Petition for Section 333 Exemption

Unmanned Sensing Systems LLC

SUBMITTED VIA FACSIMILE TRANSMISSION, JANUARY 16 2015

January 14, 2015

US Department of Transportation
Docket Management System
1200 New Jersey Ave SE
Washington DC 20590

Re: Section 333 Exemption Request

Dear Sir or Madam:

Pursuant to the FAA Modernization and Reform Act of 2012 Section 333 and the requirements contained within 14 C.F.R. §11.81, Unmanned Sensing Systems LLC ("US2"), a developer and operator of small unmanned aircraft systems (sUAS), hereby requests exemption from the below listed Federal Aviation Regulations (FARs). These exemptions would allow US2 to commercially operate the US2 GreenHawk, a proprietary fixed-wing sUAS weighing less than 5lbs, within airspace regulated by the FAA, pursuant to and under the conditions defined herein and by the FAA.

As described below, the exemptions requested would permit US2 to operate the sUAS in a safe and coordinated manner, within a predetermined and pre-communicated airspace, subject to standardized procedure and planning. US2 desires to perform precision aerial survey operations for the primary benefit of agricultural sensing and data gathering, aiding growers in planning and monitoring yields and providing a platform with which to develop techniques and applications to directly benefit the agricultural industry as a whole.

We have closely reviewed the FAA's existing exemption grants under Section 333, and believe our request to be materially similar to Exemption 11136, 11062, 11067, 11109, 11111, and 11110, among others. We are fully prepared and willing to operate under and abide by the exemptions already granted and the conditions required in Exemption 11110. The below detailed requests are provided to further demonstrate our understanding of the rationale for the FAR exemption requests and associated decisions by the FAA, as well as provide a basis for establishing our need for the same.

We are willing and prepared to discuss, and if necessary modify, this request to fully satisfy the FAA's requirements for safe and controlled sUAS operation. We look forward to working with the FAA, and welcome you to contact us at any time.

Sincerely,

Daniel J. Murray
Founder, Unmanned Sensing Systems LLC

1. Application Information

Name and address of the applicant:

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2. Summary Exemption Requests:

US2 requests exemption from the following regulations:

14 C.F.R. §61.113(a) & (b)
14 C.F.R. §61.133(a)
14 C.F.R. §91.7(a)
14 C.F.R. §91.119(c)
14 C.F.R. §91.151(a)
14 C.F.R. §91.405(a)
14 C.F.R. §91.407(a)
14 C.F.R. §91.409(a)(1) & (2)
14 C.F.R. §91.417 (a) & (b)

Further discussion regarding these exemption requests can be found below.

3. Detailed Exemption Requests

14 C.F.R. §61.113(a) & (b) and §61.133(a) – Airman Certificate Requirements

Section 61.113(a) prescribes that "no person who holds a private pilot certificate may act as pilot in command of an aircraft that is carrying passengers or property for compensation or hire; nor may that person, for compensation or hire, act as pilot in command of an aircraft."

Section 61.113(b) prescribes that "A private pilot may, for compensation or hire, act as pilot in command of an aircraft in connection with any business or employment 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."

Section 61.133(a) prescribes that "(1) General. A person who holds a commercial pilot certificate may act as pilot in command of an aircraft— (i) Carrying persons or property

for compensation or hire, provided the person is qualified in accordance with this part and with the applicable parts of this chapter that apply to the operation; and (ii) For compensation or hire, provided the person is qualified in accordance with this part and with the applicable parts of this chapter that apply to the operation."

Exemption from sections 61.113 (a) and (b), and section 61.133(a) is requested because our proposed operations include commercial operations. Considering the size, weight, and operating characteristics of the sUAS in question, and considering that the operation of the sUAS is to be confined to an area over private property with controlled access, US2 requests an exemption from section 61.113 (a) & (b) with the following conditions:

- The Pilot in Command (PIC) of the sUAS must hold at least a private pilot airman certificate and a third-class airman medical certificate and:
- sUAS operation will additionally require a Visual Observer (VO) and the VO must have acceptable vision such that they can maintain visual line of sight (VLOS) with the sUAS at all times

These conditions are not unlike those required of Astraeus Aerial under Grant of Exemption 11062.

Additionally, the US2 GreenHawk is equipped with an onboard autopilot for autonomous flight, capable of being (and required by the operating manual to be) monitored by a Ground Control Station (GCS) at all times. The onboard autopilot will also ensure flight operation is kept within the controlled airspace, including prohibiting operation above a defined maximum altitude, as discussed in more detail below.

14 C.F.R. §91.7(a) - Airworthiness

Section 61.113(a) prescribes that "No person may operate a civil aircraft unless it is in an airworthy condition."

Exemption from 61.113(a) is requested due to the lack of standards with which to certify the US2 GreenHawk sUAS. Despite the inability to retain an airworthiness certificate, operations will be conducted in accordance with the GreenHawk Operating Manual and US2 Safety Parameters.

The exemption request is not unlike exemptions granted in exemptions 11062, 11080, and 11109, among others.

