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

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

August 31, 2015

Exemption No. 12673
Regulatory Docket No. FAA−2015−0905

Mr. William F. Schmidt
Owner
Aero Tech Surveys
6810 Airport Drive
Riverside, CA 92504

Dear Mr. Schmidt:

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 letters dated March 31 and July 21, 2015, you petitioned the Federal Aviation Administration (FAA) on behalf of Aero Tech Surveys (hereinafter petitioner or operator) for an exemption. The petitioner requested to operate an unmanned aircraft system (UAS) to conduct aerial mapping and surveying applications.

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, Aero Tech Surveys 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, Aero Tech Surveys 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.

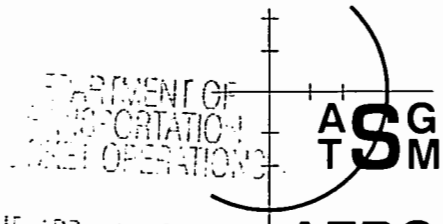
This exemption terminates on September 30, 2017, unless sooner superseded or rescinded.

Sincerely,

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

Enclosures

AERIAL MAPPING
LAND SURVEYING






AERO TECH SURVEYS
A SCHMIDT Geomatic Mapping Corporation

March 31, 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, Sir,

Pursuant to Section 333 of the FAA Modernization and Reform Act of 2012 (the "Reform Act") and 14 C.F.R. Part 11, SCHMIDT Geomatic Mapping Inc., a professional photogrammetric mapping and land surveying firm established in 1997 ("SGM"), an operator of the eBee Unmanned Aircraft System ("eBee") seeks an exemption from the Federal Aviation Regulations ("FARs") listed below:

- 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)

The requested exemption would authorize commercial operations using the eBee for mapping and survey applications. These operations will be subject to strict operating requirements defined in the eBee user manual (SGM requests the FAA treat the eBee training program as proprietary under 14 C.F.R. 11.35(b) and does not include this document in the public docket) 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.

The eBee will be operated by an individual who fulfill the following requirements:

- Has successfully passed a manufacturer's training program for the eBee; SGM requests the FAA treat the eBee training program as proprietary under 14 C.F.R. 11.35(b) and does not include this document in the public docket;

- Has on staff a pilot with Private Pilot license that will be responsible for flight operations.

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Email: aerotechsurveys@sbcglobal.net

## 1. CHARACTERISTICS OF THE AIRCRAFT

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

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-powered

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 emergent circumstances, thanks to the remote controller provided with the system.

## 2. APPLICATIONS

We (SGM) propose to utilize the eBee for professional aerial mapping projects. These projects include sanitary landfills, quarries, vegetation mapping, remote desert area pipeline, canal and solar facility monitoring. Other projects similar in scope have been performed for U.S.D.A.-Forest Service, BLM and ESRI.

## 3. APPLICABLE LEGAL STANDARD UNDER SECTION 333

a. Airworthiness assessment of the eBee

SGM 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 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 SGM 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;
- 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;
- VLOS guaranteed with a GPS geo-fence around operator of 0.5 miles
- 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.
-

c. Operator Requirements

The eBee flight operations will have an individual with a Private Pilot license to oversee, manage and be responsible for compliance with FAA guidelines, as well as a flight operator with experience in remote controlled flight that will successfully have passed a manufacturer's training program for the eBee.

## 3. CONCLUSION

Having provided professional aerial mapping services since 1997, we at SGM are excited and motivated to grasp hold of the potential mini UAVs have to offer in our profession. All operations are planned to be conducted in a professional manner and in compliance with FAA guidelines. Our concern and obligation to our profession is to provide accurate aerial mapping services in such a manner to protect our staff and the general public. We believe safety is paramount to all aspects of any job and conduct our business accordingly.

Yours sincerely,

William F. Schmidt, Owner
California Professional Land Surveyor (LS 5968)

SCHMIDT Geomatic Mapping, Inc. dba "AERO TECH SURVEYS"
6810 Airport Drive
Riverside, CA 92504

Phone (951) 785-0160

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

SGM 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. SGM 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:

(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), 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.

**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. SGM assumes that the intent of this requirement is to ensure that flight manual information is available to the aircrew while operating the aircraft. SGM 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 elaborated 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. The operator will define before every flight 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 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, SGM believes that an equivalent level of safety is already achieved with the specific procedure preventing the eBee to accept a take-off order is 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, SGM 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

**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.

SGM proposes that the maintenance of the eBee will be accomplished by the owner/operator according to the maintenance manual, provided by SenseFly. SGM 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.

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 a message error 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

July 21, 2015

U.S. Department of Transportation
Federal Aviation Administration
800 Independence Avenue SW
Washington, D.C. 20591

Re: No. FAA-2015-0905

AERIAL MAPPING
LAND SURVEYING

AERO TECH SURVEYS
A SCHMIDT Geomatic Mapping Corporation
*A Woman Owned Small Business Enterprise*

Dear Ms. Robeson,

We received your letter dated July 6, 2015 on Tuesday, July 14th, 2015. Following please find the requested reasons why granting the request would be in the public interest, and additional supporting information as well.

