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

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

July 27, 2015

Exemption No. 12171
Regulatory Docket No. FAA–2015–1736

Mr. Cody Claflin
Aerial Agronomics LLC
306 West Main Street
Sheldon, MO 64784

Dear Mr. Claflin:

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 1, 2015, you petitioned the Federal Aviation Administration (FAA) on behalf of Aerial Agronomics LLC (hereinafter petitioner or operator) for an exemption. The petitioner requested to operate an unmanned aircraft system (UAS) to conduct aerial data collection.

See Appendix A for the petition submitted to the FAA describing the proposed operations and the regulations that the petitioner seeks an exemption.

The FAA has determined that good cause exists for not publishing a summary of the petition in the Federal Register because the requested exemption would not set a precedent, and any delay in acting on this petition would be detrimental to the petitioner.

Airworthiness Certification

The UAS proposed by the petitioner are the 3D Robotics RTF X8 and Tarot 680Pro.

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

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

The Basis for Our Decision

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

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

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

Our Decision

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

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

Conditions and Limitations

In this grant of exemption, Aerial Agronomics 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 RTF X8 and Tarot 680Pro when weighing less than 55 pounds including payload. Proposed operations of any other aircraft will require a new petition or a petition to amend this exemption.

2. Operations for the purpose of closed-set motion picture and television filming are not permitted.

3. The UA may not be operated at a speed exceeding 87 knots (100 miles per hour). The exemption holder may use either groundspeed or calibrated airspeed to determine compliance with the 87 knot speed restriction. In no case will the UA be operated at airspeeds greater than the maximum UA operating airspeed recommended by the aircraft manufacturer.

4. The UA must be operated at an altitude of no more than 400 feet above ground level (AGL). Altitude must be reported in feet AGL.

5. The UA must be operated within visual line of sight (VLOS) of the PIC at all times. This requires the PIC to be able to use human vision unaided by any device other than corrective lenses, as specified on the PIC's FAA-issued airman medical certificate or U.S. driver's license.

6. All operations must utilize a visual observer (VO). The UA must be operated within the visual line of sight (VLOS) of the PIC and VO at all times. The VO may be used to satisfy the VLOS requirement as long as the PIC always maintains VLOS capability. The VO and PIC must be able to communicate verbally at all times; electronic messaging or texting is not permitted during flight operations. The PIC must be designated before the flight and cannot transfer his or her designation for the duration of the flight. The PIC must ensure that the VO can perform the duties required of the VO.

7. This exemption and all documents needed to operate the UAS and conduct its operations in accordance with the conditions and limitations stated in this grant of exemption, are hereinafter referred to as the operating documents. The operating documents must be accessible during UAS operations and made available to the Administrator upon request. If a discrepancy exists between the conditions and limitations in this exemption and the procedures outlined in the operating documents,

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

8. Any UAS that has undergone maintenance or alterations that affect the UAS operation or flight characteristics, e.g., replacement of a flight critical component, must undergo a functional test flight prior to conducting further operations under this exemption. Functional test flights may only be conducted by a PIC with a VO and must remain at least 500 feet from other people. The functional test flight must be conducted in such a manner so as to not pose an undue hazard to persons and property.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

26. All Flight operations must be conducted at least 500 feet from all nonparticipating persons, vessels, vehicles, and structures unless:
    a. Barriers or structures are present that sufficiently protect nonparticipating persons from the UA and/or debris in the event of an accident. The operator must ensure that nonparticipating persons remain under such protection. If a situation arises where nonparticipating persons leave such protection and are within 500 feet of the UA, flight operations must cease immediately in a manner ensuring the safety of nonparticipating persons; and
    b. The owner/controller of any vessels, vehicles or structures has granted permission for operating closer to those objects and the PIC has made a safety assessment of the risk of operating closer to those objects and determined that it does not present an undue hazard.

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

27. All operations shall be conducted over private or controlled-access property with permission from the property owner/controller or authorized representative. Permission from property owner/controller or authorized representative will be obtained for each flight to be conducted.

28. Any incident, accident, or flight operation that transgresses the lateral or vertical boundaries of the operational area as defined by the applicable COA must be reported to the FAA's UAS Integration Office (AFS−80) within 24 hours. Accidents must be reported to the National Transportation Safety Board (NTSB) per instructions contained on the NTSB Web site: www.ntsb.gov.

