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January 13, 2014

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

Re: Petition of Vine Rangers, Inc. for an Exemption Pursuant to Section 333 of the
FAA Modernization and Reform Act of 2012

To Whom it May Concern:

Pursuant to Section 333 of the FAA Modernization and Reform Act of 2012 ("Reform Act") and 14 C.F.R. Part 11, Vine Rangers hereby applies for an exemption from the Federal Aviation Regulations ("FARs") identified below, to allow commercial agricultural operations of small unmanned aerial vehicles (*i.e.*, "small unmanned aircraft" or "UAS").

This petition for exemption is made based on information outlined in this Petition for Exemption, as well as the accompanying Vine Rangers' UAS Operations Manual (hereinafter "Vine Rangers' Ops Manual") and 3D Robotics RTF X8 UAS Manuals (collectively referred to as "Manufacturer's Manuals"). Vine Rangers submits these supporting materials as confidential documents pursuant to 14 C.F.R. § 11.35(b), as the materials contain confidential commercial and/or proprietary information that Vine Rangers has not and will not share with others. Additionally, these documents contain operating conditions and procedures that are not generally available to the public and are protected from release under the Freedom of Information Act, 5 U.S.C. § 552 *et seq.*, and any other requirements established by the FAA pursuant to Section 333 of the Reform Act.

For your convenience, this Petition is organized as follows:

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I. DESCRIPTION OF PETITIONER

Based in the wine country of Santa Ynez Valley, California, and founded by David Baeza, Vine Rangers seeks to leverage the latest UAS technologies and analytics infrastructure to help improve the quality, consistency and yield of specialty crops, particularly, wine grapes. Building upon its already existing relationships and contacts with the University of California, Santa Barbara ("UCSB"), Vine Rangers intends to work in conjunction with UCSB's Smart Farm Initiative program to analyze and process the precision agriculture data that it collects.

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 yield. This is particularly true for winemakers as vines take years to mature, and wine grapes are only harvested once per year. Thus, there is only one chance to get it right. Vine Rangers' UASs will empower the farmer to make informed proactive, rather than reactive, decisions. This proactive decision making allows today's farmers and growers to deploy their limited resources in a more efficient, effective, and environmentally sustainable manner.

Vine Rangers' UASs will be equipped with state-of-the-art equipment capable of capturing near-infrared and thermal images in the vineyard. This data allows farmers to identify patches of disease-ridden vines and assists with water, irrigation, soil, pesticide and fertilization management. The ability to pinpoint and precision spray pesticides, rather than spray the entire vineyard, reduces the risk of human exposure to pesticide. This also helps mitigate the negative side-effects on the local ecology from pesticides which, for example, impact the honey bee, commonly referred to as Colony Collapse Disorder.

Vine Rangers 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. To that end, Vine Rangers seeks an exemption to use UASs for the commercial purpose of performing precision agricultural, surveys, imaging and inspections.

The contact information for Petitioner is as follows:

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II. DESCRIPTION OF PROPOSED OPERATION

Vine Rangers intends to use small UASs weighing less than 55 pounds for the purpose of conducting aerial surveys and inspections of wine vineyards and other specialty crops. All UAS operations will occur under tightly controlled conditions on privately owned vineyards and farms at the owner's request and consent. These vineyards and farms are generally located in rural valleys away from people, crowds, and buildings. The proposed UAS operations will be conducted in accordance with the conditions and limitations of this Petition for Exemption and Vine Rangers' Ops Manual. Among other things, Vine Rangers' proposed UAS operations will be limited to daytime VFR conditions in uncontrolled airspace, and will occur at altitudes at or below 400 feet AGL and at least 5 miles away from any airport.