14 C.F.R. §91.119(c) – Safe Altitudes

Section 91.119(c) prescribes, in part, that aircraft may not be operated: "closer than 500 feet to any person, vessel, vehicle, or structure."

Proposed operations of the sUAS are confined to the airspace below and inclusive of 400ft AGL. As such, the entirety of the sUAS operation would occur in violation of section 91.119(c). US2's Safety Parameters require that operations be performed 400ft AGL, as well as require setting the onboard autopilot maximum altitude (as determined by onboard GPS and barometric sensors) to 400ft AGL, preventing accidental encroachment into airspace utilized by full scale aircraft.

The exemption request is not unlike exemptions granted in exemptions 11062, 11136, and 11111, among others.

14 C.F.R. §91.151(a) – Minimum Fuel Requirements

Section 91.151(a) prescribes that "(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."

Due to the size and expected flight time of the sUAS, flight times are often planned for durations of less than one hour. As such, it is often impractical for the sUAS to carry enough fuel (in this case, electric charge) to fly for an additional 30 minutes beyond the intended landing point. The US2 GreenHawk is powered by a battery, and the maximum flight time is typically 55 minutes under normal flight conditions. Additionally, the sUAS will only be flown during daylight conditions.

US2 proposes the following conditions, taking into account the size and flight time of the sUAS:

- sUAS flight may not begin unless there is enough power to fly to the point of intended landing and attempt a landing with at least 30% reserve power remaining
- If already in flight, the PIC should make the first landing attempt with no less than 30% reserve power remaining

These requirements were adapted from existing FAA exemption grants, and the request is not unlike exemptions granted in exemption 11136, among others.

14 C.F.R. §91.405(a), 407(a), 409(a)(1) & (2), 417(a) & (b)

Section 91.405(a) prescribes that: "(a) Shall have that aircraft inspected as prescribed in subpart E of this part and shall between required inspections, except as provided in paragraph (c) of this section, have discrepancies repaired as prescribed in part 43 of this chapter;"

Section 91.407(a) prescribes that: "(a) No person may operate any aircraft that has undergone maintenance, preventive maintenance, rebuilding, or alteration unless— (1) It has been approved for return to service by a person authorized under § 43.7 of this chapter; and (2) The maintenance record entry required by § 43.9 or § 43.11, as applicable, of this chapter has been made."

Section 91.409(a) prescribes that: "(a) Except as provided in paragraph (c) of this section, no person may operate an aircraft unless, within the preceding 12 calendar months, it has had— (1) An annual inspection in accordance with part 43 of this chapter and has been approved for return to service by a person authorized by § 43.7 of this chapter; or (2) An inspection for the issuance of an airworthiness certificate in accordance with part 21 of this chapter."

Section 91.417(a) and (b) prescribe, in summary, that each registered owner and operator of an aircraft shall keep records of maintenance, alterations, service life, and inspections.

Since, if an exemption is granted, the sUAS in question will not carry and airworthiness certificate, and will not have established standards with which to determine its airworthiness, we request exemption from the above listed regulations.

Instead, the sUAS will be operated and maintained by the PIC per the operating manual, which contains instructions and procedures for inspecting, maintaining, and repairing the sUAS. Further, all flight operations will be recorded by way of an entry in the Log Book.

The exemption request is not unlike exemptions granted in exemptions 11136 and 11062, among others.

4. Public Interest

The purpose of this exemption request is to allow for commercial operation of sUAS for in the collection of precision aerial survey data.

Currently, most agricultural survey data is gathered via one of the following means:

- **Commercially available satellite imagery**, which can be expensive and out of date. Most commercial satellite imagery is weeks if not months old, providing very little value in the time-sensitive decision making process for planning the correct fertilization applications, determining crop yields, and identifying areas of concern. Additionally, most satellite imagery captures visible light only, and is unable to collect the same multispectral imagery the sUAS can, which further aids in determining crop health.
- **Manned aerial survey,** which employs the use of full size aircraft, a costly and time consuming process that requires planning and scheduling. While full size aircraft can provide similar results, they less able to operate safely close to the ground, reducing captured imagery resolution and increasing risk for pilots. Further, our sUAS operates off of stored electric energy, reducing emissions.
- **Ground analysis,** whereby personnel visually inspect crops for health and yield. Arguably the most accurate method, ground analysis is limited to the amount of area a person can cover on foot or in a vehicle over a period of time. Augmented with sUAS survey results, ground personnel can be more efficiently deployed to areas of concern, as well as have access to instant results from viewpoints above a large swath of land.

We feel that an exemption to allow commercial sUAS operation for agricultural survey is in the public interest because it provides timely access to large amounts of survey data via environmentally friendly means, enabling growers to increase yields and more accurately apply fertilizers, in some many cases reducing application in areas determined to already be healthy.

With respect to safety, we believe that the operation of a small UAS, weighing less than 5lbs and operating at less than 400ft AGL over controlled and private areas, presents a reduced risk compared to operations involving full scale aircraft. Such full-scale aircraft may be required to operate close to the ground for similar precision survey results, increasing risk to the pilot, occupants, and those on the ground in case of a failure.