If this exemption permits operations for the purpose of closed-set motion picture and television filming and production, the following additional conditions and limitations apply.

29. The operator must have a motion picture and television operations manual (MPTOM) as documented in this grant of exemption.

30. At least 3 days before aerial filming, the operator of the UAS affected by this exemption must submit a written Plan of Activities to the local Flight Standards District Office (FSDO) with jurisdiction over the area of proposed filming. The 3-day notification may be waived with the concurrence of the FSDO. The plan of activities must include at least the following:
    a. Dates and times for all flights;
    b. Name and phone number of the operator for the UAS aerial filming conducted under this grant of exemption;
    c. Name and phone number of the person responsible for the on-scene operation of the UAS;
    d. Make, model, and serial or N−Number of UAS to be used;
    e. Name and certificate number of UAS PICs involved in the aerial filming;
    f. A statement that the operator has obtained permission from property owners and/or local officials to conduct the filming production event; the list of those who gave permission must be made available to the inspector upon request;
    g. Signature of exemption holder or representative; and
    h. A description of the flight activity, including maps or diagrams of any area, city, town, county, and/or state over which filming will be conducted and the altitudes essential to accomplish the operation.

31. Flight operations may be conducted closer than 500 feet from participating persons consenting to be involved and necessary for the filming production, as specified in the exemption holder's MPTOM.

Unless otherwise specified in this grant of exemption, the UAS, the UAS PIC, and the UAS operations must comply with all applicable parts of 14 CFR including, but not limited to, parts 45, 47, 61, and 91.

This exemption terminates on July 31, 2017, unless sooner superseded or rescinded.

Sincerely,
/s/
John S. Duncan
Director, Flight Standards Service

Enclosures

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

Aerial Agronomics LLC
Cody Claflin
306 West Main Street
Sheldon, MO 64784
417-321-0122

May 1, 2015

RE: Exemption Request Under Section 333 of the FAA Reform Act and Part 11 of the Federal Aviation Regulations

To Whom It May Concern:

Pursuant to Section 333 of the FAA Modernization and Reform Act of 2012 ("FAA Reform Act') and 14 C.F.R. Part 11, Aerial Agronomics LLC (AALLC) requests an exemption from Federal Aviation Regulations ("FARs") detailed below for the AALLC UAS. Aerial Agronomics would like to specifically request exemptions from 14 CFR 91.203, 14 CFR 91.9, 14 CFR 61.113(a) and (b), 14 CFR 61.133, 14 CFR 91.109, 14 CFR 91.119, 14 CFR 91.121, 14 CFR 91.151, 14 CFR Subpart E (91.401- 91.417).

This petition for exemption is made based on information outlined in this Petition for Exemption, as well as the accompanying Aerial Agronomics LLC' UAS Flight Manual (hereinafter "AALLC' Flight Manual"), 3D Robotics RTF X8 UAS Manuals, and Tarot 680Pro Hexacopter Manuals (collectively referred to as "Manufacturer's Manuals"). AALLC submits these supporting materials as confidential documents pursuant to 14 C.F.R. § 11.35(b).

AALLC is submitting this petition on its own behalf. If the FAA requires any modifications to our proposed exemption request, Aerial Agronomics requests the opportunity to amend this petition to include any modifications the FAA may require before granting or rejecting the petition for exemption. Aerial Agronomics will amend its petition to meet any additional standards for the integration of small UAS operation into the NAS.

The Petition is organized as follows:

I. DESCRIPTION OF PETITIONER

Aerial Agronomics is based in Lamar, Missouri, and was founded by Cody Claflin. Aerial Agronomics seeks to use the latest UAS technologies and analytic tools to help improve the quality, consistency, and yield of crops as well as help reduce the risks involved with a variety of dangerous inspections in the private sector (pipeline, tower, natural disaster). By coupling the latest in UAS technology with existing clientele between our partnerships with Natural Solutions and Legacy Farm and Lawn, Aerial Agronomics shows great promise in assisting farmers in the coming years.

The farmer's ability to gather and process information on the health of their crops is critical to ensuring the crop's uniform quality and potential yield. Aerial Agronomics UASs will allow the farmer to make informed, data based decisions, rather than subjective, reactive decisions. This decision making process allows today's farmers and growers to deploy their limited resources in a more efficient, effective, and environmentally sustainable manner.

