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

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

September 17, 2015

Exemption No. 12907
Regulatory Docket No. FAA−2015−2699

Mr. Terry Ruddick
USI Advanced Technology LLC
2004 North Commerce Street
Victoria, TX 77901

Dear Mr. Ruddick:

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 4, 2015, you petitioned the Federal Aviation Administration (FAA) on behalf of USI Advanced Technology LLC (hereinafter petitioner or operator) for an exemption. The petitioner requested to operate an unmanned aircraft system (UAS) to conduct aerial imaging, modeling, and surveying.

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, USI Advanced Technology 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

[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.

aerial data collection. This exemption is subject to the conditions and limitations listed below.

Conditions and Limitations

In this grant of exemption, USI Advanced Technology 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 five minutes or with the reserve power recommended by the manufacturer if greater.

21. Air Traffic Organization (ATO) Certificate of Waiver or Authorization (COA). All operations shall be conducted in accordance with an ATO-issued COA. The

exemption holder may apply for a new or amended COA if it intends to conduct operations that cannot be conducted under the terms of the attached COA.

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

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

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

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

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

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

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

28. Any incident, accident, or flight operation that transgresses the lateral or vertical boundaries of the operational area as defined by the applicable COA must be reported to the FAA's UAS Integration Office (AFS−80) within 24 hours. Accidents must be

reported to the National Transportation Safety Board (NTSB) per instructions contained on the NTSB Web site: www.ntsb.gov.

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

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

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

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

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

This exemption terminates on September 30, 2017, unless sooner superseded or rescinded.

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

Enclosures

June 4, 2015

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

Re: Petition for Summary Grant of Exemption under Section 333, FAA Modernization and Reform Act (the "Reform Act") and Part 11, Federal Aviation Regulations

Ladies and Gentlemen:

Pursuant to Section 333 of the Reform Act and 14 C.F.R. Part 11, USI Advanced Technology LLC ("USI"), an operator of the eBee Unmanned Aircraft System manufactured by SenseFly Ltd. (the "eBee"), requests a summary grant of exemption from the following listed regulations:

- 14 C.F.R. 21
- 14 C.F.R. 45.23
- 14 C.F.R. 45.29
- 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(b)
- 14 C.F.R. 91.9(b)(2)
- 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(a) & (b)
- 14 CFR Subpart E (91.401 - 91.417)

This exemption will authorize commercial operations utilizing the eBee for surveying and mapping. Such operations will be subject to operating requirements and conditions defined by the Safety Code of the Academy of Model Aeronautics ("AMA") and the eBee user manual in order to ensure at least an equivalent level of safety to currently authorized operations using manned aircraft. USI requests that the SenseFly Ltd. eBee user manual be treated as proprietary under 14 C.F.R. 11.35(b) and does not include that document in the public docket.

The eBee will be operated by an individual who:

- Holds at least a sport pilot certificate and a current FAA airman medical certificate or a valid U.S. Drivers license issued by a state, the District of Columbia, Puerto Rico, a territory, possession, or the federal government;

- Meets the flight review requirements specified in 14 CFR §61.56 in an aircraft in which the operator is rated on his or her pilot certificate;
- has successfully completed SenseFly Ltd.'s training program for the eBee[1];
- has either completed an AMA-affiliated small unanned aircraft systems ("UAS") education and training program and has achieved an AMA UAS endorsement; or successfully completed a small UAS education and training program provided by any FAA qualified entity.

1. CHARACTERISTICS OF THE AIRCRAFT

The eBee is a small and ultra-lightweight UAS with a wingspan of 37.8 inches and a maximum take-off weight of 1.7 lbs. The aircraft is constructed from flexible foam, and it performs pre-programmed flight guided by on-board GPS and eMotion flight management software. The craft carries aboard a small digital camera that takes a series of high-definition still images, which, once back on the ground, are analyzed with specialized software to produce precision maps and mapping information of the area photographed. The four main characteristics of the eBee are:

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 sharp or hard edges and almost no internal strengthening structure.

b. Electric-power

The eBee is electric powered. A 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 from 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 should it become necessary to respond to emergent circumstances. This is possible due to the remote controller provided with the system.