Granting the request would be in the public interest, benefiting the public as a whole for the following reasons;

80% of our work is performed for public agencies from Federal agencies to local communities. Granting the request would benefit those agencies and the local tax payers in the community by:

1. Cost savings:

Sample general public savings comparing real world projects mapped by traditional methods versus Ultra-light Unmanned Aerial Vehicle (uUAV) image acquisition. The below costs are examples of expenses associated with image acquisition ready for mapping.

Public Agency Sanitary Landfill, 130 acres

Traditional Aircraft

| | | |
|---|---|---|
| Set 13 aerial control points (2 man survey crew) | 8 hrs | $ 2240.00 |
| Survey aerial control points dual occupation static GPS | 16 hrs | $ 4480.00 |
| Aerial fly over to acquire 7 stereo pair images, includes lab and scanning services (pilot, cameraman, and lab tech) | (lump sum) | $ 1500.00 |
| Pick up aerial control point paneling material after flight | 4 hrs | $ 1120.00 |

Estimated budget for imagery acquisition ready for mapping $ 9340.00
Note: Traditional aerial imagery to be ready for mapping needs aerial control marks and survey

Imagery Acquisition with UAV (RTK)

| | | |
|---|---|---|
| 2 man crew (uUAV pilot and air space observer) set up base station GPS for RTK use, execute photo mission, pack and go. | 4 hrs | $ 1120.00 |
| uUAV loss prevention and use costs (per flight) | lump sum | $ 500.00 |

Estimated budget for imagery acquisition ready for mapping $ 1620.00
Note: uUAV aerial imagery (RTK Equipped) is ready for mapping and does not need aerial control marks and survey

**Estimated cost savings to the local public agency $ 7720.00 or 83%**

2. Reduces carbon footprint:
   uUAVs are battery operated, considered to be "Green Technology", no fuel consumption as with traditional aircraft.
3. Less intrusive than traditional aircraft.
   Traditional aircraft flying at 1800 feet above mean terrain to acquire stereo pair aerial imagery at photo scale of 1:3600 is noisy, pollutes the air.
   UAV is quiet, generates no pollution. Flies at less than 500 feet above mean terrain.
4. Safety
   uUAVs are safer to use, lightweight, maneuverable.
   Traditional aircraft are heavy, mechanical problem crash risk.
5. Good for the economy.
   uUAVs are high tech and creates high tech jobs.
   Powerful tools for inexpensive gathering of customized data.
6. Humanitarian Technology.
   Affordable and ease of transport to remote areas
   Real time information and situation monitoring
   Public information
   Search and rescue
   Mapping
   No impact to environmentally sensitive areas.

Additional information, supporting our request.

Our company is a professional land surveying firm that specializes in aerial photogrammetric mapping. In doing so, we comply with the California Professional Land Surveyors Act which stipulates all photogrammetric mapping shall be performed under the direction of a professional land surveyor. Mr. William Schmidt, owner of the company is a California Licensed Land Surveyor, LS 5968.

As a land surveying firm providing said services, we do so consistent with the Professional Land Surveyors' Act, Chapter 15 Article 1. General Provisions, Section 8710.1 "Legislative Intent – Protection to the Public", "Protection of the public shall be the highest priority,..." Our firms' day to day operations are consistent with the Legislative Board's objectives.

Below are actual examples of projects performed by our firm where the public in general could have benefited from the use of a uUAV.

Tax payer benefits in reduced costs.
Many of our aerial mapping services are performed for Federal, State, County and City agencies. The cost of mobilization for a traditional aircraft equipped with aerial camera, fuel, and a staff of two (pilot and cameraman) equate to time and money for said agencies. The use of a "Ultra-light Unmanned Aerial Vehicle" (uUAV) such as the "Ebee" is quick and efficient to deploy. The actual task of flying a project site is performed

in a matter of minutes. A traditional aircraft flyover for image acquisition ready for mapping could cost the taxpayers approximately $ 9300.00 for a local project. The use of a UAV for the same image acquisition would be budgeted at $ 1600.00. That is an 80% savings for the local tax payers.

General public safety.
95% of our aerial mapping projects require highly detailed maps. These are typically flown with traditional aircraft at an altitude of 1800 feet above mean terrain. Traditional aircraft used for our aerial mapping projects can weigh 1500 lbs to 3500 lbs. At a flight altitude of 1800 feet AMT there is no room for error recovery. This can lead to a loss of life for both pilot and cameraman and innocent civilians on the ground. Two specific scenarios we have personal interest in relate to local aerial mapping firms experiencing an aircraft accident. One, I.K. Curtis Aerial Mapping lost both pilot and cameraman in mid air collision in Banning Pass, June 1994. Second, San-Lo Aerial Surveys lost pilot, cameraman and observer shortly after takeoff from Brown Field, June, 1997. The use of lightweight UAVs would have saved lives in this case.

