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

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

August 4, 2015

Exemption No. 12326
Regulatory Docket No. FAA–2015–1473

Ms. Tiffany Javernick
uMAP, LLC.
1624 Market Street, Suite 202
Denver, CO 80202

Dear Ms. Javernick:

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 April 3 2015, you petitioned the Federal Aviation Administration (FAA) on behalf of uMAP, LLC (hereinafter petitioner or operator) for an exemption. The petitioner requested to operate an unmanned aircraft system (UAS) to acquire aerial imagery.

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 DJI Phantom 3, DJI S1000 +, Sensefly eBee, and Sensefly eBee RTK.

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, uMAP, LLC is granted an exemption from 14 CFR §§ 61.23(a) and (c), 61.101(e)(4) and (5), 61.113(a), 61.315(a), 91.7(a), 91.119(c), 91.121, 91.151(a)(1), 91.405(a), 91.407(a)(1), 91.409(a)(1) and (2), and 91.417(a) and (b), to the

[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.

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, uMAP, 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 DJI Phantom 3, DJI S1000 +, Sensefly eBee, and Sensefly eBee RTK 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 August 31, 2017, unless sooner superseded or rescinded.

Sincerely,

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

Enclosures

April 3, 2015

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

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

Dear Sir or Madam:

Pursuant with Section 333 of the FAA Modernization and Reform Act of 2012, uMAP, LLC (uMAP), a survey and aerial imagery acquisition firm, requests exemption from the following Federal Aviation Regulations (FARs) that are found under Title 14 of the Code of Federal Regulations (CFR): Part 21 Subpart H, 45.23 (b), 61.113 (a) (b), 91.7 (a), 91.9 (b), 91.103, 91.109, 91.119, 91.121, 91.151 (a), 91.203 (a) (b), Part 91 Subpart E (91.401-91.417). Such exemptions would allow uMAP to commercially operate its Small Unmanned Aircraft Systems ("sUASs) to acquire aerial imagery for various industries with respect to the strict operation conditions outlined herein or as established by the FAA as required by Section 333. The value of sUASs would provide benefits to several industries and uMAP applies for exemption to allow operations to be conducted within Limited Access Area (LAA), which are areas that are sparse in population and/or where access is limited to personnel with jobsite clearance. This will ensure that all persons near the sUAS operations will be given an operations and safety briefing of the planned sUAS operations and/or uMAP can effectively prohibit persons from entering the flight perimeter boundaries during the flight operations. Examples of LAAs are construction sites, open-pit mines, and private property.

uMAP plans to operate sUASs that are rotorcraft and fixed wing aircraft, each weighing less than 55 pounds (including payload), at speeds less than or equal to 50 knots, and at or below 400 feet AGL. The sUASs are constructed out of lightweight materials such as foam and/or plastic, do not carry flammable materials, and will be operated by a highly qualified Pilot In Command (PIC). Given these operating limitations, uMAP is confident that operations will not create a hazard to users of the National Air Space (NAS) nor to the general public and that the operation guidelines herein meet the safety that the Congress envisioned that the FAA must, by exemption, allow commercial operation of sUAS.

1. **Company Background**

uMAP, LLC.
Tiffany Javernick PH: 719-431-1262 Email: TiffanyJavernick@gmail.com

1624 Market Street, Suite 202
Denver, CO 80202

uMAP is a female owned scientific and technological services company located in Denver, Colorado that provides research, analysis, monitoring, and reporting of geographic data captured via remote sensing. uMAP is comprised of highly experienced professionals and researchers that include a private pilot with 11 years of experience, a Doctor of Philosophy (PhD) in engineering, and a published expert on cutting edge technologies that utilize aerial photography. This background makes uMAP a strong competitor in the emerging commercial sUAS market and a prime candidate to receive an exemption for sUAS operations.

