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

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

September 22, 2015

Exemption No. 12962
Regulatory Docket No. FAA−2015−2726

Mr. Gregory Gravesen
Owner
Precision Ag & Imagery, LLC
1454 – D 180th Street
Saint Croix Falls, WI 54024

Dear Mr. Gravesen:

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 June 7, 2015, you petitioned the Federal Aviation Administration (FAA) on behalf of Precision Ag & Imagery, LLC (hereinafter petitioner or operator) for an exemption. The petitioner requested to operate an unmanned aircraft system (UAS) to conduct aerial imagery for agriculture mapping.

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

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

Airworthiness Certification

The UAS proposed by the petitioner is a SenseFly eBee.

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, Precision Ag & Imagery, 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, Precision Ag & Imagery, 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 SenseFly eBee 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 5 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 enclosed 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 September 30, 2017, unless sooner superseded or rescinded.

Sincerely,

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

Enclosures

PRECISION
Ag & Imagery, LLC

June 7, 2015

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

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

Dear Madam or Sir,

Pursuant to Section 333 of the FAA Modernization and Reform Act of 2012 (the "Reform Act") and 14 C.F.R. Part 11, Precision Ag & Imagery, LLC seeks an exemption from the Federal Aviation Regulations ("FARs") listed below:

- 14 C.F.R. Part 21
- 14 C.F.R. 45.23
- 14 C.F.R. 45.29
- 14 C.F.R. 61.23
- 14 C.F.R. 61.3
- 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. 91.9
- 14 C.F.R. 91.109(a)
- 14 C.F.R. 91.119
- 14 C.F.R. 91.121
- 14 C.F.R. 91.151(a)
- 14 C.F.R. 91.203
- 14 CFR Subpart E (91.401 - 91.417)

The requested exemption would authorize unmanned aircraft operations using the eBee for agriculture mapping and high resolution aerial imagery applications by Precision Ag & Imagery, LLC in the United States. These operations will be subject to strict operating requirements and conditions defined by the safety code of the Academy of Model Aeronautics (see Annex B), in order to ensure at least an equivalent level of safety to currently authorized operations using manned aircrafts.

Precision Ag & Imagery, LLC provides precision agriculture mapping services and high resolution aerial imagery to clients throughout Wisconsin, Minnesota, and Iowa. Precision Ag & Imagery, LLC.

Unmanned aerial technology is becoming a desirable tool in the agricultural industry. As growers are caring for more and more acres, field scouting by foot is becoming less efficient. It is nearly impossible, nor practical, for a person to scout an entire field by walking. Aerial scouting technology allows an agronomist to see a large field all at once and allows for more efficient and effective recommendations and decision-making. The unmanned aspect of aerial technology eliminates the endangerment of human life by low and slow flight and allows a safe and cost-effective acquisition of close-up aerial images.

Given the technical specifications of the eBee, especially its very light weight, and the type of operations, including flights above crops, Precision Ag & Imagery, LLC believes it is relevant to use the Academy of Model Aeronautics (AMA) rules to meet the required level of safety of future operations with the eBee. Indeed, the AMA has a proven track record in supervising operations conducted by operators using remote controlled aircrafts and provides the most relevant expertise in terms of providing safety guidelines for operators using ultra-light remote controlled aircrafts. The eBee will be operated by an individual who fulfills the following requirements:

- Is a registered member of the AMA;
- Has passed SenseFly's training program for the eBee; Precision Ag & Imagery, LLC requests the FAA treat the eBee training program as proprietary under 14 C.F.R. 11.35(b) and not include this document in the public docket.
- Have completed an aviation fundamentals course.
- Has a valid driver's license

Under this exemption, the operator would agree, if requested, to contact the FAA in order to provide the FAA with the details of the related missions and provide assurance that training and maintenance requirements are met.

1. CHARACTERISTICS OF THE AIRCRAFT

The eBee is a small (37.8-inch wingspan) and ultra-light (maximum take-off weight of 1.7 pounds) platform made of flexible foam that performs precision aerial mapping missions with an on-board GPS and related flight management software (eMotion) that allows the operator to safely and efficiently plan a mission in 3D and monitor it in real-time. Because of the embedded camera protected by a foam envelope, the eBee can take a collection of high-definition, still images that can later be used to generate maps and contour lines of the surveyed area.

