



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

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

August 6, 2015

Exemption No. 12375  
Regulatory Docket No. FAA-2015-1966

Mr. Karl Mortensen  
Dragon Avionics LLC  
7511 Woodpalace Court  
Annandale, VA 22003

Dear Mr. Mortensen:

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

By letter dated May 15, 2015, you petitioned the Federal Aviation Administration (FAA) on behalf of Dragon Avionics LLC (hereinafter petitioner or operator) for an exemption. The petitioner requested to operate an unmanned aircraft system (UAS) to conduct aerial imaging services.

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 3D Robotics Iris.

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<sup>1</sup>. 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, Dragon Avionics LLC is granted an exemption from 14 CFR §§ 61.23(a) and (c), 61.101(e)(4) and (5), 61.113(a), 61.315(a), 91.7(a), 91.119(c), 91.121, 91.151(a)(1), 91.405(a), 91.407(a)(1), 91.409(a)(1) and (2), and 91.417(a) and (b), to

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<sup>1</sup> 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.

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, Dragon Avionics LLC is hereafter referred to as the operator.

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

1. Operations authorized by this grant of exemption are limited to the 3D Robotics Iris 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](http://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 August 31, 2017, unless sooner superseded or rescinded.

Sincerely,

/s/

John S. Duncan

Director, Flight Standards Service

Enclosures



# Karl Mortensen

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(703) 354-1340

15 May 2015  
Hon. Michael Huerta  
Administrator  
Federal Aviation Administration  
U. S. Department of Transportation  
Docket Management System  
1200 New Jersey Ave., SE  
Washington, DC 20590

Re: Exemption Request under Section 333 of the FAA Reform Act and Part 11 of the Federal Aviation Regulations from certain parts of the FARs.

Dear Administrator Huerta:

Pursuant to Section 333 of the FAA Modernization and Reform Act of 2012 (the Reform Act) and 14 C.F.R. Part 11, Dragon Avionics LLC ("Dragon"), a small Unmanned Aircraft Systems ("sUAS") operator, hereby applies for an exemption from the listed Federal Aviation Regulations ("FARs") to allow Dragon to operate sUAS under the conditions and limitations set forth in this Petition.

The requested exemption would permit the operation of small, unmanned and relatively inexpensive sUAS under controlled conditions in airspace that is (1) limited, (2) predetermined, and (3) would provide safety enhancements to the already safe image gathering operations presently using manned helicopters and airplanes. Approval of this exemption would thereby enhance safety and fulfill the FAA Administrator's responsibilities to "...establish requirements for the safe operation of such aircraft systems in the national airspace system." Section 333(c) of the Reform Act.

The name and address of the applicant is:

Dragon Avionics

Attn: Karl Mortensen

Email: karl@dragonavionics.com

Address: 7511 Woodpalace Ct. Annandale, VA 22003

Telephone: (703) 354-1340

Regulations from which the exemption is requested:

14 CFR Part 21

14 C.F.R. § 45.23(b)

14 CFR § 61.3

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 § 91.205(b)

14 CFR § 91.215

14 CFR § 91.405 (a)

14 CFR § 407 (a) (1)

14 CFR § 409 (a) (2)

14 CFR § 417 (a) & (b) 3

The Appendix describes the FARs from which an exemption is requested and summarizes the justification for each requested exemption.

The Petition is submitted to fulfill Congress' goal under Section 333(a) through (c) of the Reform Act, which 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 Administrator must 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 Administrator 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 Secretary has delegated his aviation authority to the Administrator of the FAA. The Federal Aviation Act expressly grants the FAA the authority to grant exemptions from its regulatory requirements for civil aircraft, a term defined under §40101 of the Act, which includes sUAS. 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 the Federal Aviation Act if 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).

The petitioner is an aerial imaging company, intending to do business imaging agricultural, real estate, surveying, and other needs. Dragon founders have been flying model aircraft for years and are prepared to sell their aerial imaging services. The founders are also familiar with ground-based radar, UAV-based radar, Counter-UAS radar systems, aerial imagery, digital signal processing, and a variety of U.S. military UAS.

The wide availability of sUAS, sometimes known as “microdrones,” capable of carrying high-quality video equipment and priced at affordable levels fascinated the petitioner. Their careers have involved exploring new technologies and adapting them to capture good information to help the U.S. warfighter with lifesaving real-time information. Dragon founders have flown several different types of sUAS systems over the course of the last 7 years, involving locations in New York, Virginia, Alabama and Idaho, for recreational purposes, exploring the potential and the limitations of various sUAS, as well as exercising their image collection and processing subsystem. Dragon founders have also observed many professional UAS flights, involving everything from safety pre-flight checks, to mid-scenario command and control decisions, to controlled landing. They have seen first-hand successful and unsuccessful sUAS expeditions, and have learned from both. They are familiar with a wide variety of sUAS systems and have chosen as their preferred aerial platforms those sUAS solutions that offer both low price, high reliability, and good operator control. They are pleased with the platforms chosen and the quality of the images captured, and have used imagery captured from their sUAS systems to provide situational awareness to farmers already.

