 hours. Accidents must be reported to the National Transportation Safety Board (NTSB) per instructions contained on the NTSB Web site: www.nts.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 May 31, 2017, unless sooner superseded or rescinded.

Sincerely,

/s/

John S. Duncan

Director, Flight Standards Service

Enclosures



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March 25, 2015

U.S. Department of Transportation
Docket Management System
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Re: Exemption Request Under Section 333 of the FAA Reform Act and Part 11 of the Federal Aviation Regulations

Dear Sir or Madam:

Pursuant to Section 333 of the FAA Modernization and Reform Act of 2012 (the "Reform Act") and 14 C.F.R. Part 11, CDG Engineers ("CDG"), a multi-discipline, full service engineering firm, seeks an exemption from the Federal Aviation Regulations ("FARs") listed below to allow commercial operation of its UASs so long as such operations are conducted within an under the conditions outlined herein or as may be established by the FAA as required by Section 333.

The requested exemption would permit commercial operation of CDG's UAS, which is a small, multi rotor aircraft, weighing less than 30 lbs. including cargo and performs precision aerial inspections or surveys that consist of still photographs or video taken by an onboard camera. Applications for these UAS devices and associated data processing functions include mining and professional surveying as well as inspections of difficult to reach equipment or structures. Use of the UAS for aerial surveys and inspections reduces the need to operate conventional aircraft or other equipment for the same purpose and provides very high quality imagery at a fraction of the cost of surveys and inspections using conventional means. Likewise, inspections of structures can be safely performed without endangering the inspector or inhibiting local industrial or public operations with ladders, lifts or other equipment. These savings result in enhanced efficiency and productivity for the affected activities, as well as environmental benefits and potential savings in both cost and hazards to the public.

The name and address of the applicant is:

CDG Engineers
Attn: Lyle Hardin
One Campbell Plaza
Suite 3A
St. Louis, MO 63139

Phone: 314-466-3532
Email: LHardin@cdgengineers.com



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Regulations from which the exemption is requested:

14 CFR Part 21
14 C.F.R. 45.23(b)
14 CFR 61.113 (a) & (b)
14 C.F.R. 91.7 (a)
14 CFR 91.9 (b) (2)
14 C.F.R. 91.103
14 C.F.R. 91.109
14 C.F. R. 91.119
14 C.F.R. 91.121
14 CFR 91.151 (a)
14 CFR 91.203 (a) & (b)
14 CFR 91.405 (a)
14 CFR 407 (a) (1)
14 CFR 409 (a) (2)
14 CFR 417 (a) & (b)

Section 333(a) through (c) of the Reform Act. This law directs the Secretary of Transportation to consider whether certain unmanned aircraft systems may operate safely in the national airspace system (NAS) before completion of the rulemaking required under Section 332 of the Reform Act. In making this determination, the Secretary is required to determine which types of UASs do not create a hazard to users of the NAS or the public or pose a threat to national security in light of the following:

- 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 visual line of sight of the operator.

Reform Act § 333 (a). If the Secretary determines that such vehicles “may operate safely in the national airspace system, the Secretary shall establish requirements for the safe operation of such aircraft in the national airspace system.” *Id.* §333(c) (emphasis added).

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, that includes UASs, from the requirement that all civil aircraft must have a current airworthiness certificate.

CDG Engineers interprets this provision to place the duty on the Administrator to not only process applications for exemptions under section 333, but for the Administrator to craft conditions for the safe operation of the UAS, if it should be determined that the conditions set forth herein do not fulfill the statutory requirements for approval.



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The Administrator may grant an exemption from a requirement of a regulation prescribed under subsection (a) or (b) of this section or any sections 44702-44716 of this title if the Administrator finds the exemption in the public interest. 49 U.S.C. §44701(f) See also 49 USC §44711(a); 49 USC §44704; 14 CFR §91.203 (a) (1).