2. **Statutory Authority for Exemptions**

FAA Modernization and Reform Act of 2012, Section 333

Under Section 333(a), the FAA "shall determine if certain unmanned aircraft systems may operate safety in the national airspace system before completion of the plan and rulemaking required by Section 332". Section 333 (b) of the Reform Act lists several factors that should be considered in determining which UAS could allowed to operate in the National Airspace System (NAS). Factors considered for UAS are "their size, weight, speed, operational capability, proximity to airports and populated areas, and operation within visual line of sight do not create a hazard to the users of the national airspace system or the public, or pose a threat to national security". If a UAS satisfies Section 333 (b), Section 333 (c) states that the FAA can determine "whether a certificate of waiver, certificate of authorization, or airworthiness certification under section 44704 of Title 49, United States Code, is required for the operation of unmanned aircraft systems". Therefore, if the FAA determines that UAS meets the criteria of Section 333 (b) and does not pose a hazard or threat to the public, NAS, and national security, then the FAA has the ability to allow a UAS to operate within the NAS without an airworthiness certification.

3. **Meeting the Criteria of Section 333**

The operation of sUASs by uMAP will meet all criteria specified in Section 333 (b) as described in the paragraphs below.

3.a. Size, Weight, and Speed

All sUASs operated by uMAP will be constructed of strong, yet lightweight material allowing all rotorcraft and fixed wing aircraft to be well below a weight of 55 pounds (including payload). All sUASs will be flown at or below an altitude of 400 feet AGL and at speeds below 50 knots. All sUASs will be operated within the pilot's visual line of

sight, within 1 nautical mile, and in areas with limited access. Therefore, these small, lightweight, and slow moving sUASs pose minimal to no hazard to infrastructure or persons. Compared to traditional methods of acquiring aerial photographs, the use of sUASs offer a considerable risk reduction to aircraft that weigh thousands of pounds, carry people, and are powered by flammable materials.

3.b. Operational Capability

The objective of uMAP aerial photography will be to provide our clients with high resolution georeferenced images that can be utilized for analysis including construction/mining progress and promotion, agricultural yield monitoring, and digital elevation model generation. Digital imagery data has a variety of uses and benefits to various industries, but the most compelling argument for allowing sUASs to capture such data is their ability to provide safe, cost efficient, and fast methods when compared to tradition acquisition methods and thus benefit the economy and the public interest. Prior to any flight, the PIC will complete a pre-flight checklist (Appendix A) and all flights will be conducted with a specific flight protocol (Appendix B). All sUASs will be launched and landed on-site without the need for a runway, all flights will be conducted at or below an altitude of 400 feet AGL, and within visual line of sight, and visual flight rules (VFR). Given the built-in safety of most operating sUASs and the extensive training required for all PICs (Appendix C), the safety of the aerial vehicle will provide a much safer option for aerial imaging and would pose a minimal hazard to the NAS or public.

3.c. Proximity to Airports/Populated Areas

All operations will be performed at considerable and safe distances to airports and populated areas. At a minimum, flights will be conducted 5 NM away from general aviation airports, at least 3 NM away from any populated area, and at an altitude of 400 feet AGL or less, which will prevent conflict with manned aircraft operations. Further, all operations will be conducted in LAA environments were all persons within the area of interest will have explicit information of the flight operations date, time, duration and thus operations will not pose a threat to individuals or structures on the ground and will remain well clear of any and all air traffic.

3.d. Visual Line of Sight (VLOS)

The sUASs will be flown in accordance with day Visual Flight Rules (VFR) and only in Visual Meteorological Conditions (VMC) during day-light hours. Flights will operate within 1 NM and VLOS of the PIC at an altitude 400 feet AGL or less. At this time, the applicant is not including a safety observer given that the latest *Operation and Certification of Small Unmanned Aircraft Systems* (RIN: 2120-AJ60, Federal Register NUmbner 2015-03544) proposes that an observer is not necessary. However, the applicant will comply with all requirements of the FAA's ruling and future guidelines.

