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

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

May 5, 2015

Exemption No. 11489
Regulatory Docket No. FAA–2015–0320

Ms. Kristin Swoboda
Take Flight UAS, LLC
8090 West Sagebrush Way
Boise, ID 83709

Dear Ms. Swoboda:

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 February 4, 2015, you petitioned the Federal Aviation Administration (FAA) on behalf of Take Flight UAS, LLC (hereinafter petitioner or operator) for an exemption. The petitioner requested to operate an unmanned aircraft system (UAS) to conduct aerial imagery operations in support of precision production agriculture, natural resource monitoring, university and private research, climate change observations, humanitarian relief efforts, and emergency services.

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 are the 3DRobotics X8+ and Bormatec Maja UAV.

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, Take Flight UAS, 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

[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.

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.

Conditions and Limitations

In this grant of exemption, Take Flight UAS, 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 3DRobotics X8+ and Bormatec Maja UAV 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 May 31, 2017, unless sooner superseded or rescinded.

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

Enclosures

FEBRUARY 4, 2015

TAKE FLIGHT UAS, LLC

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 Modernization and Reform Act and 14 C.F.R. Part 11

Dear Sir or Madam:

Pursuant to Section 333 of the FAA Modernization and Reform Act of 2012 (the Reform Act) and 14 C.F.R. Part 11, Take Flight UAS, LLC (Applicant) an Idaho limited liability company, seeks an exemption from the Federal Aviation Regulations (FARs) listed and discussed in Appendix A in order to allow for the operation of small Unmanned Aircraft System (UAS) under the conditions and limitations set forth in this application for Petition.

The requested exemption would permit the Applicant to safely, efficiently and economically use commercial UAS within the National Airspace (NAS) for operations conducted within and under the conditions outlined in this Petition or as established by the FAA as required by Section 333.

The requested exemption would authorize the Applicant to perform commercial operations with UAS that will provide the following benefits to the public:

- Commercial use of UAS to acquire aerial imagery in support of precision production agricultural, natural resource monitoring, university and private scientific research, climate change observations, humanitarian relief efforts and emergency services.
- Application of UAS may reduce safety concerns in areas where terrain or subject matter is inaccessible, inhospitable, hazardous and unsafe to enter, or may cause undue injury or loss of life.
- UAS operations at low altitudes (< 400 ft. AGL) provide high resolution imagery that cannot be acquired with manned aircraft without compromising safety and adding excessive levels of risk to life and property.
- UAS options for collecting imagery and data result in increased efficiencies that directly influence and benefit agriculture, natural resources, scientific research and monitoring, relief efforts and emergency services (floods, fire, search and rescue).
- Commercial use of UAS can obtain data products which will directly influence and improve efficiencies within several applications. This has the potential of enhancing productivity while providing benefits to research, industry, and the general public.

STATEMENT OF BACKGROUND, PROPOSED COMMERCIAL APPLICATIONS AND PUBLIC BENEFIT

The Petitioner is a startup company, Take Flight UAS, LLC. The founders of the company were certified small UAS pilots with the Department of the Interior (DOI). DOI trains and certifies UAS pilots on fixed wing and VTOL / ducted-fan, gas powered Micro Air Vehicle (gMAV) airframes. The founders, as DOI certified fixed wing operators are graduates of UAS training courses using FAA curriculum standards. These courses included 22 classes and totaled more than 80 hours for fixed wing operations and an additional 40 hours for the VTOL gMAV operations. Past DOI operations provided practical applications in the field. This required working with low altitude UAS flights with the primary objectives of acquiring video, imagery and data in support of natural resource projects, research studies and monitoring applications.

Both founders hold general aviation private pilot licenses and have in-depth knowledge concerning NAS navigational priorities and rules. Both hold current Class II Medicals, and have passed FAA Commercial Written Exam. The founders are also aware of hobby craft/recreational UAS guidelines and have been recreationally flying keeping proficiencies current while additionally building flight time and expertise with UAS.