CDG Engineers' UAS is a multiblade rotorcraft (DJI Phantom II Vision), weighing less than 30 lbs. including payload. It operates under normal conditions at a speed of no more than 30 knots and has the capability to hover, and move in the vertical and horizontal plane simultaneously. It will operate only in line of sight of the pilot and will operate only within the project area. Such operations will insure that the UAS will not create a hazard to users of the national airspace system or the public.

Given the small size of the UAS involved and the restricted environment within which it will operate, CDG Engineers falls squarely within that zone of safety (an equivalent level of safety) in which Congress envisioned the FAA must, by exemption, allow commercial operations of UASs to commence immediately. Also due to the size of the UAS and the restricted areas in which the relevant UAS will operate, approval of the application presents no national security issue. Given the clear direction in Section 333 of the Reform Act, the authority contained in the Federal Aviation Act, as amended; the strong equivalent level of safety surrounding the proposed operations, and the significant public benefit, including enhanced safety, reduction in environmental impacts, including reduced emissions associated with allowing UASs for inspection and survey operations, the grant of the requested exemptions is in the public interest. Accordingly, CDG Engineers respectfully requests that the FAA grant the requested exemption without delay.

Aircraft and equivalent Level of Safety

CDG Engineers proposes the exemption requested herein apply to civil aircraft that have the characteristics and that operate with the limitations listed herein. These limitations provide for at least an equivalent or even higher level of safety to operations under the current regulatory structure because the proposed operations represent a safety enhancement to the already safe photography and surveying operations conducted with conventional aircraft.

These limitations and conditions to which CDG Engineers agrees to be bound when conducting commercial operations under an FAA issued exemption include:

1. The UAS will weigh less than 30 lbs.
2. Flights will be operated within line of sight of a pilot and/or observer.
3. Maximum total flight time for each operational flight will be 20 minutes. Flights will be terminated at 25% battery power reserve should that occur prior to the 20 minute limit.



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4. Flights will be operated at an altitude of no more than 400 feet AGL.
5. Minimum crew for each operation will consist of the UAS Pilot and a Visual Observer.
6. UAS pilot will be a skilled UAS operator experienced in the type of UAS flown.
7. UAS Pilot will be Pilot in Command (PIC). If a pilot certificate holder other than the UAS Pilot, who possess the necessary PIC qualifications, is also present that person can also be designated as PIC.
8. The UAS will only operate within a confined Project Area.
9. A briefing will be conducted in regard to the planned UAS operations prior to aerial activities. All personnel who will be performing duties within the boundaries of the safety perimeter will be made aware of the UAS flight(s).
10. The operator will obtain the consent of all persons involved in the project and ensure that only consenting persons will be allowed within 100 feet of the flight operation.
11. Pilot and observer will have been trained in operation of UAS generally and received up-to-date information on the particular UAS to be operated.
12. Observer and pilot will at all times be able to communicate by voice and/or visuals.
13. Written and/or oral permission from the relevant property holders will be obtained.
14. All required permissions and permits will be obtained from territorial, state, county or city jurisdictions, including local law enforcement, fire, or other appropriate governmental agencies.
15. If the UAS loses communications or loses its GPS signal, the UAS will have capability to return to a pre-determined location within the Security Perimeter and land.
16. The UAS will have the capability to abort a flight in case of unpredicted obstacles or emergencies.

Description of Specific Regulations:

14 CFR Part 21, Subpart H: Airworthiness Certificates 14 C.F.R. §91.203(a)(1)

Subpart H, entitled Airworthiness Certificates, establishes the procedural requirements for the issuance of airworthiness certificates as required by FAR §91.203 (a) (1). Given the size and limited operating area associated with the aircraft to be utilized by the CDG Engineers, 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 (49 U.S.C. §44701 (0) and Section 333 of the Reform Act both authorize the FAA to exempt aircraft from the requirement for an airworthiness certificate, upon consideration of the size, weight, speed, operational capability, and proximity to airports and populated areas of the particular UAS. Our small UAS will be operated at low speed in a controlled environment at least five miles from an airport. 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



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safe, or safer, than a conventional aircraft (fixed wing or helicopter) operating with an airworthiness certificate without the restrictions and conditions proposed.