4. Equivalent Level of Safety

The applicant proposes that exemption be granted to our sUAS operations that have the characteristics and that operate with the limitations listed herein. These limitations provide an equivalent or higher level of safety to operations under the current regulatory structure that already operates safe protocols followed by helicopters and conventional aircraft with the purpose of acquiring aerial imagery and survey data. Therefore, uMAP sUAS flights will be limited to the operations described in Appendix B.

5. Basis for Petition

5.a. Name and Address of the Petitioner

uMAP, LLC
1624 Market Street, Suite 202
Denver, CO 80202

5.b. Specific Sections of 14 CFR from which uMAP seeks the following exemptions:

- 14 CFR Part 21
- 14 CFR 45.23 (b)
- 14 CFR 63.113 (a) & (b)
- 14 CFR 91.7 (a)
- 14 CFR 91.9 (b)
- 14 CFR 91.103
- 14 CFR 91.109
- 14 CFR 91.119
- 14 CFR 91.121
- 14 CFR 91.151 (a)
- 14 CFR 91.203 (a) & (b)
- 14 CFR 91.405
- 14 CFR Part 91 Subpart E (91.401-91.417)
- 14 CFR 11.83

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

Part 21 Subpart H establishes the requirements for the issuance of an airworthiness certificate (FAR §91.203 (a) (1)). The applicatant requests exemption from Part 21 Subpart H pursuant with Section 333 given the size, and operational capability (Limited Area Access described above), proximity to airports and populated areas, and VLOS operations with which uMAP will operate sUASs. An equal level of safety will be achieved with the operational limitations established in this document (Appendix B) for all uMAP flights. Specifically, our sUASs flights will occur within VLOS of the PIC, at an altitude of 400 feet AGL or less, and only over designated LAAs. Further, coupling our pilots experience in the NAS and with the UAS required training (described in Appendix C) will ensure safely operations without creating a

hazard to any other aircraft, people, or structures on the ground and thus offers a safer alternative for aerial imagery collection.

5.b.2. 14 CFR 45.23 (b): Marking Requirements

45.23 (b) requires certain aircraft to display the roman capital letter "N" with registration number and the words "restricted", "light-sport", "experimental", or "provisional", as applicable, on the entrance to the cabin, cockpit, or pilot station in lettering that is between 2 inches and 6 inches in height. The sUASs operated by uMAP are unmanned and have no cabin, cockpit, pilot station, or entrance to which these required markings could be displayed. In addition, uMAP may not have a registration number assigned by the FAA, and therefore seeks full exemption from this regulation. However, uMAP proposes to comply with 45.29 (f) by placing the word "EXPERIMENTAL" in the largest possible lettering on top of the aircrafts fuselage. To ensure an equal or greater level of safety, uMAP also proposes to place a flag at the ground control station with the words "EXPERIMENTAL UAS" in 3 inch lettering. Together, the flag and sUAS marked as "EXPERIMENTAL" will serve to inform all persons within visual distance that UAS' status and operations.

5.b.3. 14 CFR 61.113 (a) & (b): Private Pilot Privileges and Limitations: Pilot in Command

Sections 61.113 (a) & (b) limit private pilots to non-commercial operations. However, since the sUASs will not carry a pilot or passengers, the proposed operations can achieve the equivalent level of safety of current operations by requiring the pilot operating the aircraft to hold a Private Pilots license and to have completed the sUAS flight training described in Appendix C. When comparing the knowledge requirements of a private pilot compared to a commercial pilot (Table C1), the results show that "required areas of knowledge for a commercial versus private pilot cover the same fundamental principles" and the "experience obtained beyond a private pilot certificate in pursuit of a commercial pilot certificate in manned flight does not necessarily aid a pilot in the operational environment proposed" (Exemption No. 11062). Further, the risk associated with manned commercial flights discussed in Part 61 will be decreased with sUAS operations since no pilot or passengers are on board, operations will be in limited to controlled and restricted areas, and all flights will be planned and coordinated in advance as set forth in the Appendix A and B.