Take Flight UAS, LLC founders also have knowledge and experience working with forestry/silviculture, geomorphology, hydrology/flood analysis, search and rescue emergency mapping services, habitat restoration and wildfire modeling in both Civil and Federal Government settings. Combined, the founders have 50+ years of expertise in geographic information systems (GIS), remote sensing, photogrammetric techniques and digital surface modeling. Additionally, these applications pertain to aerial imagery acquisition, spatial data creation, mapping and analysis. Founders current employment requires extensive research into lightweight sensor and camera development (multispectral, hyper spectral, natural color, forward looking infrared [FLIR], near infrared [NIR] and thermal imagery) for low altitude flights with the purpose of gathering true-color and spectral signatures for high resolution data. This data has a wide variety of scientific applications as well as significant economic benefits to the communities involved with natural resource management and precision agricultural.

If proposed exemption is approved, the Petitioner intends to acquire and provide aerial imagery and data solutions in support of scientific research and monitoring studies as they apply to natural resource based and precision production agricultural activities. For instance these will include cropland observations, invasive species monitoring, geologic and geomorphic surveys, forest and rangeland health, wildlife, wildfire, and habitat restoration.

Specifically, with the granting of this exemption, the founders will proceed to work in conjunction with university and agricultural extension offices. With these efforts, imagery and data acquired will be analyzed for the following purposes: wheat blight mitigation, sugar beet harvest rates congruent with mold presence, irrigation water budgeting and maximization of crop to water variances, fertilization and nutrient distribution, soil and plant moisture content, pest management, viticulture water stress and growth cluster yields, mold spore indexes, leaf temperature and plant water status. These site specific precision agriculture measurements and analysis of the influencing factors will directly increase crop production and yields, while minimizing wasteful crop production methods, conserving irrigation water, and mitigating extremely harmful crop diseases.

The application of UAS in these instances has the ability to produce valuable and sustainable products enhancing industry and public land operations. These products will provide definitive results for improving precision production agriculture and natural resource based activities. In time, the specific benefits will provide increased crop harvest quality and quantity throughout growing areas where prudent water use and irrigation are required.

Other highly effective uses of UAS endeavors include response to humanitarian relief efforts, emergency disaster response and Search & Rescue (SAR) operations. Providing a clear visual from a low altitude flight is extremely valuable with respect to disaster response and SAR missions. Low altitude real-time imagery assists with locating people, recognizing and identifying critically affected areas, locating safety zones and increasing situational awareness of identified risks and hazards. Resultant in more efficient and decisive response plans. Such planning assists to minimize reaction time and increase the probability of the best solution for the situation – without increasing risk to human lives.

Take Flight UAS, LLC will perform mission planning, site safety evaluation, flight operations. UAS will include the necessary sensor package for the mission. Data and imagery acquired will be analyzed and assemble into a final product. This deliverable will include geospatial products derived from post-processing techniques of the acquired data and imagery. Applicant would execute data analysis and assist clients with obtaining management goals towards achieving desired outcomes.

The name and address of the Applicant is:

Take Flight UAS, LLC
Attn: Kristin Swoboda
Telephone: (503) 975-7720
Email: takeflightaviationks@gmail.com
Address: 8090 W. Sagebrush Way, Boise ID 83709

QUALIFICATION FOR APPROVAL UNDER SECTION 333 OF THE REFORM ACT

The UAS operations proposed in this application of petition for exemptions qualify for expedited approval under Section 333 of the Reform Act. This petition outlines how each statutory criteria as well as other potentially relevant factors are satisfied.

The proposed operations would permit the use of small UAS within the National Airspace (NAS) under controlled operational conditions. In many cases, these criteria outlined below will provide a level of safety that could not be achieved using manned fixed wing or rotor aircraft in order to accomplish the same purposes.

Take Flight UAS, LLC is proposing to operate both rotorcraft and fixed wing UAS. Each UAS, including payload weighs less than 15 lbs, and always less than 55 lbs. Operations would occur under normal VFR meteorological conditions at speeds less than 50 knots. UAS are primarily constructed of foam, aluminum, carbon fiber and plastic materials. Operations will be performed by qualified UAS Pilots (PIC) and Visual Observers (VO), in order to ensure that UAS will *"not create a hazard to users of the national airspace system or the public."* Given the small sizes of the UAS, the pre-planned operation locations, flight paths, and the required VFR flight conditions, the Applicant believes that these operations fall directly within or exceed the required level of safety. Under the Reform Act, Congress has endorsed through exemption that the FAA will allow commercial operations of UAS to commence immediately if an appropriate level of safety is achieved or exceeded. The Applicant believes an "equivalent level of

safety" or better will be achieved by the proposed outlined operations. It is also determined that due to the dimensions and composite materials of the UAS, flight paths and operational areas, the VFR conditions in which UAS flights will take place, approval of this application of petition presents no threat to national security. The operation of UAS under these conditions will serve to guarantee pilot, public and property safety while adding tangible benefits to industry, the economy, scientific research, and the general public.