The four main characteristics of the eBee include:

a. Very light weight

The eBee is so light that the operator can launch it by hand and let it land on almost any surface without requiring a parachute or landing net (belly land). Its low impact energy (38 J in case of a controlled emergency landing) also significantly reduces the risk of hazardous situations. Finally, the wings of the eBee are detachable and made of flexible foam with no hard or sharp edges and almost no internal strengthening structure.

b. Electric-powered

The eBee is electric powered. Brushless engine technology makes it silent and reliable. The propeller is attached with a rubber band to the body of the plane so that it can easily flex away in case of contact with any object.

c. Semi-automatic flight

The artificial intelligence incorporated within the eBee autopilot system continuously analyzes data from the Inertial Measurement Unit and the onboard GPS and takes care of all the aspects of the flight under the supervision of the operator.

d. Option for Manual control

Additionally, the eBee provides an override capability that allows the operator to take manual actions during the flight (Go to Home, Go Land, Hold and Resume the mission) and also suspend automated operations and take manual control of the aircraft with the remote controller provided with the system, should it become necessary to respond emergent circumstances.

2. APPLICATIONS AND ADDED VALUE OF THE EBEE

Precision Ag & Imagery, LLC intends to plan and implement an aerial agricultural program using precision agricultural mapping services and high resolution aerial imagery and SenseFly's eBee in order to assist its clients in management decision-making to increase production and crop-scouting efficiency.

Using the eBee's sensor technology, Precision Ag & Imagery, LLC staff will be able to collect near infrared (NIR) and/or multispectral images. Once the entire field is flown, collected images can be "stitched" together in a software program to make a complete infrared or multispectral map of a field. Using specific mathematical equations within the Pix4D program, different crop stresses and production factors can be discovered.

The eBee will be used to determine several factors, including but not limited to:

- Nutrient deficiencies
- Vegetation stress
- Weed pressure and type
- Presence and onset of disease
- Weather damage (hail/wind)
- Soil erosion

Often times, diseases or insects begin deteriorating plant health within one part of a field and spread over time. If an agronomist is only able to see a few areas of a field, the chances of overlooking a major problem are incredibly high, but if the entire field can be depicted from the eBee, plant health issues can be fixed before they expand, reducing yield loss.

Every stressful situation that a plant encounters reduces crop yield. The work product provided by Precision Ag & Imagery, LLC will assist agronomists strive to eliminate and reduce plant stress by implementing crop protection programs to make their customers more profitable. By using *real-time* aerial imagery to see the onset and occurrence of plant stresses, Precision Ag & Imagery, LLC can better help their customers maintain a high yield (more production), and in turn, high profitability, in a safe and efficient manner.

The end goal at Precision Ag & Imagery, LLC is to be able to provide the maps produced by the eBee to qualified personnel to create variable- rate prescriptions using an agronomic mapping program. The prescriptions can then be loaded into one of the cooperative's fertilizer spreaders so that fertilizer is applied to the correct areas at the proper rate.

Overall, UAV technology offers a substantial economic benefit to the agricultural industry. The eBee would save clients and agronomists a great deal of time scouting fields. Furthermore, due to the fact the eBee images are geo-referenced, agronomists can pinpoint a problem area on a map and then walk or drive directly to that area to see what issues are happening and potentially correct them.

Along with efficiency, UAV technology offers the potential for maintaining high yields. This is not only important from a financial standpoint for growers, but from a production standpoint. With the world population continuously increasing, it is essential that farmers be able to maintain higher yields in order to continue to feed a hungry planet and to keep up with the world demand for high quality food and fuel products.

The use of the eBee technology will allow clients a significant advantage to maintain crop health and maintain high yields in order to meet consumer demand and make a living. Several countries around the world are offering this technology to farmers. UAVs have successfully and safely scouted fields in Europe and China and even applied aerial application.

3. APPLICABLE LEGAL STANDARD UNDER SECTION 333

a. Airworthiness assessment of the eBee

Precision Ag & Imagery, LLC notes that the airworthiness of the eBee has already been demonstrated for different projects in the United States, involving state/federal agencies or universities (including New Mexico State University:

https://newscenter.nmsu.edu/Articles/view/10208/nmsu-uas-flight-test-center-conducts-ebee-airworthiness-assessment, and the USACE New Orleans, who coordinated with the Department of Army and the FAA to obtain all authorizations required in order to operate the eBee UAS for levee system monitoring, documentation of construction progress, and extensive oblique photography of USACE structures & activities, and others).