The data collected will allow farmers to identify patches of disease-ridden vines and assists with water, irrigation, soil, pesticides and fertilization management. The ability to pinpoint and precision spray pesticides, rather than spray the entire field, reduces the risk of exposure to pesticide. This also helps mitigate the negative side-effects on the local ecology from pesticides.

Aerial Agronomics is dedicated to providing technologically driven and innovative solutions to getting farmers and growers the information they need to make informed decisions that will allow them to produce better crops in a more sustainable and environmentally conscious manner. A variety of other potential uses for the Aerial Agronomics UAS lie on the horizon as well. Aerial Agronomics sees the potential of performing volumetric measurements for rock quarries. A UAS would also provide new perspective that is otherwise unseen by the human eye by utilizing near infrared imagery. To that end, Aerial Agronomics seeks an exemption to use UASs for agricultural survey, film production, property survey, aerial photography, pipeline survey.

Contact Information for Petitioner

Cody Claflin, CEO
Aerial Agronomics, LLC
510 W 12th St
Lamar, Mo. 64759
417-321-0122

II. EXPLANATION OF PROPOSED OPERATION

AALLC's UASs are multi-rotor vehicles, weighing 15 or fewer lb. including payload. They operate under normal conditions at a speed of no more than 25 mph and have the capability to hover, and move in the vertical and horizontal plane simultaneously. The UASs are equipped with GPS and auto return to launch capabilities. The UASs will be operated by an experienced pilot familiar with the AALLC UAS. The UASs will operate only in the visual line of sight (VLOS) of the PIC at all times and operations will utilize a visual observer (VO) at all times. Operations will take place only within the area described in the Aerial Agronomics Aircraft Flight & Operations Manual, attached. Such operations will insure that the UASs will "not create a hazard to users of the national airspace system or the public." Reform Act Section 333 (b)."

Given the small size of the UASs involved and the restricted and environment within which they will operate, our application falls squarely within the zone in which Congress envisioned that the FAA must, by exemption, allow commercial operations of UASs to commence immediately.

The Aerial Agronomics Tarot 680 Pro Hexacopter (hereinafter "Tarot 680Pro") is a six-rotor UAS that has a total payload weight of 7.5 pounds, and is operated using a radio control 2.4 GHz transmitter, monitored using a Windows-based ground control station, and connected via radio telemetry in the 915 MGHz band. Aerial Agronomics Tarot 680Pro can carry a payload of up to 5.29 pounds, and has been operated with a payload of high-resolution DSLR cameras, infrared cameras, and video cameras for photography, videography, geospatial analysis and photogrammetry.

The 3D Robotics RTF X8+ (hereinafter "X8+) is a coaxial octocopter UAS that has a total payload weight of 1.8lbs and is operated using a radio control 2.4 GHz transmitter, monitored using a Windows-based ground control station, and connected via radio telemetry in the 915 MGHz band. The aforementioned crafts will herein be referred to as "AALLC UAS".

If the radio control link is lost, emergency failsafe is designed to prevent flyaway, to hover independent of GPS signal then perform a controlled descent. If GPS signal is sufficient, the aircraft can automatically return to the takeoff point. The flight control system can fly pre-programmed waypoints for photogrammetry yet respond immediately to pilot stick overrides in case of route adjustment or emergency.

Its radio control system incorporates telemetry which is displayed on the pilot's handheld controller and may be announced by voice. The AALLC UAS are optimized for aerial survey and incorporates safety features to reduce pilot workload. The Tarot 680Pro is less than four feet in diameter, made of carbon-fiber reinforced polymer and is designed for a maximum takeoff weight of less than 12 pounds, with a flight time of approximately twenty five

minutes. Maximum speed is about 55 MPH, but AALC treats this limitation as an emergency reserve, and plans no flying at greater than 25 MPH. The aircraft carries no flammable liquid fuel. System redundancies are described in the Manufacturer's Manual.

This request for an exemption would support a COA application to use the AALLC UAS for agricultural survey, film production, property survey, aerial photography, pipeline survey, and for monitoring damage in the event of a natural disaster.