Take Flight UAS, LLC acting as UAS Pilot in Command (PIC) and Visual Observer (VO) agree to the requirements and constraints of these limitations and conditions for conducting commercial operations within the National Airspace under an FAA issued exemption:

Pertaining to UAS

- UAS will weigh typically less than 15 lbs., and always less than 55 lbs.
- UAS will operate at a maximum speed of no greater than 25 knots.
- UAS will operate at or below 400ft AGL.
- UAS shall not be operated within 5 miles of an airport without prior approval of, and establishing a line of communication for the duration of the flight operations with the controlling authority of that airspace/airport.
- UAS will be operated within visual line of sight (VLOS) of the PIC and VO(s).
- UAS will follow pre-determined flight lines over the mission area conducted via automated navigational flight software.
- UAS will be operated under visibility and cloud clearance requirements equivalent to Visual Flight Rules (VFR).
- UAS will be equipped with an autopilot system. UAS will utilize GPS navigation, systematic pre-flight checks, and failover safety mechanisms as return-to-home (RTH), auto-land, loiter and flight abort safety features.

Pertaining to Pilots, Visual Observer(s) and Ground Control Station crew

- Minimum crew for each operation will consist of the UAS Pilot in Command (PIC), Visual Observer (VO) and/or Ground Control Station (GCS) crew.
- The UAS pilot will be considered the Pilot in Command (PIC) and be responsible for conducting safe flight operations.
- PIC, VO(s) and/or GCS crew will have communications established in advance of any flight operations.
- A briefing will be conducted in regard to the planned UAS flights prior to operation at each new location. All personnel who will be performing duties within the boundaries of the area of operation will be present for this briefing.
- The UAS pilot will be trained in advance for the safe operation of the UAS to be operated. This will include operation of the UAS both in normal and emergency procedures and will include familiarization with the flight manual (or similar) furnished by the UAS manufacturer. Training will also include basic flight maneuvers, navigational awareness, emergency procedures, loss of uplink, loss of downlink, loss of GPS and safe flight operations in relation to persons, property and applicable airspace.

Pertaining to Flight Operations

- Risk assessment evaluation for safe site operations and flight conditions before each mission.
- Prior to a UAS flight, an area of operation will be established. This area of operation will include a defined lateral and vertical area, where the UAS will operate. Safety procedures will be established for persons, property and applicable airspace within the area of operation.
- Flights will be operated in Class G airspace whenever possible. If operation in other airspace is required, the appropriate controlling authority will be notified at least 24 hours prior to the operation and, if required, any necessary permission obtained.
- See and avoid: If at any time the operator see or hears another aircraft and it appears that aircraft may come within one (1) mile of the UAS, or it is questionable whether or not it will do so, the PIC shall immediately descend the UAS and direct it on a heading toward the designated landing area, or alternate landing area if necessary, until the UAS has landed or it is determined the other aircraft has maintained a separation of one (1) mile.
- The UAS shall operate from on-site launch/landing locations directly next to the PIC and GCS crew. Non-essential flight operation personnel will be at an appropriate distance away or a minimum of 100 ft from the operation unless barriers or structures are in place which may sufficiently protect non-participating persons in case of UAS emergency.
- Flight planning will include flight completion with at least 25% battery power remaining as measured by the UAS or appropriate flight time planning.
- A Ground Control Station (GCS) will be connected by radio communication to the UAS during the entire flight operation. Flight information relayed to the PIC will include UAS GPS position, altitude, speed, compass heading/bearing, aircraft angle of attack, flight time, battery power remaining, and other telemetry information.
- Written, and/or documented oral permission from property owners or land management agency will be obtained prior to an operation.

In summary, it is the Applicant's belief that the size, weight, speed, operating environment, and operating capabilities of each UAS will provide an "equivalent level of safety" or better when operating for commercial and public interest as outlined in Section 333 of the Reform Act. Applicant appreciates the time and consideration devoted to this request for exemption to permit safe, legal commercial UAS operations within the NAS.