Moreover, Precision Ag & Imagery, LLC notes that SenseFly obtained flight approvals for the eBee (delivered by national civil aviation authorities) in many countries, among others:

- Switzerland (flight approval for Visual Line of Sight operations)

- Canada (flight approval for Visual Line of Sight operations)
- Australia (flight approval for Visual Line of Sight operations)
- France (flight approval for Extended Visual Line of Sight operations)
- Germany (flight approval for Visual Line of Sight operations)
- United Kingdom (flight approval for Visual Line of Sight operations)
- Norway (flight approval for Visual Line of Sight operations)
- Sweden (flight approval for Visual Line of Sight operations)
- Denmark (flight approval for Visual Line of Sight operations)

b. Operating Conditions

Grant of the exemption to Precision Ag & Imagery, LLC for use of the eBee will be subject to the following operating conditions, based on the operating conditions set forth by the Academy of Model Aeronautics (see Annex B). The main restrictions are summarized below:

- Operations to be conducted over private, controlled-access, or public property where approved;
- Permission from the land owner/authority required before commencing any flight;
- Operations over congested areas shall be avoided;
- Operations must not interfere with manned aircraft operations, must yield the right of way to manned aircraft, and operators must See & Avoid other aircraft and obstacles at all times
- Operations limited to Visual Flight Rules Meteorological Conditions (VMC) and daylight hours
- Aircraft operations must remain within Visual Line of Sight (VLOS) and will be visually monitored at all times;
- Flight ceiling pre-programed at 400 feet;
- All operations conducted within 5 miles from an airport shall only be initiated after verbal coordination with the airport authority, or air traffic control when a control tower is present at the airport;
- All operations shall comply with required permissions and permits established by territorial, state, county or city jurisdictions; including local law enforcement, fire, or other appropriate governmental agencies.
- The eBee operations will be compliant with existing safety procedures inherent to the activities of the related company.

A large percentage of the property serviced by Precision Ag & Imagery, LLC is located within isolated, rural areas. Before a property is flown, Precision Ag & Imagery, LLC will request permission from each owner. With the geo-fence incorporated within the software, Precision Ag & Imagery, LLC will avoid flying over houses and house-yards as much as reasonably possible. The flight ceiling will be pre-programmed at 400 feet so as to ensure the aircraft will not fly over the height specified by the AMA. By staying below this level, the eBee should not interfere with manned aircraft operations

Precision Ag & Imagery, LLC takes pride in providing a safe working environment for its clients and staff and currently has excellent safety procedures in place.

c. Operator Requirements

The eBee is an ultra-light UAV platform made of flexible foam with no sharp or hard edges characterized by a high level of pre-programmed controls and various built-in technical capabilities (programming of a geo-fence, automatic wind detection) that prevent the operator from doing a mission outside of the operating limits. All flights are pre-programmed with GPS guidance and do not require human intervention; nevertheless human override is possible by clicking on one of the multiple "action" buttons or by using the remote controller provided with each eBee system. In the case of unplanned events, either the autopilot reacts immediately or the operator can choose between different pre-programmed or manual actions. Those procedures include a Flight Termination System (emergency landing procedure, triggered by the autopilot or the operator in charge: given its very light weight, the eBee will initiate a gliding approach to the ground at very low speed around the current location). Moreover, the kinetic energy of the aircraft is 60 J in-flight at cruise speed. In comparison, the kinetic energy of a football is about 110 J when thrown by hand

Given these safety features recognized by the U.S. Army Corps of Engineers and the national aviation authority of several countries, Precision Ag & Imagery, LLC requests an exemption from the airworthiness certification requirements in Part 21 and the concomitant requirements in 14 C.F.R. 91.7(a)) and 91.203 to operate an airworthy aircraft. Instead, operators of the eBee will:

- Have completed an aviation fundamentals course, and;
- Have passed SenseFly's training program for operation of the UAS. The manufacturer's training program for operators has been already satisfactorily reviewed through the Application for Airworthiness Qualification Level (AQL) 3 Airworthiness Release (AWR).

Precision Ag & Imagery, LLC also seeks an exemption from certain requirements in Parts 45 and 91 that are impractical as well as unnecessary for UAS operations. Please see Annex A for a detailed explanation of each regulation from which an exemption is sought and the equivalent level of safety showing.