Traditionally, imaging technology from the agricultural survey and inspection industry has had to rely on the use of full-scale rotorcraft or fixed-wing aircraft. These aerial surveys and inspections have afforded farmers and growers with the critical information like imaging that they need to maximize crop yield, in a conservative and sustainable manner. However, conventional operations using rotorcraft and fixed-wing aircraft in low level operations present risks associated with vehicles weighing thousands of pounds and carrying large amounts of fuel. It is important to note that the use of small UAS will not only provide information in a more cost efficient, sustainable, and ultimately, much safer manner, but the quality of the information will be far superior. For example, the use of small UASs can provide improved resolution and flexibility in imaging as low-flying UASs can collect sub-millimeter resolution crop images that support analysis that is not possible with satellite or aircraft images. In the vineyard context, small UASs will be capable of capturing canopy images from both above the rows, and also at the canopy level—something that is impossible to do using conventional aircraft.

III. RELEVANT STATUTORY AUTHORITY

This Petition for Exemption is submitted pursuant to Section 333(a) through (c) of the FAA Modernization and Reform Act of 2012 ("Reform Act"). Congress has directed the FAA "to safely accelerate the integration of civil unmanned aircraft systems into the national airspace system." Pursuant to Section 333 of the Reform Act, the FAA Administrator is to permit unmanned aircraft systems to operate in the National Air Space ("NAS") where it is safe to do so based on the following considerations:

- The UAS's size, weight, speed and operational capability;
- Operation of the UAS in close proximity to airports and populated areas; and

- Operation of the UAS within the visual line of sight of the operator.

Additionally, the FAA Administrator has general authority to grant exemptions from the agency's safety regulations and minimum standards when the Administrator decides a requested exemption is in the public interest. *See* 49 U.S.C. § 106(f) (defining the authority of the Administrator); 49 U.S.C. § 44701(f) (permitting exemptions from §§ 44701(a), (b) and §§ 44702 – 44716, *et seq.*). A party requesting an exemption must explain the reasons why the exemption: (1) would benefit the public as a whole, and (2) would not adversely affect safety (or how it would provide a level of safety at least equal to the existing rules). *See* 14 C.F.R. § 11.81 (petitions for exemption).

IV. VINE RANGERS' PROPOSED UAS OPERATIONS MEET THE REQUIREMENTS OF SECTION 333 OF THE REFORM ACT

The small UAS operations proposed by Vine Rangers 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

Vine Rangers 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 Set Forth in the Ops Manual

The Vine Rangers' Ops Manual and the Manufacturer's Manual¹ 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 Vine Rangers' 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 20 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 Vine Rangers' Ops Manual. The Ops 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 Vine Rangers' Ops Manual, the conditions and limitations in the granted exemptions shall take

¹ The term "Manufacturer's Manual" includes all relevant manufacturer publications, including, but not limited to: operations and flight manuals, user guides, component maintenance manuals, pilot training manuals, service information letters and, safety/service bulletins.

precedence and must be followed. Otherwise, Vine Rangers' must follow the procedures outlined in their Ops 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 alternations 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 Vine Rangers' Ops 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 Vine Rangers' Ops 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. Vine Rangers 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 Vine Rangers 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. Vine Rangers will coordinate its operations with the Van Nuys Flight Standards District Office ("FSDO"), or other appropriate local FSDO. This requirement may be waived or modified by agreement with the applicable FSDO.
17. 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.
18. Contingency plans will be in place to safely terminate flight if there is a loss of communication between the PIC and the Observer.
19. The UAS will have the capability to safely abort flight in the case of unpredicted obstacles or emergencies.
20. PICs and Observers will have at least a current Class III Medical Certificate.
21. Operations shall occur during daytime VFR Meteorological Conditions; flights under special visual flight rules ("SVFR") shall not be conducted.
22. 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.).
23. UAS Operations under Instrument Flight Rules, at night, or beyond VLOS are prohibited.