5.b.4. 14 CFR 91.7 (a): Civil Aircraft Airworthiness

Regulation 91.7 (a) states "no person may operate a civil aircraft unless it is in an airworthy condition". Assuming that uMAP is approved exemption for airworthiness certification requested in Section 5.b.1, no FAA standard will exist for determining airworthiness. Therefore, uMAP seeks full exemption from this regulation. To

achieve an equal level of safety, prior to each flight uMAP will perform the pre-flight protocol and safety checks described in Appendix A as well as follow all comprehensive maintenance procedures established by the specific sUAS manufacturer.

5.b.5. 14 CFR 91.9 (b): Civil Aircraft Flight Manual in the Aircraft

91.9 (b) states that no person may operate an aircraft unless there is a current approved flight manual for the aircraft onboard. Since the sUASs utilized are small and lightweight, it is not physically capable of carrying an aircraft flight manual onboard. Given the sUAS is an unmanned aircraft with the PIC located at the ground control station, accessing such documents would be impossible during a flight. Therefore, uMAP requests exemption from the requirement to carry the aircraft flight manual onboard. To provide an equivalent level of safety, uMAP proposes to keep the sUASs manufactures' flight manual at the ground station and thus allowing the PIC immediate access. The FAA has issued several exemptions to this regulation and include: Exemption Nos. 8737,8738, 9299, 9299A, 9565, 9565B, 10167, 10167A, 10602, 32827, and 10700.

5.b.6. 14 CFR 91.103: Preflight Action

Regulation 91.103 requires that the PIC be familiar with specific information before each flight such as weather, forecast, and fuel requirements to ensure the safety of flight. Further, the PIC must be familiar with the information of the approved flight manual relating to aircraft performance and take-off and landing distances. Since the operated sUASs will not have fuel or a FAA-approved flight manual, uMAP requests exemption from this regulation. To achieve an equal level of safety, uMAP will perform the pre-flight actions listed in Appendix A including checking for weather conditions, checking flight battery requirements, checking takeoff and landing distances, and all other actions listed.

5.b.7. 14 CFR 91.109: Flight Instruction

Section 91.109 states that "no person may operate a civil aircraft that is being used for flight instruction unless that aircraft has fully functioning dual controls". Since all sUASs will be piloted remotely and do not have dual controls, uMAP requests exemption from this regulation. An equivalent level of safety can be achieved since pilot and passengers are not aboard the aircraft and thus the lack of dual controls does not pose a safety hazard. Further, the remote 'controls' can be passed back and forth between the Instructor and the Student, which will essentially provide the same functionality as having dual controls. Examples of exemptions the FAA has previously approved for aircraft without fully functional dual controls include: Exemption Nos. 5778K & 9862A.

5.b.8. 14 CFR 91.119: Minimum Safe Altitude

91.119 establishes safe minimum altitude to operate civil aircraft. Section 91.119 (c) specifically states that over “other than congested areas” a civil aircraft cannot operate below 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.” Section 91.119 (d) allows helicopters to be operated at less than the minimums prescribed, if the PIC of the helicopter complies with any route or altitudes prescribed for helicopters by the FAA. The functions of the uMAP’s sUASs will be to fly at low altitudes over LAAs that can be described as “other than congested areas.” All flight operations will be flown at altitudes of 400 feet AGL or less, within close proximity to the PIC to maintain visual line of sight (VLOS). Therefore, uMAP requests exemption from this regulation. An equivalent level of safety will be maintained by only operating sUASs over areas that meet our definition of Limited Access Areas, which meet the criteria of “other than congested areas.” Given the small size and lightweight airframes of sUASs, these alternative aerial platforms offer a significant risk reduction to persons and structures on the ground than a manned aircraft providing the same service. Further, by operating the sUASs at or below 400 feet AGL, uMAP will ensure that conflicts will be avoided between manned aircraft that are subject to the minimum safe altitude regulation of 91.119 and thus provide an equal or greater level of safety.