Respectfully,

Take Flight UAS, LLC
Attn: Kristin Swoboda
Telephone: (503) 975-7720
Email: takeflightaviationks@gmail.com
Address: 8090 W. Sagebrush Way, Boise ID 83709

EXEMPTION IS REQUESTED FROM THE FOLLOWING REGULATIONS:

Appendix A discusses each rule listed above and explains why exemptions pursuant to the proposal set forth in this letter are appropriate while providing an equivalent level of safety and consider the public interest.

GLOSSARY OF TERMINOLOGY:

COA	Certificate of Authorization
FAA	Federal Aviation Administration
FLIR	Forward Looking Infrared
GIS	Geographic Information Systems
GPS	Global Positioning System
GCS	Ground Control Station
NAS	National Airspace
NIR	Near- Infrared
NOTAM	Notice to Airmen
PIC	Pilot in Command
RS	Remote Sensing
TIR	Thermal Image Recorder
VFR	Visual Flight Rules
VLOS	Visual Line of Sight
VO	Visual Observer
UAS	Unmanned Aircraft System

APPENDIX A

EXEMPTION REQUESTS AND EQUIVALENT LEVEL OF SAFETY

The Applicant requests an exemption from the following regulations as well as any additional regulations that may technically apply to the operation of UAS:

14 CFR PART 21, SUBPART H: AIRWORTHINESS CERTIFICATES

Section 91.203(a)(1) requires all civil aircraft to have *"an appropriate and current airworthiness certificate*." Part 21, Subpart H, entitled Airworthiness Certificates, establishes the applicability and the procedural requirements for the issuance of airworthiness certificates as required by FAR § 91.203(a)(1).

With the size of the UAS (typically less than 15 lbs., and always less than 55 lbs.) and the limited flight operation areas, it is unnecessary to undergo the certificate of airworthiness process under Part 21 Subpart H to achieve or exceed current levels of safety.

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 of an airworthiness certificate of the UAS involved upon consideration of the size, weight, speed, operational capability, and proximity to airports and populated areas. These outlined conditions all apply to the UAS considered in this proposed exemption, therefore an airworthiness certificate is not applicable.

See Exemptions: 11138, 11062, 11067, 11080, 11114, and 11112.

14 CFR § 91.203 (A) & (B): CARRYING CIVIL AIRCRAFT CERTIFICATION AND REGISTRATION

This regulation provides as follows: *(a)"… no person may operate a civil aircraft unless it has … an appropriate and current airworthiness certificate."*

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

The UAS with a full capacity payload weighs no more than 15lbs, and always less than 55 lbs. Due to the small size there is no open cabin or cockpit. There is no space, or onboard storage place located in/on the UAS in which to carry certification and registration documents. An equivalent level of safety will be achieved by keeping proper documentation at the location of the Ground Control Station where the PIC, VO or GS crew and others working with the UAS will have readily available access to them. The FAA has issued numerous exemptions to this regulation. A representative sample of other exceptions includes: Exemption Nos. 9565A, 9565B, 9789, 9789A, 9797, 9797A, 9816A, and 9816.

Further examination of §91.203 (a) & (b) conditions lends that UAS operated without an airworthiness certificate, under the conditions proposed in this petition, will achieve the equivalent level of safety or better, than a conventional manned aircraft (fixed wing or rotorcraft) with an airworthiness certificate for the purposes outlined in this application. The UAS will not carry a pilot or passenger, will not carry flammable

fuel, and will operate only within small well-defined locations. All operations will be in compliance with the limitations and conditions stated in this application for petition. The FAA will have advance notice of all operations through the filing of Certificates of Waiver or Authorizations (COA) and Notices to Airman (NOTAMS) not more than 72 hours in advance, but not less than 48 hours prior to conducting any operations under this grant of exemption. In summary, the size of the aircraft, the lack of flammable fuel and the fact that the UAS is carried to the location, rather than flown to the site of operation, all create an equivalent level of safety. The UAS provides and even exceeds an equivalent level of safety when comparing low altitude operations conducted with conventional manned aircraft that would be carrying passengers, cargo, and flammable fuel.

14 CFR § 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 UAS without an airworthiness certificate, no standard will exist for airworthiness of the UAS. An equivalent level of safety will be achieved by ensuring compliance with the UAS standard operating procedures, flight operations manuals, and following established practices which utilize safety checklists, pre-flight checklists and regularly scheduled maintenance.