V. REGULATIONS FROM WHICH EXEMPTION IS REQUESTED

The Federal Aviation Act expressly grants the FAA the authority to issue exemptions. This statutory authority, by its terms, includes exempting civil aircraft, as the term is defined

under § 40101 of the Act, including UASs, from its safety regulations and minimum standards when the Administrator decides a requested exemption is in the public interest.²

Vine Rangers seeks an exemption from several interrelated provisions of Title 14 of the Code of Federal Regulations ("14 C.F.R.") Parts 21, 45, 61 and 91 for purposes of conducting the requested operations using a UAS. Listed below are: 1) the specific sections of 14 C.F.R for which exemption is sought, and 2) the operating procedures and safeguards that Petitioner has established which will ensure a level of safety better than or equal to the rules from which exemption is sought.³

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

The FAA has stated that no exemption is needed from this section if a finding is made under the Reform Act that the UAS selected provides an equivalent level of safety when compared to aircraft normally used for the same application. These criteria are met, and therefore no exemption is needed. *See* Grant of Exemption to Astraeus Aerial, Docket No. FAA-2014-0352 at 13-14, 22. If, however, the FAA determines that there are some characteristics of the chosen UAS that fail to meet the requirements of the Reform Act, an exemption is requested.

Equivalent Level of Safety

The UASs that Vine Rangers will use are safe when taking into account their size, weight, speed, and operational capability. As set forth in the description of proposed operations in Section II, the UAS weighs less than 55 pounds and will be flown at less than 50 knots and completely outside controlled airspace. Additionally, the UASs carry neither pilots nor passengers, carry no explosive materials or flammable liquid fuels, and operate exclusively within the parameters stated in the Ops Manual.

Operations conducted under this exemption will be closely controlled and monitored by the operator and will be conducted in compliance with local public safety requirements, to provide security for the area of operation. Vine Rangers will also provide the FAA with advance

² *See* 49 U.S.C. § 44701(f) (authorizing the grant of exemptions from requirements of regulations prescribed pursuant to Sections 44701(a) and (b) and Sections 44702 - 44716).

³ *See* 14 C.F.R § 11.81(e), which requires a petition for exemption to include:

The reasons why granting the exemption would not adversely affect safety, or how the exemption would provide a level of safety at least equal to that provided by the rule from which you seek exemption.

notice of all operations via NOTAMs and coordination with the local FSDO, as necessary. In all cases, the UAS operated under the proposed conditions will be at least as safe as, or safer than, conventional rotorcraft operating with an airworthiness certificate.

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. *See id.*

B. 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 Vine Rangers' small 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, Subpart H, *supra*.

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

Inasmuch as there will be no airworthiness certificate issued for the UAS, Vine Rangers 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. Accordingly, Petitioner requests that the requirements for § 91.7(a) be treated in accordance with Section V(A), *supra*.

D. 14 C.F.R. § 91.9(b)(2): Civil Aircraft Flight Manual in the Aircraft and 14 C.F.R. § 91.203(a) and (b): Carrying Civil Aircraft Certification and Registration

Title 14 C.F.R. § 91.9(b)(2) and § 91.203(a) and (b) require the operator to carry airworthiness documents and other aircraft manuals onboard the aircraft. Pursuant to 14 C.F.R. § 91.9(b)(2):

(b) No person may operate a U.S.-registered civil aircraft –

...

(2) For which an Airplane or Rotorcraft Flight Manual is required by § 21.5 of this chapter, unless there is available in the aircraft a current approved Airplane

or Rotorcraft Flight Manual, approved manual material, markings, and placards, or any combination thereof.

Pursuant to 14 C.F.R. § 91.203(a) and (b):

(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.

Given the small size and configuration of the UAS, it would be impossible to keep airworthiness documents and other aircraft manuals on board the UAS because there is simply no room and the UAS has no cabin or cockpit.