5.b.9. 14 CFR 91.121: Altimeter Settings

Regulation 91.121 requires aircraft to maintain cruising altitude by reference to a current reported altimeter that is set "... to the elevation of the departure airport or an appropriate altimeter setting available before departure." Since the sUASs operated may not have a barometric altimeter, uMAP requests exemption from this regulation. However, all sUASs operated by uMAP will be equipped with GPS that will provide both an initial altitude of the launch site prior to flight operations as well as real time GPS altitude readings during the flight that are visible to the PIC, which will ensure that flights at and below 400 feet AGL. Prior to any flight, a separate handheld barometer will be utilized to check that the GPS altitude accuracy is within a tolerable range. This will ensure a level of safety equal to the regulation 91.121. Further details about uMAP’s altitude can be found in the pre-flight operations of Appendix A, and the flight protocol of Appendix B.

5.b.10. 14 CFR 91.151 (a): Fuel Requirements for Flight in VFR Conditions

Regulation 91.151 (a) outlines fuel requirements for flights in VFR conditions and states that no person may begin a flight in Day VFR conditions unless there is enough fuel to fly to the intended landing point and fly for 30 minutes after that

point is reached. Since the operated sUASs are battery operated and will not carry fuel, uMAP requests an exemption from 91.151 (a). Since most sUASs batteries will be exhausted after flights between 20 to 45 minutes (depending on the sUAS model), a 30 minute reserve would leave minimal, if any, operational flight time. Instead, uMAP proposes to operate its sUASs until the battery reaches 20% of its power (as determined by the onboard monitoring system and the PIC). Such an operation guideline will ensure that the sUASs will have plenty of battery to return to the launch site safely; however, one major advantage of a sUAS is that unlike manned aircraft it can easily and safely land anywhere over a Limited Access Areas in which its operations are limited to. Similar exemptions have been granted to other operations, including Exemptions 2689F, 5745,10673, and 10808.

5.b.11. 14 CFR 91.203 (a) & (b): Carrying civil aircraft certification and registration

Regulation 91.203 requires all civil aircraft to have within "...an appropriate and current airworthiness certificate" which must be "displayed at the cabin or cockpit entrance so that is legible to passengers or crew." As requested in Section 5.b.1, uMAP is already seeking exemption from the airworthiness certificate regulation and thus requires an exemption from this regulation. Further, since the small size and design of sUASs do not provide cabin or cockpit, there is no ability to carry passengers or certification and registration documents. To provide an equal level of safety, uMAP proposes keep these documents at the ground flight control point where the PIC will have immediate access, to the extent they are applicable to the sUAS. Numerous exemptions to this regulation have been granted and include: Exemption Nos. 9565, 9665, 9789, 9789A, 9797, 9797A, 9816A, and 10700.

5.b.12. Part 91 Subpart E (91.401-91.417): Maintenance, Preventative Maintenance and Alterations

These regulations outline the requirements for maintenance and inspections in reference to Part 39 and Part 43. 91.405 (a), which states that "no person may perform maintenance, preventive maintenance, and alterations on an aircraft other than as prescribed in this subpart and other applicable regulations, including part 43 of this chapter." Since these sections apply to only aircraft with an airworthiness certificate, for which uMAP has applied for exemption (Section 5.b.1), uMAP also seeks full exemption from these regulations. Prior to any flight, the PIC will be responsible for conducting pre-flight inspections and will following all inspection requirements specified by the manufacturer of the utilized sUAS. Further details can be found in Appendix A.