5. Summary of Request for Federal Register

In accordance with 14 C.F.R. §11.81(f), a summary of our exemption request is provided for publication in the Federal Register:

Unmanned Sensing Systems LLC is requesting exemption from the following regulations:

14 C.F.R. §61.113(a) & (b)
14 C.F.R. §61.133(a)
14 C.F.R. §91.7(a)
14 C.F.R. §91.119(c)
14 C.F.R. §91.151(a)
14 C.F.R. §91.405(a)
14 C.F.R. §91.407(a)
14 C.F.R. §91.409(a)(1) & (2)
14 C.F.R. §91.417 (a) & (b)

The exemptions are requested in order to commercially operate a small unmanned aircraft system (sUAS), weighing less than 5lbs, below an altitude of 400ft AGL over controlled areas.

If granted, the exemptions would permit Unmanned Sensing Systems to utilize the sUAS to collect precision aerial survey data, including multispectral imagery, of crops and agricultural interests for its customers. Such data will allow its customers to make timely, informed decisions to maximize crop yield, reduce and fine-tune fertilizer application, and more closely and efficiently monitor crop health.

Compared to current survey methods, the exemption would eliminate the need for growers to rely on outdated satellite imagery, or to employ the use of low altitude full-scale aircraft, increasing safety for both pilots and those on the ground.

If granted, Unmanned Sensing Systems intends to operate sUAS in accordance with all applicable FAA regulations, and conduct all operations with the utmost regard for safety. All operations would be restricted to confined, sterile environments over private property, away from congested areas.

5. Additional Operating Restrictions

In addition to the applicable FAA regulations, and pursuant to the exemptions above (if granted), the operation of the sUAS will be subject to the following operational restrictions:

1. The sUAS will be operated solely within the United States of America
2. The sUAS will be operated at altitudes no greater than 400ft AGL
3. The sUAS will be operated in Class G airspace only, over private property, with the prior consent of the landowner
4. The sUAS will not be operated within 5 NM of an airport
5. The sUAS will not be operated over populated or congested areas
6. The sUAS will be operated only when both a PIC and VO are present
7. The designated PIC will hold at least a private pilot airman certificate and third class medical certificate
8. The sUAS will only be operated in visual meteorological conditions, where both the PIC and VO can maintain VLOS with the sUAS unaided (except for corrective lenses or sun protection) and
9. the sUAS will not be operated beyond 0.5 NM of the PIC, regardless of ability to maintain VLOS
10. The operating documents, including log book, will be maintained and made available to the FAA Administrator upon request
11. The sUAS will be inspected and maintained according to the Operating Manual, and log entries will be made to record repairs, alterations, and maintenance performed, to be validated with a signature of the PIC returning the sUAS to service (if applicable)
12. The sUAS will, at all times, be programmed to automatically return to a pre-determined location (in accordance with the Operating Manual) upon loss of signal or immediately upon a breach of the designated flight area
13. Prior to operation, the operator will obtain a Certificate of Authorization, and:
14. the operator will make a request for a Notice to Airman not more than 72 hours in advance, but not less than 48 hours prior to operation.

6. Aircraft Description

US2 is requesting exemptions for its proprietary GreenHawk fixed wing aircraft type, beginning with serial number US2FGH03 and higher. We understand that any exemption grants will be for this type only, and exemption requests for another airframe type will require the submission of an additional exemption petition or an amendment to this one.

7. Additional FAA Conditions and Restrictions

While US2 has made every attempt to anticipate the concerns and conditions the FAA will contemplate while evaluating this request, we understand that the FAA may wish to impose additional restrictions or conditions in order to grant the request.

We ask that the FAA prescribe any additional requirements necessary to grant the requested exemptions.

7. Willing to Accept Existing Conditions

We have provided the information above to assist the FAA in confirming that the exemption relief request is warranted.

US2 is aware that the FAA has previously issued a number of Grants of Exemption, many of which grant relief similar in nature to the exemptions requested above.

In the interest of timeliness, US2 is prepared and willing to accept the terms and conditions of any exiting Grant of Exemption which the FAA feels is similar and applicable to the exemption requests we have made.

For example, our exemption request is materially similar to that requested by Trimble Navigation, Ltd. and subsequently granted by Grant of Exemption 11110. More recently, Advanced Aviation Solutions LLC was issued a similar request of exemption, granted under Grant of Exemption 11136.

We are fully confident we can perform our desired operations under a Grant of Exemption with conditions similar to any of the above listed Grants of Exemption, or any other materially similar Grant of Exemption already issued concerning commercial sUAS operation.

8. Appendices

Appendix A: US2 GreenHawk Operating Manual
Appendix B: US2 Operational Checklist
Appendix C: US2 Logbook Entry - Flight

Please note: Appendices A, B, and C are confidential, proprietary information, being provided for the FAA's consideration in granting the exemptions requested herein. These materials are exempt from disclosure under the Freedom of Information Act.