4. CONCLUSION

Precision Ag & Imagery, LLC, in association with SenseFly and the Academy of Model Aeronautics organization, who has a deep and well-known experience in terms of safe integration of remote controlled aircrafts in the National airspace for low-level operations, provides here adequate justification for the grant of the requested exemption allowing safe precision agriculture mapping services, high resolution aerial imagery and operations of the eBee in the National Airspace System.

The value that the eBee could bring to the agricultural industry is invaluable. It would bring several efficiency and production benefits to agricultural operations and allow Precision Ag & Imagery, LLC to provide the owner-members of the cooperative with outstanding service in order to help them exceed their potential. If the population is expected to continually increase, then it is essential for agricultural production to escalate as well. Allowing Precision Ag & Imagery, LLC to utilize the eBee in their operations in a safe manner in accordance with AMA guidelines would not only make sense economically, but would also in a matter of sustainability.

Precision Ag & Imagery, LLC offers in this Exemption a pragmatic approach to allow the efficient operation of ultra-light UAVs pursuant to FAA, AMA, and SenseFly safety requirements and conditions.

Sincerely yours,

Gregory Gravesen, Owner
Email: agricultureimagery@gmail.com

ANNEX A: EXEMPTION REQUEST AND EQUIVALENT LEVEL OF SAFETY SHOWINGS UNDER APPLICABLE RULES SUBJECT TO EXEMPTION

Precision Ag & Imagery, LLC requests an exemption from the following regulations as well as any additional regulations that may technically apply to the operation of the eBee:

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

Section 91.203 requires all civil aircraft to have a certificate of airworthiness. Part 21, Subpart H, entitled Airworthiness Certificates, establishes the procedural requirements for the issuance of airworthiness certificates as required by FAR § 91.203(a). Given the size of the eBee, its very light weight (the maximum take-off weight is 1.7 pounds) and the limited operating area associated with its utilization, it is unnecessary to go through the certificate of airworthiness process under Part 21 Subpart H in order to achieve or exceed current safety levels.

Such an exemption meets the requirements of an equivalent level of safety under Part 11 and Section 333 of the Reform Act. The Federal Aviation Act and Section 333 of the Reform Act both authorize the FAA to exempt aircraft from the requirement for an airworthiness certificate, upon consideration of the size, weight, speed, operational capability, and proximity to airports and populated areas of the UAS involved. An analysis of these different criteria demonstrates that the eBee operated without an airworthiness certificate, under the conditions proposed in that exemption, will be at least as safe, or safer, than a conventional aircraft with an airworthiness certificate. A proprietary risk assessment for operations with the eBee, which demonstrates that assertion, is also being submitted to the FAA as part of this application. Precision Ag & Imagery, LLC requests the FAA treat the eBee risk assessment as proprietary under 14 C.F.R. 11.35(b) and not include this document in the public docket.

14 C.F.R. § 45.23 & 14 C.F.R. § 45.29: Display of marks; size of marks

These regulations provide that each aircraft must display "N" and the aircraft's registration number in letters at least 3 inches high. Additionally, the aircraft must display the word "EXPERIMENTAL" in letters at least 2 inches high near the entrance to the cabin, cockpit, or pilot station.

Given the size of the eBee (wingspan of 37.8 inches), this requirement is impossible to match.

The equivalent level of safety will be achieved by having the upper part of the eBee stick with a copy of the AMA membership of the operator in charge. The AMA agrees to provide 2 original copies of the AMA license to every eBee operator.

14. CFR §61.23 Medical certificates: Requirement and duration

Regulations provide that a person:

(1) Must hold a first-class medical certificate:

- When exercising the pilot-in-command privileges of an airline transport pilot certificate;
- When exercising the second-in-command privileges of an airline transport pilot certificate in a flag or supplemental operation in part 121 of this chapter that requires three or more

pilots; or
- When serving as a required pilot flight crew member in an operation conducted under part 121 of this chapter if the pilot has reached his or her 60th birthday.

(2) Must hold at least a second class medical certificate when exercising:
- Second-in-command privileges of an airline transport pilot certificate in part 121 of this chapter (other than operations specified in paragraph (a)(1)(ii) of this section); or
- Privileges of a commercial pilot certificate

Given the size of the eBee, its structure, the limited flight area, and the safety features integrated in the autopilot (among others the Flight Termination System), Precision Ag & Imagery, LLC and SenseFly believes that an Equivalent Level of Safety can be reached if the operator has a valid driver's license.