Preventative maintance and corrective maintance will be conducted by the manufacture if so stated by the manufactures' guidelines. However, in instances that the manufacture does not require maintance to be performed by the manufacturer, then the PIC will be responsible for conducting maintenance in

accordance with the manufactures procedures and all maintenance performed by the PIC and/or manufacturer will be documented in accordance with 91.407 (a) (1). Specifically, records will include "a description of the work performed; and the date of completion of the work performed; and the signature of the person approving the aircraft for return to service." Further, uMAP will ensure that no modifications or alterations are made to the airframe that affects the flight operating characteristics of the sUAS. These proposals are considered to be an equivalent level of safety since these sUASs are very limited in size and will carry a small payload and operate only in restricted areas for limited periods of time. In the event that mechanical issues arise, the sUAS can land immediately and will be operating from no higher than 400 feet AGL.

6. Benefits to the Public

Approval of the above exemptions and commercial operation of sUASs by uMAP will benefit the public in the following four ways.

1) The commercial use of sUASs to acquire aerial photographs will reduce the need for manned aircraft operating in the NAS. With the skies of America becoming busier and Air Traffic Control (ATC) workloads overburdened, the use of sUASs will offer some relief to ATC since coordination during ground, take-off, departure, transit, arrival, and landing phases of flights is not necessary.
2) Reduced manned aircraft will reduce air and noise pollution. Since all sUASs operated by uMAP will be lightweight and battery powered, these sUASs electric motors operate much quieter than manned aircraft and do not burn fossil fuels. Typically, aerial photography is captured by twin engine fixed wing aircrafts that burn between 20 to 30 gallons of fuel per hour and can require significant travel time before reaching the intended area of interest. However, acquiring aerial imaging with sUASs can takeoff and land on site and would greatly reduce both air pollution and noise pollution which is of great benefit to the public.
3) Operating sUASs for the purpose of aerial photography also reduces the risk to life and property on the ground. When compared to a twin engine airplanes, sUASs' size, weight, slow speed, and lack of flammable liquids are considerably less dangerous to people and/or structures on the ground.
4) Operations of sUASs offer an effective, affordable, and safe method to acquire aerial photography to many business industries such as mining, construction, and agriculture. Such cost efficiencies and improved knowledge from available data will result in greater business efficiency and thus the potential for economic growth for such industries. These high-resolution imagery data generated from sUAS flights can help mines and construction sites monitor progress, plan and design future improvements/work, and aid in site surveys in both two-dimensional maps and three-dimensional terrain models. Further, farmers and scientists can use this aerial data to estimate biomass, yield monitoring, leaf area indexing, and overall crop health. In all, this data will provide the information necessary for businesses of today to thrive in the future and thus in the publics' interest.

7. **Summary for Federal Register**

Pursuant to with Section 333 of the FAA Modernization and Reform Act of 2012, uMAP LLC requests exemption from the following Federal Aviation Regulations that are found under Title 14 of the Code of Federal Regulations: Part 21 Subpart H, 45.23 (b), 61.113 (a) (b), 91.7 (a), 91.9 (b), 91.103, 91.109, 91.119, 91.121, 91.151 (a), 91.203 (a) (b), Part 91 Subpart E (91.401-91.417). Exemption from these regulations would allow uMAP, LLC to operate small unmanned vehicle (of 55 pounds or less) in areas with limited and controlled access for the purpose of providing high-resolution aerial imagery.

APPENDIX A: Pre-flight protocol

This section is divided into two areas of i) 24 hours prior to flight and ii) an immediate pre-flight inspection checklist.