AALLC has extensive operational experience in the United States and designed the AALLC UAS for topographic survey, aerial mapping, agricultural monitoring and high resolution photography and videography. AALLC staff members have assisted American research institutions in survey and supplemental aerial photography.

With the ever growing presence of UAS operations and their existence in the public eye, we realize that issues of safety and responsibility when operating any UAS are of the utmost importance. Aerial Agronomics is wholeheartedly in support of these missions and paving the way for future UAS operations in the national spotlight. Aerial Agronomics desires to operate small UAS platforms for both commercial and research purposes using the Flight Restrictions (FRs) listed in the following pages.

The AALLC UAS will be operated in accordance with the following FRs:

- Flight operations will occur only in Class E or Class G airspace
- Flight operations will occur at no more than 400 feet above ground level
- Flight operations will occur using an electric power source
- Flight operations will not risk the safety of the PIC or VO, or fly over any members of the general public
- Flight operations will avoid congested or populated areas, which the FAA designates as yellow on VFR charts
- Flight operations will be operated within VLOS, with one PIC and one ground-based VO within an audible distance of the PIC
- Flight operations will occur only during daylight hours
- Flight operations will not be conducted within a 5 NM radius from the center of

any FAA designated airport

- Flight operations will only be conducted with permission from the land owner

- Flight operations will comply with all NOTAMs and TFRs

III. AALLC's PROPOSED UAS OPERATIONS MEET THE REQUIREMENTS OF SECTION 333 OF THE REFORM ACT

The small UAS operations proposed by AALLC in this Petition for Exemption qualify for expedited approval pursuant to Section 333 of the Reform Act as each of the statutory criteria and relevant factors are satisfied.

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

AALLC will only employ small UASs that meet the following characteristics to perform the operations described in this Petition for Exemption:

● The unmanned aircraft ("UA") will weigh less than 20 pounds, including all equipment and payloads;

● The UA will not be flown at a speed in excess of 25 knots;

● The UA will not be flown 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 20% of the battery's maximum charge;

● Altitude information will be generated by equipment onboard the UA as specified using GPS triangulation, digitally encoded barometric altimeter, radio altimeter, or any combination thereof. This information will be transmitted to the pilot via telemetric data feed.

● The UAS will have system redundancies and independent functionality to ensure the overall safety and predictability of the system. If connection to the remote control or ground control station is lost, failsafe systems will permit the UAS to return to a predetermined location and safely land without injury or damage.

● The radio frequencies used for operations and control of the UAS will comply with the Federal Communications Commission ("FCC") or other appropriate government oversight agency requirements.

B. Approval is Warranted Based on the Operational Restrictions described in the Flight Manual

The AALLC' Flight Manual and the Manufacturer's Manual for the selected UAS will contain all the procedures and limitations necessary to safely and successfully perform the

operations specified in this Petition for Exemption. To assist the FAA in making a safety assessment of AALLC' proposed operations, below is a summary of operational limitations and conditions that will ensure an equivalent or higher level of safety to operations conducted under current regulatory guidelines:

1. The UAS weighs less than 10 pounds, fully loaded.

2. Minimum crew for each operation will consist of a pilot, who will be Pilot-in-Command ("PIC") of the UAS, and one or more Visual Observers ("Observer") as necessary to safely conduct the mission.

3. The UAS shall be operated within Visual Line of Sight ("VLOS") of the PIC and Observer at all times. The PIC must use human vision unaided by any device other than corrective lenses.

4. The Observer designated for any operation will be in constant voice contact with the PIC.

5. The additional requirements identified in the exemption grant shall be added to the AALLC' Flight Manual. The Flight Manual will be maintained and made available to the Administrator upon request. If a discrepancy exists between the conditions and limitations in the granted exemptions and the AALLC' Flight Manual, the conditions and limitations in the granted exemptions shall take precedence and must be followed. Otherwise, AALLC' must follow the procedures outlined in their Flight Manual.

6. Maximum total flight time for each operational flight will be limited to the amount of time the UAS can be flown and still maintain a reserve battery power of no less than 20%.

7. Flights will be operated at an altitude of no more than 400 feet AGL and will never enter navigable controlled airspace without prior written authorization and approval from the FAA.