14 C.F.R. § 61.3: Requirements for certificates, ratings and authorizations
14 C.F.R. § 61.113(a) & (b); 61.133(a): Private Pilot Privileges and Limitations; Pilot in Command; Commercial Pilot Privileges and Limitations

The regulation provide that no person may serve as a required pilot flight crewmember of a civil aircraft of the United States, unless that person:

(1) Has a pilot certificate or special purpose pilot authorization issued under this part in that person's physical possession or readily accessible in the aircraft when exercising the privileges of that pilot certificate or authorization. However, when the aircraft is operated within a foreign country, a pilot license issued by that country may be used.

The regulation provides also that no person that holds a private pilot certificate may act as pilot in command of an aircraft for compensation or hire. Subparagraph (b) allows a private pilot to 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;
(2) The aircraft does not carry passengers or property for compensation or hire.

Given the safety features of the eBee and the fact that the missions are pre-programmed and monitored in real-time with a specific flight management software (eMotion), Precision Ag & Imagery, LLC and SenseFly proposes that operators of the eBee should not be required to hold a commercial or private pilot certification. Instead, operators should be required to:

- Have completed an AMA affiliated small unmanned aircraft systems education and training program and achieved an AMA UAS endorsement, or have successfully completed a small UAS education and training program provided by any FAA qualified entity, and;
- Have passed SenseFly's training program for operation of the UAS. The manufacturer's training program for operators has been already satisfactorily reviewed through the Application for Airworthiness Qualification Level (AQL) 3 Airworthiness Release (AWR).

The equivalent level of safety will be achieved by having an operator trained by the AMA (or any FAA qualified entity) and SenseFly, and using the integrated features of the aircraft to maintain a high level of safety during the different missions.

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

This regulation requires that no person may operate a civil aircraft unless it is in airworthy condition. Should the exemption be granted allowing operation of the eBee without an airworthiness certificate, no standard will exist for airworthiness of the eBee. Given the size of the aircraft and the previous airworthiness assessments given to the eBee, among others, include:

- New Mexico State University: https://newscenter.nmsu.edu/Articles/view/10208/nmsu-uas-flight-test-center-conducts-ebee-airworthiness-assessment
- USACE New Orleans, who coordinated with the Department of Army and the FAA to obtain all authorizations required in order to operate the eBee UAS for levee system monitoring, documentation of construction progress, and extensive oblique photography of USACE structures & activities

An equivalent level of safety will be achieved by insuring compliance with the eBee user manual prior to each flight. Precision Ag & Imagery, LLC requests the FAA treat the eBee user manual as proprietary under 14 C.F.R. 11.35(b) and not include this document in the public docket.

The equivalent level of safety will be achieved because the eBee will only fly over private property with the permission of the landowner. Before every flight, the operator will define a working area radius and a flight area ceiling, preventing the eBee to go beyond the flight area. The landowner and the persons who may be on the ground in the flight area will be briefed of the expected route of flight and the associated risks to persons and property on the ground. Due to the small size of the eBee, the material with which the eBee is built and its specific safety procedures (among others ground detection), the hazard to persons, vessels, vehicles, and structures is not comparable to manned aircraft and should be considered in granting the exemption. Moreover, the aircraft will not be operated over congested areas or over any open-air assembly of persons.

14 CFR 91.121 – Altimeter settings

This section requires that each person 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 below 18,000 feet MSL to:

- The current reported altimeter setting of a station along the route and within 100 nautical miles of the aircraft;
- If there is no station within the area prescribed in paragraph (a)(1)(i) of this section, the current reported altimeter setting of an appropriate available station;
- In the case of an aircraft not equipped with a radio, the elevation of the departure airport or an appropriate altimeter setting available before departure.

To provide an equivalent level of safety, the eBee autopilot calculates the reference altitude (ground level) with the on-board GPS during the pre-flight tests. The GPS and barometer data are then used to calculate the altitude in-flight.

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

The regulation provides that no person may begin a flight in an airplane under day-VFR conditions unless there is enough fuel to fly to the first point of intended landing and to fly after

that for at least 30 minutes.