Having prepared themselves to capture and process aerial imagery, proven that it aids farmers in making near-real-time decisions for their livelihood and real estate agents in displaying their wares, Dragon desires the ability to do this in a professional, compensated capacity. For this purpose, Dragon seeks special permission from the FAA by way of this document. Many competitors of Petitioner are actively flying sUAS to conduct aerial photography for commercial purposes, notwithstanding the FAA’s stated prohibition. Dragon also notes the congressional mandate in sections 332 and 333 of the FAA Revitalization and Reform Act of 2012 that the FAA move quickly to accommodate the economic and societal benefits that can result from widespread deployment of sUAS technology. Accordingly, Petitioner applies for authorization under the Federal Aviation Act, and the FARs rules to undertake the following activities for commercial purposes. Unless the Petition is granted, Petitioner will be at a significant competitive disadvantage, as Dragon intends to comply with FAA policy.

## **Vehicles**

The Petitioner has tested many sUAS vehicles, and intends to fly ArduPilot-compatible vehicles such as the 3DR Iris and those that are substantially similar. The 3DR Iris has already been approved by the FAA in multiple instances. The ArduPilot flight controller has built-in capability to limit the height the vehicle will fly above the ground, to limit the radius of the distance the vehicle will fly from the operator, and to exclude the vehicle from class B, C, 5 and D airspace. The petitioner has even designed a custom-built avionics device called Screamy that enables a ground operator to trigger a lost-drone alarm from their handheld controller or laptop ground control station. The vehicles also have built-in capability to return to the launching point if the wireless control link is interrupted or if the operator attempts to exceed any of the height, radius, or airspace limitations programmed into the vehicle during the pre-flight preparation step.

The vehicles weigh around five pounds empty and have a maximum gross weight of up to approximately ten pounds. Most have a top speed around 30 knots. The vehicles are standard four-channel, five-channel, or six channel sUAS systems. They have standard control surfaces, with thrust varied by changing RPM. They are powered by lithium polymer batteries.

## **Flight profiles**

The Petitioner will program the software controlling the vehicle so that it will not fly more than 400 feet above ground level, nor more than 1500 feet away from the operator. The operator will carefully preflight the vehicle before each mission to assure that its gyrocompass and GPS system are properly calibrated and that the return-to-home feature, altitude, and radius limitations are enabled. Operation on aerial photography missions will mainly take place in the early morning hours and other times when few people are out and about. The operator will fly only over largely unpopulated areas, where the potential of uncontrolled descent to cause injury or damage is low.

As part of standard pre-flight operations, Dragon operators will use the FAA's B4UFLY mobile app to determine whether there are any restrictions or requirements in effect at the location where they want to fly.

The operator will not operate in controlled airspace. In the unlikely event that a manned aircraft flies below 400 feet AGL where a safety hazard could exist, the operator will keep both the vehicle and manned aircraft in sight and avoid the manned aircraft, deferring to manned aircraft at all times. More particularly, the Petitioner will fly only where invited or commissioned by the person in legal possession of the property to do so and where allowed by law.

All Dragon operators will undertake a period of at least twelve hours flight training with a simulator and actual vehicles, ensuring that the operator is proficient in anticipating and responding to situations or events that might interfere with safe flight, with ground operations, or with manned aircraft.

The Petitioner's proposed operations satisfy the criteria provided in Section 333 of the Reform Act relating to size, weight, speed, operating capabilities, proximity to airports and populated areas and operation within visual line of sight and national security. The Petition justifies grant of the requested exemptions to allow the Petitioner to perform aerial imagery for compensation.

Respectfully submitted,  
Karl D. Mortensen  
Founder, Dragon Avionics

## Appendix FAR section

	Subject	Justification
14 CFR § 45.23(b)	Requirement to display registration number on vehicle	Insufficient space on vehicle
14 CFR Part 21	Aircraft certification requirements and procedures	Designed for manned aircraft; not suitable for off-the-shelf sUAS
14 CFR § 61.3	Requirement for pilot certificate	Part 61 requirements designed for manned aircraft, not sUAS; petition describes training for sUAS operator
14 CFR § 91.7 (a)	Airworthiness requirement	Designed for manned aircraft; not suitable for off-the-shelf sUAS
14 CFR § 91.9 (b) (2)	Requirement for manual to be available in the cockpit	No one aboard to read manual
14 CFR § 91.103(b)	Requirement for crew members to be onboard	Unmanned vehicle
14 CFR § 91.109	Requirement for dual controls during flight instruction	No one aboard to operate controls
14 CFR § 91.119	Minimum altitudes for safe flight	Safety requires operation below these altitudes
14 CFR § 91.121	Altimeter settings	No one aboard to read altimeter
14 CFR § 91.151(a)	Fuel requirements	Vehicle does not use fuel
14 CFR § 91.203 (a) & (b)	Requirement for registration and airworthiness certificates to be onboard	No one aboard to read certificates
14 CFR § 91.205(b)	Cockpit instruments	No one aboard to read