Equivalent Level of Safety

In an FAA Office of Chief Counsel's Opinion dated August 8, 2014, and prepared by Dean E. Griffith, Attorney, AGC-220, it was acknowledged that the intent of 14 C.F.R. 91.9(b) and 91.203(a) and (b) is met if the pilot of the unmanned aircraft has access to the UAS flight manual, registration certificate, and other required documents from the ground control station from which he or she is operating the aircraft.⁴ As this FAA Office of Chief Counsel Opinion clarifies, the intent of the rule is to ensure the pilot has access to these key documents during flight. Therefore, an equivalent level of safety will be achieved by ensuring that the pilot has access to the documents at the ground control station from which he or she is piloting the UAS.

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

Vine Rangers seeks an exemption from the aircraft marking and identification requirements contained in 14 C.F.R. §§ 91.9(c), 45.23(b) and 45.27(a).

⁴ Memorandum from Mark Bury, FAA Assistant Chief Counsel for International Law, Legislation and Regulation, to John Duncan, FAA Flight Standards Service (Aug. 8, 2014); *see also* Docket No. FAA-2014-0352 at 16-18.

- 14 C.F.R. § 91.9(c), Civil Aircraft Flight Manual, Marking and Placard requirements, provides that:

No person may operate a U.S.-registered civil aircraft unless that aircraft is identified in accordance with Part 45 of this chapter.

- 14 C.F.R. § 45.23(b), Markings of the Aircraft, states:

When marks include only the Roman capital letter "N" and the registration number is displayed on limited, restricted or light-sport category aircraft or experimental or provisionally certificated aircraft, the operator must also display on that aircraft near each entrance to the cabin, cockpit, or pilot station, in letters not less than 2 inches nor more than 6 inches high, the words "limited," "restricted," "light-sport," "experimental," or "provisional," as applicable.

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

Each operator of a rotorcraft must display on that rotorcraft horizontally on both surfaces of the cabin, fuselage, boom, or tail the marks required by § 45.23.

In a previous Grant of Exemption, the FAA determined that exemption from these requirements was warranted provided that the aircraft "have identification (N-Number) markings in accordance with 14 C.F.R Part 45, Subpart C if the markings are as large as practicable." FAA Docket No. FAA-2014-0352.

Equivalent Level of Safety

All UA flown by Vine Rangers will bear N-number markings that are as large as practicable in accordance with 14 C.F.R. Part 45, Subpart C.⁵

⁵ See, e.g., FAA Docket No. FAA-2014-0352, at 14.

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

Vine Rangers 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 Manual is required.

Equivalent Level of Safety

An equivalent level of safety will be provided by following the Vine Rangers' Ops 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 Vine Rangers' Ops 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. Vine Rangers' Ops 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.

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

Vine Rangers seeks an exemption from 14 C.F.R. § 91.109(a), which provides in pertinent part that "[n]o 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." UASs and remotely piloted aircraft, by their design, do not have functional dual controls. Instead, flight control is accomplished through the use of a device that communicates with the aircraft via radio communications. Accordingly, an exemption will be required for the flight instruction requirements of 14 C.F.R. § 91.109(a).

Equivalent Level of Safety

Given the size and speed of the UAS that Vine Rangers intends to use, an equivalent level of safe training can still be performed without dual controls because no pilot or passengers are aboard the UAS, and as required by the Vine Rangers' Ops Manual, all persons will be a safe distance away in the event that the UAS experiences any difficulties during flight instruction. Moreover, as required by the Vine Rangers' Ops Manual, all flight training will be conducted in controlled and sterile environment. As a whole, the safety procedures provided for in Vine Rangers' Ops Manual ensure that the proposed UAS operations provide an equivalent or higher level of safety than that provided by the flight instruction regulations.

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

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

An exemption is required because in order to perform the intended agricultural aerial surveys and inspections, the UAS will need to be operated lower than 400 feet AGL. Further, due to the nature of the proposed operations, the PIC and Observer(s) may at times be less than 500 feet away from the UAS.