The UAS to be operated hereunder is less than 30 lbs. fully loaded, carries neither a pilot nor passenger, carries no explosive materials or flammable liquid fuels, and operates exclusively within a secured area. Like other civil aircraft, operations under this exemption will be tightly controlled and monitored by the operator, pursuant to the Manual's requirements, and under the requirements and in compliance with local public safety requirements, to provide security for the area of operation as is currently done on active construction sites. The FAA will have advance notice of all operations.

These safety enhancements, which already apply to civil aircraft operated in connection with construction sites, 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 ability to carry an external load no greater than two lbs.

14 C.F.R. 45.23(b): Marking of the Aircraft

This regulation requires certain experimental, provisionally certificated aircraft, or light sport category aircraft to be marked with letters between 2 inches and 6 inches high "limited," "restricted," "light-sport," "experimental," or "provisional," near each entrance to a cabin, cockpit, or pilot station.

Even though the UAS will have no airworthiness certificate, an exemption may be needed as the UAS will have no entrance to the cabin, cockpit or pilot station on which the word "Experimental" can be placed. Given the size of the UAS, two-inch lettering will be impossible. The word "Experimental" will be placed on the fuselage in compliance with §45.29 (f).

The equivalent level of safety will be provided by having the UAS marked on its fuselage as required by §45.29 (f) where the pilot, observer and others working with the UAS will see the identification of the UAS as "Experimental." The FAA has issued the following exemptions to this regulation: Exemptions Nos. 10700, 8738, 10167 and 10167A.

14 CFR 61.113 (a) & (b): Private pilot privileges and limitations: Pilot in command

Sections 61.113 (a) & (b) limit private pilots to non-commercial operations. Unlike a conventional aircraft that carries the pilot and passengers, the UAS is remotely controlled with no living thing or cargo on board. The area of operation is controlled and restricted, and all



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flights are planned and coordinated in advance. The risks associated with the operation of the UAS are so diminished from the level of risk associated with commercial operations contemplated by Part 61 when drafted, that allowing operations of the UAS as requested with a pilot who is an experienced UAS operator exceeds the present level of safety achieved by 14 C.F.R. §61.113 (a) & (b).

14 C.F.R. 91.7 (a): Civil aircraft airworthiness

The regulation requires that no person may operate a civil aircraft unless it is in airworthy condition. As there will be no airworthiness certificate issued for the aircraft, should this exemption be granted, no FAA regulatory standard will exist for determining airworthiness. Given the size of the aircraft and the requirements contained in the Manual for maintenance and use of safety checklists prior to each flight, an equivalent level of safety will be provided.

14 CFR 91.9 (b)(2): Civil aircraft flight manual, marking, and placard requirements

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

The equivalent level of safety will be maintained by keeping the flight manual at the ground control point where the pilot flying the UAS will have immediate access to it. 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.

14 C.F.R. 91.103: Preflight Action

This regulation requires each pilot in command take certain actions before flight to ensure the safety of flight. An exemption is needed from this requirement as the pilot will take separate preflight actions, including checking for weather conditions, checking flight battery requirements, checking takeoff and landing distances, and all other actions in the Preflight Checklist in the UAS Manual. These actions will provide an equivalent level of safety.

14 C.F.R. 91.109: Flight Instruction

Section 91.103 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.

By design, UASs and remotely piloted aircraft do not have fully functional dual controls. Flight control is accomplished through the use of a control box that communicates with the aircraft via radio communications. The FAA has previously approved exemptions for aircraft without fully



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functional dual controls. See Exemption Nos. 5778K & 9862A. The equivalent level of safety provided by the fact that neither a pilot nor passengers will be carried in the aircraft, the ability to control the UAS via radio signals from the controller, and by the size and speed of the aircraft.