8. Flights will be operated at a lateral distance of at least 500 feet from any nonparticipating persons, unless that person is in a position where he or she is shielded from the UAS and any possible debris resulting from UAS failure. Flight will be terminated if a nonparticipating person within 500 feet of the UAS leaves a shielded position. At no time will the UAS be conducted so close to persons or objects to present an undue hazard to the PIC or Observer, per §91.119(a).

9. Flights will be limited to a speed of 25 knots.

10. Prior to each flight the PIC shall inspect the UAS to confirm that it is in a condition safe for flight. The PIC shall not operate the UAS if the inspection reveals a condition that affects the safe operation of the UAS until the necessary maintenance has been performed and the UAS is found to be in a condition for safe flight. The Ground Control Station ("GCS") shall be included in the preflight inspection. All maintenance and alterations must be properly documented in the UAS records.

11. 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 in accordance with AALLC' Flight Manual. The PIC who conducts the

functional test flight must make an entry in the UAS aircraft records of the flight. The requirements and procedures for a functional test flight and UAS record entry shall be included in the AALLC' Flight Manual.

12. The UAS will be operated and maintained according to the Manufacturer's Manuals and any required manufacturer Safety/Service Bulletins.

13. Prior to the operation, there will be a Mission Plan setting forth the operational limitations and conditions for the mission, as well as key personnel contact information and a description of any potential hazards on or in the vicinity of the survey site.

14. AALLC will obtain an Air Traffic Organization ("ATO") issued Certificate of Waiver or Authorization, otherwise known as a COA, prior to conducting any operations under this grant of exemption. This COA will require AALLC to request a Notice to Airman ("NOTAM") with an appropriate ATC facility between 48 and 72 hours before the flight.

15. 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.

16. If the UAS loses communication with the pilot, it will have the capability to return to a pre-determined location within the operational area and land safely.

17. Contingency plans will be in place to safely terminate flight if there is a loss of communication between the PIC and the Observer.

18. The UAS will have the capability to safely abort flight in the case of unpredicted obstacles or emergencies.

19. PICs and VOs will have at least a valid U.S. drivers license.

20. Operations shall occur during daytime VFR Meteorological Conditions; flights under special visual flight rules ("SVFR") shall not be conducted.

21. The UA shall remain clear and yield the right of way to all other manned operations and activities at all times (including, but not limited to, ultralight vehicles, parachute activities, parasailing activities, hang gliders, etc.).

22. UAS Operations under Instrument Flight Rules, at night, or beyond VLOS are prohibited

IV. REGULATIONS FROM WHICH EXEMPTION IS REQUESTED

STATUTORY AUTHORITY FOR EXEMPTIONS

The Federal Aviation Act expressly grants the FAA authority to issue exemptions. This statutory authority includes exempting civil aircraft, as the term is defined under §40101 of the Act, including UASs, from the requirement that all civil aircraft must have a current airworthiness certificate.

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).

Section 333(b) of the Reform Act assists the Secretary in determining whether UAS may operate in the National Airspace System (NAS) without creating a hazard to the user, the public, or a threat to national security. In making this determination, the Secretary must consider:

- The UAS's size, weight, speed, and operational capability;
- Whether the UAS operates within the visual line of sight of the PIC;
- Whether the UAS operates outside of highly populated areas and away from close proximity to airports.

Reform Act §333(a). If the Secretary determines that a UAS "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).

14 CFR 21 Airworthiness Certificates

AALLC requests an exemption from Section 14 CRF Part 21 which requires the issuance of an Airworthiness Certificate for flight operation, while the FAA is still carrying out research and development for UAS standards and regulation.

AALLC's Tarot 680 Pro Hexacopter multi-rotor aircraft weights only approximately 7.5 pounds, and can carry a maximum payload of up to 5 pounds. It will not carry fuel or passengers, and will obey the operational requirements (FRs) outlined in the introduction to this exemption petition. We assert that the AALLC UAS, as compared to manned aircraft, significantly reduces the risk to crew, passengers, property, and the general public due its small size and FR outlined above.

Further, the UAS does not need a means to communicate with other aircraft or ATC, because those capabilities will be possessed by the PIC and Observer, who are not onboard the UAS. *See* Grant of Exemption, Docket FAA-2014-0352 at 13. In addition, no sense-and-avoid technology is necessary for the UAS because it will be operated at all times in VFR conditions and within VLOS of the PIC and Operator.