Equivalent Level of Safety

Compared to flight operations with rotorcraft weighing far more than the maximum weights proposed herein, and given the lack of flammable fuel with the UASs, any risk associated with these operations is far less than those that presently exist with conventional aircraft. An equivalent level of safety will be achieved given the size, weight, and speed of the UASs, as well the controlled and sterile location where the operations will occur. In order to avoid any risk to manned aircraft, flight operations will be restricted to 400 feet AGL or below. As set forth in the Ops Manual, the UASs will be operated in a restricted area, and all 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. As required by the Ops Manual, flights will be terminated if a nonparticipating person within 500 feet of the UAS leaves a shielded position. Further, UAS operations will occur at least 500 feet away from vehicles or structures unless the property owner/controller has granted permission and the PIC has made a safety assessment of the risk of operating closer to those objects and, operations near the PIC or Observer will not present an undue hazard per § 91.119(a). As a whole, these requirements ensure a level of safety better than or equal to the rules from which exemption is sought.

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

Vine Rangers seeks an exemption from 14 C.F.R. § 91.121, which requires a person operating an aircraft to maintain cruising altitude or flight level by reference to an altimeter that is set to the elevation of the departure airport or barometric pressure. An exemption is required to the extent that the UASs do not have a barometric altimeter, but rather a GPS altitude read out.

Equivalent Level of Safety

The FAA has stated that an equivalent level of safety to the requirements of 14 C.F.R. § 91.121 can be achieved in circumstances where: (1) the UASs will be operated at 400 feet AGL or below, (2) within VLOS, (3) where GPS based altitude information is relayed in real time to the operator at a ground-based on-screen display and, (4) where prior to each flight, a zero altitude initiation point is established for the PIC to confirm accuracy of the onboard GPS. *See* Grant of Exemption to Astraeus Aerial, Docket No. FAA-2014-0352 at 21.

The UASs that Vine Rangers uses for performing the proposed UAS operations will meet all these operational characteristics. Moreover, as required by Vine Rangers' Ops Manual, the PIC will be required to calibrate the aircraft's GPS compass prior to each flight operation. Like the Grant of Exemption to Astraeus Aerial, the UASs Vine Rangers intends to use, and the safety mitigation procedures contained in the Ops Manual, both ensure that an equivalent level of safety will be achieved, and a grant of exemption to the requirements of § 191.121 is therefore appropriate.

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

Vine Rangers requests an exemption from 14 C.F.R. § 91.151(a)'s fuel requirements for flight in VFR conditions. Section 91.151 states:

- (a) No person may begin a flight in an airplane under VFR conditions unless (considering wind and forecast weather conditions) there is enough fuel to fly to the first point of intended landing and, assuming normal cruising speed –
 - (1) During the day, to fly after that for at least 30 minutes; or
 - (2) At night, to fly after that for at least 45 minutes.

Here, the technological limitations on UAS battery power means that no meaningful flight operations can be conducted while still maintaining a 30-minute battery reserve. An exemption from the fuel requirements of 14 C.F.R. § 91.151(a) is therefore required.

Equivalent Level of Safety

The FAA has stated that an equivalent level of safety can be achieved by requiring that each UAS operation be completed within 30 minutes flight time or with 20% battery power remaining, whichever occurs first. *See* Grant of Exemption to Clayco, Inc., Docket No. FAA-2014-0507 at 15. Vine Rangers' Ops Manual conforms to this limitation, and therefore provides an equivalent level of safety.

The UASs that Vine Rangers will use under this grant of exemption will include low battery warning system. The amount of battery reserve power remaining will be transmitted to the PIC via telemetric data feed, which downlinks from the UAS to a ground-based-on-screen display. As required by Vine Rangers' Ops Manual, the PIC will promptly fly the UAS back to the home launch location or pre-determined abort location where the UAS may safely land, while still maintaining a minimum of 20% reserve battery power. Vine Rangers submits that the procedures requiring flights to be safely terminated once the batteries fall below 20% capacity, combined with the requirement that flights only be conducted within a secure, isolated area, using a UAS weighting less than 20 pounds, and within VLOS of the PIC and Observer(s), ensure that the proposed operation will provide an equivalent or higher level of safety to that provided by the regulations from which exemption is sought.