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

Section 91.119 establishes safe altitudes for operation of civil aircraft. Section 91.119 (d) allows helicopters to be operated at less than the minimums prescribed, provided the person operating the helicopter complies with any route or altitudes prescribed for helicopters by the FAA. This exemption is for a multirotor craft that flies similarly to a helicopter, with vertical take off and vertical landing, which will typically operate at altitudes of 200 AGL so an exemption may be needed to allow such operations. The UAS will never operate at an altitude higher than 400 AGL and will be in a restricted area, where buildings and people will not be exposed to operations without their pre-obtained consent. The equivalent level of safety will be achieved given the size, weight, speed of the UAS as well as the location where it is operated. No flight will be taken without the permission of the property owner or local officials. Because of the advance notice to the property owner and any onsite personnel all affected individuals will be aware of the planned flight operations. Compared to flight operations with aircraft or rotorcraft weighing far more than the maximum 30 lbs. proposed herein and carrying flammable fuel, any risk associated with our operations is far less than those presently presented with helicopters and other conventional aircraft operating at or below 500 AGL in the industry. In addition, the low-altitude operations of the UAS will ensure separation between these small UAS operations and the operations of conventional aircraft that must comply with Section 91.119.

14 C.F.R. 91.121: Altimeter Settings

This regulation requires each person operating an aircraft to maintain cruising altitude by reference to an altimeter that is set "...to the elevation of the departure airport or an appropriate altimeter setting available before departure." As the UAS may not have a barometric altimeter, but instead a GPS altitude read out, an exemption may be needed. An equivalent level of safety will be achieved by the operator, pursuant to the UAS Manual and Safety Check list, confirming the altitude of the launch site shown on the GPS altitude indicator before flight.

14 CFR 91.151 (a): Fuel requirements for flight in VFR conditions

Section 91.151 (a) outlines fuel requirements for beginning a flight in VFR conditions. Our UAS is limited to operations in sterile and controlled environments and has a limited range and flight time which require an exemption from 14 CFR 91.151(a). The battery powering the UAS provides approximately 20 minutes of powered flight. This does not meet the 30 minute reserve requirement in 14 CFR §91.151.



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CDG Engineers believes that an exemption from 14 CFR §91.151(a) falls within the scope of prior exemptions. See Exemption 10673 (allowing Lockheed Martin Corporation to operate without compliance with FAR 91.151 (a)). Operating the small UAS, in a tightly controlled area where only people and property owners or official representatives who have signed waivers will be allowed, 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. An equivalent level of safety can be achieved by limiting flights to 15 minutes, or enough battery reserve to ensure that the UAS lands at the ground station with at least 20% of battery power (as determined by the onboard monitoring system and the pilot), whichever happens first. This restriction would be more than adequate to return the UAS to its planned landing zone from anywhere in its limited operating area. Similar exemptions have been granted to other operations, including Exemptions 2689F, 5745, 10673, and 10808.

14 CFR 91.203 (a) & (b): Carrying civil aircraft certification and registration

The regulation provides in 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.

The UAS fully loaded weighs no more than 30 lbs and is operated without an onboard pilot. Therefore there is no ability or place to carry certification and registration documents or to display them on the UAS.

An equivalent level of safety will be achieved by keeping these documents at the ground flight control point where the pilot flying the UAS will have immediate access to them, to the extent they are applicable to the UAS. 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.

14 CFR 91.405 (a); 407 (a)(1); 409 (a)(2); 417 (a) & (b): Maintenance inspections

These regulations require that an aircraft operator or owner "shall have that aircraft inspected as prescribed in subpart E of this part and shall between required inspections, except as provided in paragraph (c) of this section, have discrepancies repaired as prescribed in part 43 of this chapter..." and others shall inspect or maintain the aircraft in compliance with Part 43.