Given the area of operation for the eBee, Precision Ag & Imagery, LLC believes that an equivalent level of safety is already achieved with the specific procedure preventing the eBee to accept a take-off order if the battery level is below a given value. Moreover, SenseFly has integrated "low" and "critical" battery level warnings and implemented a "return to Home" (and "Go Land") actions in these situations.

14 C.F.R. § 91.9: Civil aircraft flight manual, marking, and placard requirements.

This regulation provides that no person may operate an aircraft unless a current, approved flight manual is in the aircraft. We assume that the intent of this requirement is to ensure that flight manual information is available to the aircrew while operating the aircraft. We request an exemption to this requirement since the aircraft is not only too small to carry documentation, but the documentation would not be available to the crew, as there is no flight crew on board.

The equivalent level of safety will be achieved by keeping a hard copy of the eBee user manual in the eBee transport box that will be within reach of the operator at all times.

14 C.F.R. § 91.109(a) & 91.319(a)(1): Flight Instruction

The regulation provides that "No person may operate a civil aircraft that is being used for flight instruction unless that aircraft has fully functioning dual controls."

Flight instruction will be accomplished through an elaborated training program, using first the simulation mode of the flight management software eMotion. The equivalent level of safety during the in-flight training will be achieved by the manufacturer or affiliate providing the training as described in the eBee training program and through the use of experienced and qualified instructors familiar with the eBee and also members of the AMA.

14 CFR § 91.119: Minimum Safe Altitudes

The regulation provides that over sparsely populated areas, the aircraft cannot be operated closer than 500 feet to any person, vessel, vehicle, or structure. Since the eBee will be operating at a maximum of 400 feet AGL, Precision Ag & Imagery, LLC cannot comply with this requirement.

14 C.F.R. § 91.203 (a) & (b): Carrying Civil Aircraft Certification and Registration

This regulation provides as follows:

- No person may operate a civil aircraft unless it has an appropriate and current airworthiness certificate.
- No person may operate a civil aircraft unless the airworthiness certificate required by paragraph (a) of this section or a special flight authorization issued under §91.715 is displayed at the cabin or cockpit entrance so that it is legible to passengers or crew.

The eBee weighs only 1.7 pounds (max take-off weight). As such, there is no ability or place to carry certification and registration documents or to display them on the UAS. In addition, there

is no pilot on board the aircraft.

To obtain an equivalent level of safety and meet the intent of 91.203, we propose that documents deemed appropriate for this aircraft by the FAA will be co-located with the operator at the ground control station in the eBee box and available for inspection upon request. In order to identify the aircraft, we propose that a copy of the AMA membership of the operator will be permanently affixed to the eBee on the upper side of the body.

14 CFR Subpart E (91.401 - 91.417) - Maintenance, Preventive Maintenance, and Alterations

The regulation provides that the operator is primarily responsible for maintaining the aircraft in an airworthy condition, including compliance with Parts 39 and 43. Paragraphs 91.407 and 91.409 require the aircraft to be "approved for return to service by a person authorized under 43.7" after maintenance and inspection. Section 91.409 requires an annual inspection for the issuance of an airworthiness certificate. Section 91.417 requires the owner or operator to keep records showing certain maintenance work that has been accomplished by certificated mechanics, under Part 43, or licensed pilots and records of approval of the aircraft for return to service.

SenseFly proposes that the maintenance of the eBee will be accomplished by the owner or the operator according to the eBee user manual. An equivalent level of safety will be achieved because the eBee is small in size, it is not a complex mechanical device and does carry any external payload. Moreover, the operator is the person most familiar with the aircraft and is best suited to maintain the aircraft in an airworthy condition and to ensure an equivalent level of safety. Finally, before every flight, the eBee automatically runs a sequence of pre-flight tests to make sure that every sensor and every critical part is operating properly. If a problem is detected, the eBee will not be able to be switched-on and a message error is displayed on the main screen of eMotion. The owner or the operator can then refer to the eBee user manual to troubleshoot this issue. Several parts of the eBee are easily interchangeable (propellers, wings), which allows the operator to make sure the wings and propulsion system are always airworthy when a mission is initiated.

ANNEX B: ACADEMY OF MODEL AERONAUTICS SAFETY REQUIREMENTS

http://www.modelaircraft.org/files/105.pdf

http://www.modelaircraft.org/files/540-D.pdf

http://www.modelaircraft.org/files/560.pdf