Please note exemptions: 11159, 11157, 11153, 11150, 11138, 11136, 11109 and 11080.

14 CFR § 91.9 (b)(2): Civil Aircraft Flight Manual in the Aircraft

This regulation provides guidance for aircraft flight manuals. *(b)"No person may operate a U.S.-registered civil aircraft … (2) "For which an Airplane or Rotorcraft Flight Manual is not required by §21.5 of this chapter, unless there is available in the aircraft a current approved airplane or Rotorcraft Flight Manual, approved manual material, markings, and placards, or any combination thereof."*

The UAS is small in size and there is no cabin or cockpit entrance to the UAS. There is no onboard pilot, passenger(s) or crew. Due to the small size, configuration with no cockpit or cabin for a pilot, passengers or crew, there is no room or capacity onboard to carry a flight manual. The equivalent level of safety will be achieved by keeping the flight manual(s) and standard operating procedures at the Ground Control Station where the pilot in command and GCS crew flying the UAS will have readily available access to it.

Previous exemptions granted by the FAA concerning Section 91.9(b) establish that safety is not adversely affected when the approved Aircraft Flight Manual is kept at the Ground Control Station of a UAS, where it can be immediately accessed by the pilot in command. Section 91.9(b) *"requires aircraft to carry the flight manual so the pilot would have ready access to the aircraft limitations while in flight."* However, the FAA has also determined that UAS will always be operated without any passengers or crew onboard, and that *"requiring these special-use aircraft [UAS] to carry superfluous paper documents may present a safety hazard to the integrity of the [UAS]."*

The FAA has previously granted exemptions under similar circumstances. Exemption Nos. 8607, 8737, 8738, 9299, 9299A, 9564, 9564B, 9720, 10167, 10167A, 11112, 11114, and 11138.

14 CFR § 45.23 & 91.9(c): Marking of the Aircraft

Regulation 45.23 states (a) *"Each operator of an aircraft must display on that aircraft marks consisting of the Roman capital letter "N" (denoting United States registration) followed by the registration number of the aircraft. Each suffix letter used in the marks displayed must also be a Roman capital letter."*

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

Regulation 91.9(c) provides: *"No person may operate a U.S.-registered civil aircraft unless that aircraft is identified in accordance with part 45 of this chapter."*

UAS does not have entrance to a cabin, cockpit, or pilot station on which markings can be placed. The small size of the UAS prevents marking the UAS with two-inch lettering. Official marking systems for UAS have not yet been established for operations inside the NAS. However, the Applicant is prepared to mark the UAS with appropriate sized markings for the UAS. This can include identification as the name of the organization, its location of origin and aircraft serial numbers. The UAS Ground Control Station will also have proper marking § 45.29(f) where the Pilot, Visual Observer(s), and others working with the UAS will see the identification of the UAS and GCS.

The FAA has issued the following exemptions to this regulation; see Exemption Nos. 8738, 10167, 10167A and 11112, 11136, 11109, and 11062.

14 CFR § 61.113(a) & (b); 61.133(a): Private Pilot Privileges and Limitations; Pilot in Command; Commercial Pilot Privileges and Limitations

Sections 61.113 (a) & (b) provide regulations for the limitation of private pilot privileges to non-commercial operations. Section 61.133(a) requires an individual to hold a commercial pilot's license when acting as pilot in command of an aircraft used for compensation or hire. UAS will not carry a pilot or passengers. The proposed operations can achieve the equivalent level of safety by requiring the UAS PIC to undergo UAS flight instruction, hold at least a private pilot's license or other FAA recognized equivalent, rather than a commercial pilot's license to operate small UAS. Unlike a conventional aircraft which carries a pilot and passenger(s), UAS are remotely controlled with no souls on board. The area of operation is limited with flights not exceeding 400 feet in altitude and not out of visual line of sight. All flights are planned and coordinated in advance and will be monitored by both the PIC operator, Visual Observer(s) and Ground Control Station and will follow all requirements to ensure compliance with safety regulations.

Further provisions will take into account the safety features and characteristics of the UAS. UAS navigational system and autopilot's have a high degree of preset automated navigational control with built-in technical capabilities that will limit the ability for UAS to operate outside of the flight operations envelop. Automated features and advanced fly-safe controls consistently enable safe and reliable operation.