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Given these sections and Part 43 apply only to aircraft with an airworthiness certificate these sections will not apply to CDG Engineers. Maintenance will be accomplished by the operator pursuant to the flight manual and operating handbook. An equivalent level of safety will be achieved because these small UASs are very limited in size and will carry a small payload and operate only in restricted areas for limited periods of time. If mechanical issues arise the UAS can land immediately and will be operating from no higher than 400 feet AGL. The operator will ensure that the UAS is in working order prior to initiating flight, perform required maintenance, and keep a log of any maintenance performed. Moreover, 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.

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:

CDG Engineers seeks an exemption from the following rules: 14 C.F.R. §21, subpart H; 14 C.F.R. 45.23(b); 14 C.F.R. §§ 61.113(a) & (b); 91.7 (a); 91.9 (b) (2); 91.103(b); 91.109; 91.119; 91.121; 91.151(a); 91.203(a) and (b); 91.405 (a); 91.407 (a) (1); 91.409 (a) (2); 91.409 (a) (2) and 91.417 (a) & (b) to operate commercially a small unmanned vehicle (551bs or less) in construction, mining, surveying, or inspection operations.

Approval of exemptions allowing commercial operations of UASs in the construction, mining, surveying, or inspection industry enhances safety while reducing risk. Manned aircraft monitoring and surveying creates a greater risk because the craft are much larger, have combustible fuel, and carry an onboard human pilot. In contrast, a UAS weighing fewer than 30 lbs. and powered by batteries eliminates virtually all of that risk given the reduced mass and lack of combustible fuel carried on board. The UAS will carry no passengers or crew and, therefore, will not expose them to the risks associated with manned aircraft flights.

The operation of small UASs, weighting less than 30 lbs., conducted in the strict conditions outlined above, will provide an equivalent level of safety supporting the grant of the exemptions requested herein, including exempting CDG Engineers from the requirements of Part 21 and allowing commercial operations. These lightweight aircraft operate at slow speeds, close to the ground, and in a sterile environment and, as a result, are far safer than conventional operations conducted with helicopters operating in close proximity to the ground and people.



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Privacy

All flights will occur over private or controlled access property with the property owner's prior consent and knowledge. Images taken will be of individuals who have also consented to being filmed or otherwise have agreed to be in the area where aerial photography will take place.

Satisfaction of the criteria provided in Section 333 of the Reform Act of 2012--size, weight, speed, operating capabilities, proximity to airports and populated areas and operation within visual line of sight and national security — provide more than adequate justification for the grant of the requested exemptions allowing commercial operation of CDG Engineers' UASs in construction industry pursuant to the UAS Manual.

Specific Examples of Potential UAS use by CDG:

CDG Engineers currently has available a DJI Phantom II Vision to use if/when permission is granted. Purchase of a similar yet more advanced model may be pursued at a later date. Use of this tool would allow CDG to:

- Inspect existing inaccessible or difficult to access structures such as tops of river cells, sides of bridges, industrial rooftops, and smoke stacks. This would save time and money and public inconveniences by negating the need to mobilize large lift equipment or close roads during bridge or public building inspections.
- Develop 3D models from imagery collected during flight. Using software to turn photographs into scalable 3D models minimizes the need for tape measures and other 'hands on' surveying tools which can inhibit industrial and public operations as well as be a safety issue to the employee and public.
- Develop land surveys quickly and inexpensively compared to conventional methods. Aerial surveys can be conducted on small areas with the UAS negating the need for large conventional aircraft and other conventional surveying devices which may inhibit industrial or public operations.
- Enhanced public awareness. Many of CDG Engineers' projects involve public places such as bridges, biking/hiking trails, landfill closures, etc. The ability to use up to date aerial photography will enable the client and the public to better understand the project.

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