**K. 14 C.F.R. § 91.405(a), 91.407(a)(1), 91.409(a)(1) and (2); 91.417(a) and (b):
Maintenance Inspections**

Vine Rangers seeks an exemption from the maintenance inspection requirements contained in 14 C.F.R. § 91.405(a), 91.407(a)(1), 91.409(a)(2); 91.417(a) and (b). These regulations specify maintenance and inspection standards in reference to 14 C.F.R. Part 43. *See, e.g.,* 14 C.F.R. § 91.405(a) (stating that each owner or operator of an aircraft "[s]hall have the aircraft inspected as prescribed in subpart E of this part and shall between required inspections ...have discrepancies repaired as prescribed in part 43 of this chapter"). An exemption from these regulations is needed because Part 43 and these sections only apply to aircraft with an airworthiness certificate, which the UAS to be operated under this grant of exemption will not have.

Equivalent Level of Safety

An equivalent level of safety will be achieved because maintenance and inspections will be performed in accordance with the Manufacturer's Manuals and any required manufacturer Safety or Service Bulletins. Further, as required by Vine Rangers' Ops Manual, the PIC will conduct a pre-flight inspection of the UAS and all associated equipment to account for all discrepancies and/or inoperable components. Maintenance will be performed and verified to address any conditions potentially affecting safe operation of the UAS and no flights will occur unless, and until all flight critical components of the UAS have been found to be airworthy and

in a condition safe for operation. A functional test flight will be conducted following the replacement of any flight-critical components. As required by Vine Rangers' Ops Manual, the PIC who conducts the functional test flight will make an entry in the UAS aircraft records of the flight.

Vine Rangers' Ops Manual also includes requirements to follow the manufacturer's UAS aircraft/component, maintenance, overhaul, replacement, inspection, and life limit requirements for the following applicable components: powertrain system (powerplant), propellers, avionics and control surfaces (including ailerons/elevons), structures & airframe, camera system, electrical systems (including batteries), GCS, hazard accessories, and spare parts. Further, Vine Rangers' Ops Manual also includes procedures to document and maintain a record of the UAS maintenance, preventative maintenance, alterations, status of replacement /overhaul component parts, and the total time in service of the UASs used under this grant of exemption. As a whole, the maintenance and inspection procedures required in Vine Rangers' Ops Manual ensure that an equivalent or higher level of safety will be achieved.

L. 14 C.F.R. § 61.113: Private Pilot Privileges and Limitations

Vine rangers seeks exemption from 14 CFR § 61.113, which restricts private pilot certificate holders from flying aircraft for compensation or hire, and would also require a second class medical certificate. The purpose of Part 61 is to ensure that the skill and competency of any PIC matches the airspace in which the PIC will be operating, as well as requiring certifications if the private pilot is carrying passengers or cargo for hire. In this case, while the UASs will be operated as part of a commercial operation, it carries neither passengers nor cargo. In the Grant of Exemption in FAA Docket No. FAA-2014-0352, the FAA determined that the unique characteristics of UAS operation outside of controlled airspace did not warrant the addition cost and restrictions attendant with requiring a the PIC to have a commercial pilot certificate and class II medical certificate.

The restrictions Vine Rangers has placed on its UAS operations meet or exceed the restrictions similarly imposed on Astraeus Aerial in FAA Docket No. FAA-2014-0352. Vine Rangers will operate away from persons and property not involved in the operation, and flights will be conducted using VLOS at 400' AGL or below. A NOTAM will be issued between 48 and 72 hours before the flight is to occur, and the flight will be coordinated with the applicable FSDO.