In the event that the FAA requires AALLC to obtain an Experimental Airworthiness Certificate or traditional Airworthiness Certificate in order to receive an exemption from Section 333, AALLC requests an opportunity to pursue such a certification.

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

Title 14 C.F.R. Part 27 sets forth the procedural requirements for airworthiness certification of normal category rotorcraft. To the extent that AALLC UASs would otherwise require certification under Part 27, Petitioner seeks 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.

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

AALLC 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 that no exemption is required for 14 C.F.R. § 91.7(a) to the extent that the requirements of Part 21 are waived or found inapplicable. *See* Grant of Exemption to Astraeus Aerial, Docket No. FAA-2014-0352 at 13-14, 22.

14 CFR 91.203 I Civil Aircraft; Certifications Required

Section 14 CFR 91.203 requires that aircraft carry on board the aircraft's Airworthiness
Certificate. The subsection (b) further states that the Airworthiness Certificate should be "displayed at the cabin or cockpit entrance so that it is legible to passengers or crew".

The AALLC UAS has requested an exemption in the previous section (14 CFR 21 I Airworthiness Certificates). In the event that the FAA required AALLC to obtain an experimental Airworthiness Certificate, AALLC would pursue such a certification and keep the relevant information on the ground with the PIC and VO at their designated ground station.

Subsection (b) does not apply to the AALLC UAS, as it does not carry passengers or crew, or have a "cockpit" entrance. AALLC proposes mounting the AALLC identification information (mailing address, phone number, COA ID Number, or any other information deemed relevant to the FAA) and the UAS identification information (UAS unique number issued by AALLC, and Airworthiness Certificate information if required) on a visible exterior surface of the AALLC 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. In addition, based on the FAA Memorandum “Interpretation regarding whether certain
required documents may be kept at an UA’s control station,” dated August 8, 2014 the requested relief from 91.203 (a) & (b) may not be necessary.

14 CFR 91.9, 45.23, and 45.27: Civil aircraft flight manual, marking, and placard requirements.

Section 14 CFR 91.9 requires those operating an aircraft to keep a Flight Manual on board the aircraft during operation.

AALLC requests an exemption from this section as the AALLC UAS does not carry passengers or crew and would not benefit from keeping a Flight Manual on board the aircraft during operation, it would also be impossible due to the size of the UAS. AALLC will keep a

Flight Manual with the PIC and VO at the ground station. In addition, 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 CFR 45.23 1 Display of marks; general.

Subsections (a) and (b) for 14 CFR 45.23 require that the operator of the aircraft display the registration number on the side of the aircraft, and at various positions "near each entrance to the cabin, cockpit, or pilot station, in letters not less than 2 inches nor more than 6 inches high".

AALLC's Tarot 680 Pro Hexacopter does not have a cabin, cockpit, passengers or crew, and as such has no means of mounting it to these structures. AALLC proposes that it keeps identification information and an AALLC UAS manual with the PIC and VO at the ground station.

AALLC also proposes that in place of the markings required by 14 CFR 45.23, it keeps registration information and the AALLC mailing address; email address, and phone number permanently affixed to a visible exterior surface of the AALLC UAS.

14 CFR 45.29 Size of marks.

Subsections (a) and (b) of 14 CFR 45.29 provide for the size and dimensions of the markings noted in 14 CFR 45.23. Subsection (b) section (iii) states that "Marks at least 3 inches high may be displayed on an aircraft for which the FAA has issued an experimental certificate under§ 21.191 (d),§ 21.191 (g), or§ 21.191 (i) of this chapter to operate as an exhibition aircraft, an amateur-built aircraft, or a light-sport aircraft when the maximum cruising speed of the aircraft does not exceed 180 knots CAS".

AALLC proposes that the mounted identification information listed in the previous two sections will be sufficient for identification for the AALLC UAS. As the Tarot 680 Pro Hexacopter is only 7.0 pounds and does not have the space on board to post 3 inch letters, we propose that AALLC keeps registration information and the AALLC identification information (mailing address, email address, phone number, or any other information the FAA deems relevant for identification purposes) permanently affixed to a visible exterior surface of the AALLC UAS and with the PIC and VO on the ground.