Rapid response.
Our firm responds to urgent needs for aerial imagery acquisition. Many cases, a final product can take a week or more to produce an exhibit. The rapid response and delivery of accurate data crucial to decision makers is important for the general public. Some examples we have mapped in which a quick response proved helpful are:

Esperanza Fire, October 2006. Five U.S. Forest Service firemen lost. Immediate response was required of our firm to fly, photograph, map and document the site. Turn around was five days after working around the clock. CAL-Fire and the U.S. Forest Service demanded delivery of data A.S.A.P. Through the use of a uUAV and it's image processing software we could have delivered a product the next day.

Landslides, Our firm is called upon not only to document but map the hazard area. The sooner a product can be delivered to project engineers, the sooner a solution can be found. This translates to benefit the general public by rapid response and solutions. The use of a UAV can capture the problem area within minutes after the event happens. Surveying staff would not be exposed to dangerous slopes typically surveyed by traditional methods. Solutions can be assessed in a timely manner not only saving tax payer dollars, but by re-opening closed roads or access points sooner.

Quarries.
Our firm provides aerial mapping services for quarries on public lands. Traditional aircraft mobilization costs and man-hours for pilot and cameraman can be reduced by the use of UAVs. This results in a direct savings to the government agency responsible for monitoring the mining activities (approximately 80% as shown above), in our case, the Bureau of Land Management (BLM). A savings to the BLM means a savings to the U.S. tax payer. In addition to a tax payer savings, the safety of surveyors on the ground in paramount to us. A uUAV equipped with RTK capabilities eliminates the need for setting traditional ground control points. That means the surveyors on the ground will not be exposed to the danger of working around steep slopes where debris could injure a worker.

Landfills.
Our firm provides annual mapping services for public landfills. Besides the costs associated with aircraft mobilization as mentioned above, there is the cost of land surveyors on the ground setting aerial control points. The use of a UAV with RTK capabilities reduces the labor costs associated with mapping the landfills. A cost reduction in labor and aircraft mobilization is a direct savings to the public agencies managing the landfills. Once again, approximately 80% is estimated to be saved. More importantly to us, ground surveyors are not exposed to the dangers of working in close proximity of heavy machinery. The landfills are typically mapped once a year to calculate volumes and determine efficiency of fill rates and cover material use. With the reduced cost of a uUAV, the landfill could be mapped quarterly, providing much needed information for landfill operators to maximize efficiency. With quarterly data they could analyze refuse fill rates and cover material use and adjust operations more frequently. The advanced technology a uUAV could help maximize the operations of the landfill, extending the landfill life, minimize the impact to the local community and save tax payer dollars.

Environmentally Sensitive Areas.
Working around sensitive areas creates a dilemma with access for land surveyors to set aerial control points on the ground. In addition, the control points need to be bio degradable or need to be picked up after the flight. This means traversing sensitive areas numerous times to set, survey and pick up aerial targeting material. The use of a UAV equipped with RTK eliminates the need for surveyors to traverse the sensitive areas. Benefits to the general public, zero impact to sensitive areas.

Flood Control Basins.
Our firm has mapped on numerous occasions flood control basis for our local county flood control district. The basins are mapped each fall to document the status of the basin prior to the rainy season. The cost of operating a uUAV equipped with RTK is substantially less than traditional aircraft and the required setting and surveying of traditional ground control points. This results in a direct savings to the district and the local tax payers. In addition, immediately after a storm event, a uUAV could fly and map the basin with next day data for flood engineers' assessment of the situation. This rapid information technology delivered to the engineers provides for rapid deployment of services to avoid or minimize a flood hazard situation thereby benefiting the general public over a regional area.

Vegetation Mapping:
In the past and presently, California is experiencing a drought situation. This creates a stress on the certain pine trees in the mountains. The stress leads to bark beetle infestations and the dying off of the trees. The forest service mobilized "40 King", a helicopter with a crew of 4 to monitor the dead tree situation. The cost of operating "40 King" is approximately $ 1000.00 an hour. Our firm has performed aerial mapping services to the U. F. Forest Service as a vendor and through an I.D.I.Q. Agreement. The use of a uUAV could have saved the department thousands of dollars in this type of situation. In addition, the uUAV equipped with RTK generates geo-referenced imagery. This gives the user the ability to instantly retrieve lat/long positioning of trees or other vegetative areas of concern. The processed uUAV imagery is generally ready for use within hours for next day delivery. The information technology we could provide to many of the local agencies with the use of a uUAV

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should be considered priceless with the safety, cost savings, rapid deployment, ease of use, and quick turn-around time of accurate mapping data thereby benefiting the general public as a whole.

Thank you very much,

Aero Tech Surveys

By: William F Schmidt

William F. Schmidt, P.L.S., President
SCHMIDT Geomatic Mapping, Inc. dba: Aero Tech Surveys