Equivalent Level of Safety

In addition to these flight restrictions, Vine Rangers will further ensure safe operation by requiring that any PIC be thoroughly versed not only in airspace and communication issues pertaining to all aircraft operators but also in the unique aspects of UAS flight. As set forth in the Operations Manual, Pilots will have experience not only in UAS operations generally but

have logged flight time in the specific make and model used for the operations before they are permitted to participate in commercial flights on behalf of Vine Rangers. Petitioner believes that this system will provide a higher level of competency and proficiency for its pilots.

VI. DRUG AND ALCOHOL PROGRAM

Vine Rangers will have policies in place to ensure that no person may participate in UAS flight operations if they are under the influence of alcohol or any drug.

VII. PUBLIC INTEREST

The public interest will be served by granting Vine Rangers' Petition for Exemption. Congress has established a national policy that favors early integration of UAS into the NAS in controlled, safe working environments such as those proposed in this Petition. Granting this Petition for Exemption helps fulfill Congress' goal in passing Section 333(a) through (c) of the Reform Act—the FAA Administrator's assessment of whether certain UAS may operate safely in the NAS before completion of the statutorily required rulemaking.

The proposed UAS operations in this Petition for Exemption significantly improve safety and reduce risk by alleviating the public's exposure to danger and emissions associated with traditional agricultural aerial survey and inspection methods, namely, full size fixed-wing aircraft and rotorcraft. The UASs Petitioner intends to use are battery powered and create no emissions. Moreover, in the unlikely event that one of Petitioner's UASs crash, there is no fuel to ignite and explode. Any accident involving Petitioner's lightweight UASs will present significantly less danger to the pilot and other individuals on the ground than one involving a full size helicopter.

Moreover, the agricultural modeling and imaging resulting from Vine Rangers' UASs will provide farmers and growers with the information they need to produce more from their land while also conserving valuable resources like water and energy. The ability to pinpoint and precision spray pesticides reduces human exposure to pesticides and also mitigates negative side-effects on the ecology of the farm/vineyard associated with overuse of pesticides. The public as a whole will benefit from an agricultural industry that can harness the power of new technologies to produce better crops in a cost-effective, sustainable and environmentally conscious manner.

VIII. PRIVACY

All Vine Ranger UAS operations will be conducted in accordance with applicable federal, state, or local laws regarding privacy. Vine Rangers will not conduct flight operations over property that it does not own or control without the prior consent and knowledge of the property owner.

IX. FEDERAL REGISTER SUMMARY

Pursuant to 14 C.F.R. Part 11, the following summary is provided for publication in the FEDERAL REGISTER, should it be determined that publication is needed:

Petitioner seeks an exemption from the following rules in Title 14 of the Code of Federal Regulations:

Part 21, Subpart H; Part 27; 45.23(b); 45.27(a); 61.113; 91.7(a); 91.9(b)(2); 91.9(c); 91.103; 91.109(a); 91.119; 91.121; 91.151(a); 91.203 (a) & (b); 91.405(a); 91.407(a)(1); 91.409(a)(1) & (2); 91.417 (a) & (b).

The exemption will enhance safety by reducing risk to the general public and property owners from the substantial hazards associated with performing equivalent agricultural aerial surveys and inspections with conventional fixed-wing aircraft, rotorcraft, or other methods.

X. CONCLUSION

Vine Rangers' 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 Vine Rangers 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.

Very truly yours,

/s/ Matthew J. Clark
Matthew J. Clark
Lisa M. Ellman
Mark E. McKinnon
Counsel for Vine Rangers

U.S. Department of Transportation
January 13, 2014
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(The following attached items contain proprietary and commercial information exempt from disclosure under the Freedom of Information Act, 5 U.S.C. § 522 *et seq.*, and should be held in a separate file pursuant to 14 C.F.R. § 11.35(b)).

Attachment A: Vine Rangers' UAS Operations Manual

DC 51195545.1