[1] USI requests that the SenseFly Ltd. eBee training program be treated as proprietary under 14 C.F.R. 11.35(b) and it therefore does not include that document in the public docket.

2. APPLICATIONS

USI intends to use the eBee to conduct flights to gather images and aerial data for use in the conduct of land surveys, terrain-modeling, mapping activities, and in the generation of other geographic information products and services. Among other things, the following geographic information can be obtained through the use of the eBee:

- topographic characteristics
- volumetric estimates
- slope and terrain impediments
- natural and cultural resource identification
- as-built feature identification and analysis
- hazard evaluation
- project design evaluations

UAS technology is beneficial to the land surveying industry, as it affords substantial cost and time savings in the development of real-time and information-rich GIS products. Those cost and time savings in turn generate additional benefits in terms of conservation and safety: less fuel use, fewer emissions generated, less risk to personnel conducting the data gathering function, and less intrusiveness and risk to third parties and/or the property of third parties. In particular:

- *Added safety*: no need for the humans to directly access dangerous working areas, as missions can be programmed and reproduced reliably as often as needed for regularly updated maps; no fuel is carried, meaning less risk to persons and property on the ground.
- *Cost effectiveness*: It is cheaper to operate a UAS rather than an aircraft or other ground systems to obtain the same information. Moreover, the eBee enables the confrontation of new challenges and the development of new products, like resource or environmental management through analysis of surface characteristics or conditions.
- *Efficiency:* A flight does not require long preparation time or long deployment of personnel or resources, or long waiting time for weather conditions or data return unlike, for example, the use of satellites or manned aircraft. Pre-programmed operation is repeatable, something hard to replicate with manned or other systems.
- *Social benefits*: The electric powered craft consumes little energy and its operation is quiet and emission free; its affordability allows many high-valued applications like data gathering for sustainability projects (agribusiness, reforestation) or post-disaster management applications.

The FAA has approved a number of exemptions for like operations, including those sought by Trimble Navigation Ltd., VDOS Global, Clayco Inc., Woolpert Inc., Eagle UAS Services, and by the eBee's manufacturer, SenseFly Ltd.

3. APPLICABLE LEGAL STANDARD UNDER SECTION 333

a. Airworthiness assessment of the eBee

USI notes that the airworthiness of the eBee has already been demonstrated for different projects in the United States, involving state/federal agencies or universities (among others the 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).

Moreover, SenseFly has obtained flight approvals for the eBee (delivered by national civil aviation authorities) in many countries, among others:

- Switzerland (flight approval for VLOS operations)
- Canada (flight approval for VLOS operations)
- Australia (flight approval for VLOS operations)
- France (flight approval for Extended-VLOS operations)
- Germany (flight approval for VLOS operations)
- United Kingdom (flight approval for VLOS operations)
- Norway (flight approval for VLOS operations)
- Sweden (flight approval for VLOS operations)
- Denmark (flight approval for VLOS operations)

b. Operating requirements

Grant of the exemption to USI for 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 with 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;

- Visual Line of Sight operations guaranteed with a GPS geo-fence around operator of 0.5 miles;

- Flight ceiling pre-programmed at or below 400 feet;

- All operations conducted within five 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.

- eBee operations will be compliant with existing safety procedures of its manufacturer, SenseFly Ltd.

A large percentage of project locations serviced by USI are in isolated, rural, nonresidential areas. Before an area is flown, USI will request written permission from the property owner. With the geo-fence incorporated within the flight management software, USI will avoid flying over houses and yards as much as reasonably possible. The flight ceiling will be pre-programmed no higher than 400 feet 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. USI takes pride in providing a safe working environment for its personnel and currently has excellent safety procedures in place.

c. Operating Requirements

The eBee is an ultra-light UAS platform made of flexible foam with no sharp or hard edges. It operates under pre-programmed controls and possesses various technical capabilities (programming of a geo-fence, automatic wind detection) that prevent operation outside of prescribed 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, USI 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:

- Hold at least a sport pilot certificate and a current FAA airman medical certificate or a valid U.S. Drivers license issued by a state, the District of Columbia, Puerto Rico, a territory, possession, or the federal government;

- Meet the flight review requirements specified in 14 CFR §61.56 in an aircraft in which the operator is rated on his or her pilot certificate;

- Have completed an AMA affiliated small UAS 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;

- Have passed SenseFly Ltd.'s training program for operation of the eBee. SenseFly's training program for operators has been already satisfactorily reviewed through the Application for Airworthiness Qualification Level (AQL) 3 Airworthiness Release (AWR).