14 C.F.R. § 91.103: Preflight Action

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

An equivalent level of safety will be provided by following the AALLC Flight Manual and the Manufacturer's Manuals. The PIC will perform a series of checklists designed to identify any defects or inoperable components in accordance with the AALLC Flight Manual, including checklists covering Pre-Flight, Launch, Landing, and Post-Flight procedures. The PIC will also be required to review weather, flight requirements, battery charge, landing and takeoff distance, UA performance data, and contingency landing areas—before initiation of flight. The AALLC Flight Manual and the Manufacturer's Manual (and any other relevant manufacturer publications) will be kept at the GCS and will be accessible to the PIC at all times while operating the UAS.

14 CFR 91.109 Flight instruction; Simulated instrument flight and certain flight tests.

14 CFR 91.109 stipulates, "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."

AALLC requests an exemption from this part, as the AALLC UAS uses on board software and a small RC transmitter for flight operation, which can accommodate "Instructor" override with the correct RC transmitter. We feel that this override, along with training within VLOS for the PIC, VO, student, and instructor, is sufficient for the operation of AALLC UAS UAS.

The FAA has previously approved exemptions for aircraft without fully 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 CFR 91.119 Minimum safe altitudes: General.

14 CFR 91.119 requires that the PIC operate at " ... an altitude of 500 feet above the surface, except over open water or sparsely populated areas. In those cases, the aircraft may not be operated closer than 500 feet to any person, vessel, vehicle, or structure."

Following current FAA guidelines, the AALLC UAS operates below 400 feet and within VLOS. Considering that we intend to operate within VLOS and below 400 feet, the AALLC UAS cannot comply with this request. AALLC will operate within all guidelines and proposed operation procedures outlined above. In addition, AALLC will fly only over private property with written permission from the property owner for flight, image capture, image storage, and image transfer (in accordance with Texas House Bill 912, published September 2013).

14 CFR 91.121 Altimeter settings.

14 CFR 91.121 stipulates that the PIC "operating an aircraft shall maintain the cruising altitude or flight level of that aircraft, as the case may be, by reference to an altimeter that is set, when operating - (i) The current reported altimeter setting of a station along the

route and within 100 nautical miles of the aircraft."

The AALLC UAS maintains an altitude using the barometric altitude reading and the GPS reading for altitude on board, transmitted through the 915 MHz telemetry dongle to Windows based ground station PC. Considering that the AALLC uses primarily a barometric altitude reading, and the AALLC UAS will only be in flight for around 20-30 minutes, even drastic changes in barometric pressure will not affect the altitude reading.

14 CFR 91.151 Fuel requirements for flight in VFR conditions.

14 CFR 91.151 requires that the PIC may not begin a flight under VFR "unless (considering wind and forecast weather conditions) there is enough fuel to fly to the first point of intended landing ..."

The AALLC UAS does not use liquid fuel, but instead uses a lithium polymer battery that utilizes electric energy instead of fuel. Considering this clarification, and the fact that the AALLC UAS cannot fly more than 0.5 NM from its launch point, AALLC requests an exemption from 14 CFR 91.151. Similar exemptions have been granted to other operations, including Exemptions 2689F, 5745, 10673, and 10808.

14 CFR Subpart E (91.401- 91.417)

General Operating and Flight Rules Subsections 91.405 and 91.407 of 14 CFR Subpart E require that routine and regularly scheduled maintenance be performed upon the aircraft before flight. Furthermore, Section 91.407 Part (1) stipulates that no person may operate an aircraft unless "It has been approved for return to service by a person authorized under §43.7 of this chapter".

AALLC requests exemption from these points, and proposes that the PIC and VO be allowed to perform maintenance reviews and inspections once a month, and pre-flight checks before every flight. The 'Monthly Maintenance Inspection Checklist' and 'Pre-Flight Checklist' are both attached to this petition. The PIC and VO will be able to repair broken arms, replace broken or worn propellers, and calibrate using the flight software. Further diagnosis or maintenance that requires tools not available to the PIC or VO in the field will be performed by AALLC.

14 CFR 61.113 1 Private pilot privileges and limitations:

14 CFR 61.113 stipulates, "No person who holds a private pilot certificate may act PIC that is carrying passengers or property for compensation or hire". Subsection (b) of this part stipulates that the PIC may conduct flight if(1) the "flight is only incidental to that business or employment; and (2) "the aircraft does not carry passengers or property for compensation or hire."