Flight safety is a priority, no matter the flight operating environment. Because there are no souls on board, UAS offer superior safety over manned aircraft in flying low altitude flights. UAS will operate with multiple built-in safety features-

- UAS navigation and auto pilot system will fly a preset flight path autonomously or fly in manual override.
- UAS flight software automatically and systematically scans for system anomalies while in flight. Detected issues are then handled with configurable preset automated response behavior such as return-to-home, loiter and auto-land functionality.
- UAS has capability to auto detect loss of GPS link. If link is lost, a warning alarm is indicated and the UAS initiates an immediate landing.
- If UAS detects a low battery, a warning alarm sounds and UAS will return to home and land.
- If UAS loss of link to the Ground Control Station occurs the UAS will perform its preset response to the condition by performing an auto-land.
- UAS flight time and battery power charge/minutes are displayed at all times. UAS will return home and land automatically if user-configurable limits are reached or battery power reaches 25%.
- UAS have the ability to set up no-fly zones. These virtual boundaries will contain UAS flight operations not allowing UAS to fly horizontally and/or vertically outside the pre-planned flight area.
- UAS safety pre-flight checks and system status assessments prior to takeoff also include system self-calibration of flight sensors. If problems with flight sensors are detected the automated pre-flight phase will abort.

These safety features, characteristics and advanced controls can be learned through proper flight instruction and hands on UAS pilot training. With UAS pilot training, there is a reduction of risk associated with the operation of UAS. Risks are mitigated due to size, speed, weight, operational capabilities, safety features and advanced navigational controls. The level of risk associated with private pilot operations or commercial operations considered by Part 61 with conventional aircraft (fixed wing or rotorcraft) is considerably greater than that of UAS operations as defined by this petition. Therefore, an equivalent level of safety is exceeded over the current level of safety required under 14 C.F.R. § 61.113(a) & (b) § 61.133(a).

The FAA has issued the following exemptions to this regulation; see Exemption Nos. 11110, 11109, 11062, 11065, 11067, 11136 and 11138.

14 CFR § 91.103: PREFLIGHT ACTION

This regulation requires each pilot in command to take certain actions before flight to ensure the safety of the flight. As FAA approved flight manuals will not be provided for the UAS, an exemption will be needed. To provide for an equivalent level of safety the following protocols will be in effect. The Pilot in Command and Ground Control Station crew will take all actions including: systematic and comprehensive pre-flight checks, safety plan review, weather updates, briefing of flight plan operations, flight battery power needs and requirements, aircraft performance data and landing/takeoff distances before proceeding with flight operations.

Summary of Pre-flight Checklist Items

- Visual inspection of entire airframe

- Visual inspections of fuselage, wings/rotor integrity
- Run-up testing and battery power charge checks of all batteries (aerial vehicle, command station, radio transmitter)
- Check altimeter is set to zero at UAS launch site/landing zones, check GPS altitude, location, compass heading/bearing
- Verify communication between PIC, VO(s) and/or GS crew

The failure of any portion of the pre-flight check will prevent take-off. Pre-flight checks which cannot be passed by the onboard flight system will be investigated and remedied by a qualified person prior to each flight. This will be noted in the flight log for inclusion within the regular maintenance schedule.

14 CFR § 91.109(A): FLIGHT INSTRUCTION

These regulations provide that no person may operate a civil aircraft (except a manned free balloon) that is being used for flight instruction unless that aircraft has fully functioning dual controls.

UAS are remotely piloted aircraft that do not, by their nature, have fully functional dual controls. Flight control is accomplished through the use of a remotely operated hand-held controller that communicates with the aircraft via radio telemetry. During flight instruction, UAS will be flown by both student and instructor using separate flight controllers simultaneously. If necessary for failover safety, the Ground Control Station can override and perform an immediate auto-land. However, during typical flight operations, flights are either manually flown, controlled on the fly by point and click navigational commands or with predetermined way points and flight paths. Pilot has the ability to override preset flight paths.

In summary, the equivalent level of safety is exceeded due to the fact that neither a pilot nor passenger(s) are onboard the UAS. In addition, the UAS is small in size, slow in speed and flies at low altitudes. Other weight and material characteristics of the UAS are also considered contributing factors for safety. With this the Applicant believes that the previously outlined safety features provide for an increased level of safety over current regulations.