USI 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

USI, adopting the position of SenseFly Ltd. and the AMA, which both possess deep and well-known experience in terms of the safe integration of remote controlled aircraft in the national airspace for low-level operations, offers adequate justification for the grant of the requested exemption allowing for its safe operation of the eBee in the National Airspace System for the commercial purposes stated above.

The value that the eBee and similar UASs bring to the land surveying industry is possibly immeasurable. The demand for better, fresher, and more detailed geographic data and information will only continue to increase. The integration of the eBee as a component of USI's information gathering toolbox will be of tremendous benefit to it.

Yours sincerely,

USI Advanced Technology LLC

/s/ Terry Ruddick

Terry Ruddick, President

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

USI 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. USI 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.

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 provides 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:

- The flight is only incidental to that business or employment;
- 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), SenseFly proposes that operators of the eBee should not be required to hold a commercial pilot certification. Instead, operators should be required to:

Have a private pilot license and have successfully passed a manufacturer's training program for the eBee. The operator will either meet the flight review requirements specified in 14 CFR §61.56 or will annually complete and log at least 4 hours of ground instruction with a certified flight instructor (CFI) covering regulations pertinent to operation of the eBee.

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 commercial 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:

- 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 SenseFly manuals prior to each flight.

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. USI assumes that the intent of this requirement is to ensure that flight manual information is available to the aircrew while operating the aircraft. USI requests an exemption to this requirement since the aircraft is not only too small to carry documentation, the documentation would not be available to the crew.

The equivalent level of safety will be achieved by keeping a hard copy of the flight manual in the eBee transportation box.

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 elaborate training program, using first the simulation mode of the flight management software eMotion. The equivalent level of safety during the training will be achieved by the manufacturer or authorized distributor providing the training and through the use of experienced and qualified operators familiar with the eBee.

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 aircraft will be operating at a maximum of 400 feet AGL, the eBee cannot comply with this requirement.

The equivalent level of safety will be achieved because the eBee will only fly over private property with the permission of the landowner or public property where approved. The operator will define before every flight a working area radius and a flight area ceiling, preventing the eBee from going 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 and the material with which the eBee is built, 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 nor over any open-air assembly of persons. The aircraft will be operated at an altitude allowing, if a power unit fails, an emergency landing without undue hazard to persons or property on the surface.

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 merged with respect to their respective precisions. The GPS provides reliable information to correct potential barometric bias, while rapid variations in altitude are detected through the barometer. Hence, barometric bias induced by environmental factors is rejected.

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, USI 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. § 91.203 (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 or passengers on board the aircraft.

To obtain an equivalent level of safety and meet the intent of 91.203, USI proposes 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.

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 that the aircraft be "approved for return to service by a person authorized under 43.7" after maintenance and inspection. Section 91.409(a)(2) requires an annual inspection for the issuance of an airworthiness certificate. Section 91.417(a) 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.
USI proposes that the maintenance of the eBee will be accomplished by the owner/operator according to the maintenance manual, provided by SenseFly Ltd. USI requests the FAA treat the eBee maintenance manual as proprietary under 14 C.F.R. 11.35(b) and not include this document in the public docket.

An equivalent level of safety will be achieved because the eBee is small in size, it is not a complex mechanical device, it will carry no external payload, and it will operate only in restricted predetermined areas. 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 runs automatically a sequence of pre-flight tests to make sure that every sensor and every critical part is running properly. If a problem is detected, the eBee will not be able to be switched-on and an error message is displayed on the main screen of the flight management software. The operator can then refer to the maintenance 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