As AALLC requests that the AALLC UAS be operated with only ground school and a passing score on the FAA Written Examination, AALLC requests that the AALLC UAS be

allowed to operate for compensation or hire to complete market research for use for agricultural survey, pipeline survey, oil rig survey, monitoring damage or movement of environmentally sensitive materials in the event of an environmental disaster, property survey, film production, and aerial photography. Considering that the AALLC UAS does not carry passengers or property, and there is no equivalent flight certification for UAS PICs and VOs, AALLC requests that the PIC and VO be required to complete only an FAA approved ground school program and pass the FAA Written Examination.

V - Public Interest

The public interested will be served by granting Aerial Agronomics' petition for exemption. With the establishment of a national policy that promotes early integration of UAS into the NAS when safe working conditions are set forth, such as in this petition.

The UAS operations stated in this petition significantly improve safety and reduce risk by alleviating the public's exposure to danger, risks and emissions associated with traditional agricultural aerial survey and inspection methods, namely, full size fixed-wing aircraft and rotorcraft. The UAS's submitted for approval by AALLC are battery powered and create no emissions. In the case of an unforeseeable in which one of Petitioner's UASs crash, there is no fuel to ignite and explode. Furthermore if any accident were to occur involving AALLC's lightweight UASs will present significantly less danger to the pilot and other individuals on the ground than one involving a full size helicopter or fixed wing craft.

AALLC will be implementing sophisticated modeling and observational tools to pair with the UASs. By combining the proposed UAS and agriculture modeling software AALLC's clients will be able to precision apply fungicides, herbicides, and fertilizers. This precision application will have a twofold benefit; the client will save time and money and the environmental impact of the commercial operation will be reduced by using the correct amount of chemical and fertilizers.

A. Privacy Concerns

In regards to privacy concerns, all flights will occur over private or controlled access property with the property owner's prior consent and knowledge. Inspection will be in areas where the owners will have consented to the inspections or otherwise have agreed to allow the UAS and the operator to be in the area where inspection will take place.

VI - Conclusion

AALLC's Petition for Exemption satisfies the criteria articulated in Section 333 of the Reform Act of 2012 including weight, speed, operating capabilities, proximity to airports and populated areas, operation within VLOS and national security. The proposed UAS operations

will benefit the public as a whole by improving safety and reducing risk by alleviating human exposure to danger. The public also benefits from improving the quality, environmental friendliness, and cost-effectiveness of comparable agricultural surveys and inspections completed with conventional flight operations. In consideration of the foregoing, this Petition for Exemption provides the FAA with more than adequate justification for granting the requested exemptions allowing AALC to perform precision agricultural surveys and inspections using small UAS. We thank you for your prompt consideration of our requested exemptions. Should you have any questions, or if you need any additional information to support the requested exemptions, please do not hesitate to contact the undersigned.

VII. Glossary of Terms

AALLC - Aerial Agronomics LLC
AGL - Above Ground Level
AOI - Area of Interest
ATC - Air Traffic Control
ATO - Air Traffic Organization
AV - Aerial Vehicle
CFR - Code of Federal Regulations
COA - Certificate of Authorization
FAA - Federal Aviation Administration
FAR - Federal Aviation Regulation
GCS - Ground Control Station
GPS - Global Positioning System
LOL - Loss of Link
NAS - National Airspace System
NOTAM - Notice to Airman
PIC - Pilot In Command
Section 333 - FAA Modernization and Reform Act of 2012 (FMRA) Section 333
SO - Safety Observer
SOP - Standard Operating Procedures
UA - Unmanned Aircraft
UAS - Unmanned Aircraft System
VFR - Visual Flight Rules
VLOS - Visual Line of Site
VMC - Visual Meteorological Conditions
VTOL - Vertical Takeoff and Landing

VIII. Attachments

Aerial Agronomics Flight Manual

Aerial Agronomics Tarot 680 Pro Hexacopter Manual and Crucial Flight Component Manuals

3D Robotics RTF X8+ Operations Manual

Monthly Maintenance Inspection Checklist

Aerial Agronomics Operational Pre-Flight Checklist