The FAA has approved exemptions for flight training without fully functional dual controls for a number of aircraft and for flight instruction in experimental aircraft. See Exemption Nos. 11109, 11138, 11110.

14 CFR § 91.119(C): MINIMUM SAFE ALTITUDES

Section 91.119 establishes safe altitudes for operation of civil aircraft. Specifically, 91.119(c) limits aircraft flying over areas other than congested areas to an altitude of 500 feet above the surface, except over open water or sparsely populated areas. In those cases, the aircraft may not be operated closer than 500 feet to any person, vessel, vehicle, or structure.

Because aerial survey, monitoring, mapping, inspection or data collection work must be accomplished at relatively low altitudes and at altitudes preferably less than 400 feet AGL, an exemption from Section 91.119(c) is requested.

The equivalent level of safety will be achieved given the size, weight, speed, and locations of flight operations areas. No flight operations will occur without the permission of the property owner or land management entities. Advance notice to the property owner or land managing entities, will ensure the correct individuals will be notified of planned flight operations. In addition, small size, weight, and low speeds of UAS,

contribute to very minimal hazards to persons, property, vessels, vehicles or structures. Autopilot features include a governor preset that will inhibit flights above 400 ft. AGL. Due to the extremely low altitude flights planned for UAS operations, it is not allowable, feasible or safe for conventional aircraft to fly within these parameters. Therefore, associated risks are marginal and do not compare to traditional manned aircraft flights operating at this altitude and should be considered for exemption.

The FAA has granted similar exemptions to others, including Exemptions: 4063, 11138, 11136, 11112, 11110, 11109, 11080, 11066, 11063, 11062 and 11067.

14 CFR § 91.121: Altimeter Settings

Section 91.121 requires a person operating an aircraft to maintain cruising altitude or flight level by reference to an altimeter that is set to the elevation of the departure airport or barometric pressure. Some UAS have a barometric pressure sensor, while others only use GPS for elevation or altitude. When a barometric pressure sensor is on the UAS, it is corrected to the point of take-off; this is in close proximity to the PIC and not at a departure airport. The altitude reading will be relative to that launch point on the ground.

The equivalent level of safety will be achieved by the PIC and GS crew. As part of the pre-flight checklist, the PIC and the GCS crew will confirm the elevation or altitude of the launch site. Using the altitude of the launch site shown on the GPS altitude indicator and then confirming the UAS AGL altimeter is set to zero on the ground before each flight is initiated. The altitude of the UAS will also be displayed via telemetry at the GS and will be constantly monitored by the PIC and GS crew during the entire flight operation.

Please note similar exemptions have been granted: 11153, 11150, 11138, 11136, 11159 and 11159.

14 CFR § 91.151(a): Fuel Requirements for Flight in VFR Conditions

Section 91.151 (a) prohibits an individual from beginning *"a flight in an airplane under VFR conditions unless (considering wind and forecast weather conditions) there is enough fuel to fly to the first point of intended landing and, assuming normal cruising speed – (1) During the day, to fly after that for at least 30 minutes; or (2) At night, to fly after that for at least 45 minutes."*

Different UAS batteries provide a range of powered flight times, depending on elevation, density altitude, wind and other environmental conditions. However, because UAS does not require landings at airports or airstrips, time in fuel as a safety buffer for go-arounds, delays for landing or diversion to another airport or airstrip is unnecessary. Applicant believes that an equivalent level of safety can be achieved by calculating flight operations to planned landing zones with sufficient power for safe landings or by maintaining 25% of reserve battery power whichever happens first. This criteria will be more than adequate to return the UAS to its planned landing zone from anywhere within the flight operations area.

Operating the UAS, without 30 minutes of reserve fuel does not engender the type of risks that Section 91.151(a) was meant to prevent given the size, weight and speed at which the UAS operates. The UAS are constructed of lightweight materials, and have no onboard pilot, passenger(s), or cargo. The risk to human life and property is extremely minimal. In the unlikely event that the UAS is drained of battery power, it would simply auto-land. Given the UAS dimensions and weight, and proven the risks are clearly less than the

risk associated with conventional aircraft represented by this regulation, an equivalent level of safety is exceeded, and an exemption from § 14 CFR 91.151 is requested.

The FAA has granted similar exemptions to others, including Exemptions 2689F, 5745, 10673, 10808, 11138, 11136, 11112, 10650, and 10159.

14 CFR § 91.405(A); 407(A)(1); 409(A)(2); 417(A): MAINTENANCE INSPECTIONS

Section 91.405(a) requires that an aircraft operator or owner *"shall have that aircraft inspected as prescribed in subpart E of this part and shall between required inspections, except as provided in paragraph (c) of this section, have discrepancies repaired as prescribed in part 43 of this chapter ..."* Section 91.407 similarly makes reference to requirements in Part 43; Section 91.409(a)(2) requires an annual inspection for the issuance of an air worthiness certificate. Section 91.417(a) requires the owner or operator to keep records of maintenance work that has been accomplished by certificated mechanics, under Part 43, or licensed pilots and records of approval for aircraft return to service.

Since UAS are small in size and cannot carry pilot/passengers, they are not considered complex mechanical equipment. UAS will operate only within flight operation areas and no higher than 400 ft AGL. If mechanical issues arise, the UAS can land immediately within the designated flight operation area. The equivalent level of safety will be achieved as UAS PIC and GS crew will ensure that UAS are in proper working order prior to initiating flight operations. This will occur through required pre-flight checks, regular UAS maintenance, and keeping a documented log of any date/ type of maintenance performed.

Similar exemptions have been granted including: 11159, 11157, 11150, 11153, 11138, 11136, 11109 and 11080.

APPENDIX C

SUMMARY OF SECTION 333 EXEMPTION REQUEST

Take Flight UAS, LLC hereby provides pursuant to Part 11 a summary of its exemption application to allow commercial operation of UAS. With petition approval, the Applicant intends to acquire and provide aerial imagery and data solutions in support of scientific research and monitoring activities as they apply to natural resource based interests and precision production agriculture. For instance these will include cropland observations (growth yields, fertilization and nutrient distribution, soils and plant moisture content, mold and blight occurrence, and pest management), irrigation water conservation methods, invasive species monitoring, geologic and geomorphic surveys, forest and rangeland health, wildlife monitoring, wildfire management, and habitat restoration. Additionally, uses of UAS include assisting in humanitarian relief efforts, emergency disaster response and Search & Rescue (SAR) operations.

The application of UAS in these instances has the ability to produce valuable and sustainable products enhancing industry and public land operations. These products will provide definitive results for improving precision production agriculture and natural resource based activities. In time, the specific benefits will provide increased crop harvest quality and quantity throughout growing areas where prudent water use and irrigation are required**.** Implementing UAS for emergency disaster and SAR operations will result in more efficient, decisive reaction plans while significantly decreasing response time. This will help to provide the

best solutions for the situation – without increasing risk to human lives. An exemption is requested from the following regulations:

14 CFR PART	SUMMARY OF REGULATION
PART 21 AIRWORTHINESS CERTIFICATION	
21, SUBPART H	CERTIFICATION PROCEDURES FOR PRODUCTS AND PARTS, AIRWORTHINESS CERTIFICATES
PART 61 CERTIFICATION: PILOTS, LIGHT INSTRUCTORS, AND GROUND INSTRUCTORS	
61.113(A)(B)	PRIVATE PILOT PRIVILEGES AND LIMITATIONS; PILOT IN COMMAND;
61.133(A)	COMMERCIAL PILOT PRIVILEGES AND LIMITATIONS
PART 91 GENERAL OPERATING AND FLIGHT RULES	
91.203(A)(B)	CARRYING CIVIL AIRCRAFT CERTIFICATION AND REGISTRATION
91.7(A)	CIVIL AIRCRAFT AIRWORTHINESS
91.9(B)(2)	CIVIL AIRCRAFT FLIGHT MANUAL IN THE AIRCRAFT
91.9(C) 45.23(B)	MARKING OF THE AIRCRAFT
91.103	PREFLIGHT ACTION
91.109(A)	FLIGHT INSTRUCTION
91.119(C)	MINIMUM SAFE ALTITUDES
91.121	ALTIMETER SETTINGS
91.151(A)	FUEL REQUIREMENTS FOR FLIGHTS IN VFR CONDITIONS
91.405(A)	MAINTENANCE REQUIRED
91.407(A)(1)	OPERATION AFTER MAINTENANCE
91.409(A)(2)	INSPECTIONS
91.417 (A)	MAINTENANCE RECORDS