1) 24 hours prior to flight:
   - Prior to a sUAS flight, an area of operation will be established. This area of operation will include a defined lateral and vertical area, where the sUAS will operate. Safety procedures will be established for persons, property, and applicable airspace within the area of operation.
   - Flights will be operated within line of sight of the PIC.
   - The sUAS will weigh less than 55 lbs total.
   - Flights will be operated in Class G airspace whenever possible. lf operation in other airspace is required, the relevant controlling agency will be notified at least 24 hours prior to the operation and, if required, any necessary permission obtained.
   - Flight planning will include flight completion with at least 20% battery power remaining as measured by the sUAS or appropriate timing.
   - lf equipped, and appropriate for the operation, sUAS aircraft will utilize GPS navigation, failsafe, return-to-home (RTH) and/or flight abort safety features.
   - A briefing will be conducted in regard to the planned sUAS operations 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. Therefore, images taken will be of individuals who have also consented to being photographed or otherwise have agreed to be in the area where aerial photography will take place.
   - All required permissions and permits will be obtained from appropriate state, county or city jurisdictions, including local law enforcement, fire, or others appropriate governmental agencies.
   - Written, to include electronic, and/or oral permission from the relevant property owners will be obtained prior to an operation.
   - All employees working on-site will be thoroughly briefed on sUAS operations prior to operations commencing

2) Pre-flight inspection checklist

The pre-flight checklist/inspection will follow the specific pattern and sequence before each flight.

A. Ground station setup:
   I. Place the “EXPERIMENTAL” flag near the area of PIC
   II. Visually scan the area of operation for any unforeseen hazards, persons, or infrastructure
   III. Check that all relevant documents are on site and within easy access. These include:
      i. PIC’s pilot license and medical certificate
      ii. Proof of company’s FAA exemptions
      iii. sUAS manufacturer’s flight manual
      iv. All maintenance records

B. Pre-start sUAS inspection checklist
   I. Check to ensure the sUAS power is “OFF”
   II. Battery
      i. Check sUAS batter is fully charged
      ii. Check the hand-held controller’s battery is fully charged
   III. Visually inspect the following
      i. All propeller blades are free of damages
      ii. All propeller blades are securely attached to the sUAS
      iii. All surfaces are free from damages
      iv. Antenna is undamaged

C. Pre-flight inspection checklist
   I. Turn on the controller and sUAS battery
      i. Ensure that all available system read-outs are clearly displayed on the controller and within normal range
      ii. Test the functionality and free movement of:
         1. Propulsion blade(s)
         2. Ailerons (if applicable)
         3. Check the GPS altitude reading of the sUAS is within range of a separate hand held barometer.
   II. Test flight
      i. Prior to flying the sUAS for commercial purposes, the aircraft must successfully demonstrate a successful flight of approximately one minute in duration, in a small area free from any hazards, persons, and property and at an elevation at or below 10 feet AGL.

APPENDIX B: Flight protocol

Safety is the first and foremost concern of uMAP. Therefore, the following outlines the limitations and conditions which will govern all commercial operations conducted by uMAP PIC in lieu of the approved FAA exemptions and all aircraft will be limited to the specifications of Appendix D.

- The sUAS will be less than 55 pounds (including payload)
- All sUAS flights will be piloted by an FAA licensed airman with at least a Private Pilot certificate and who will have completed the training outlined in Appendix C.
- The sUAS FAA licensed airman will be considered Pilot in Command (PIC), whether flying or supervising, and will be responsible for safe operation of the flight.
- The sUAS will operate at or below 400 feet AGL
- No flight will be conducted if wind speeds are in excess of 20 mph.
- The sUAS will operate within 1 NM and within visual line of sight (VLOS) of the PIC
- The duration of each flight shall not exceed 20% of the sUAS battery's power or a maximum total flight time of 30 minutes, whichever occurs first.
- All take-off and landings will occur on-site in accordance with the specifications of the sUAS manufacture's User Manual
- Flights will avoid direct overflight of any office or maintenance buildings located on-site
- Flights will be cancelled in the event that any aircraft or ground control station equipment is inoperative or not fully functional
- Flights will be operated under visibility and cloud clearance requirements equivalent to Visual Flight Rules (VFR) and only in Visual Meteorological Conditions during daylight hours
- If the PIC identify a potential hazard, such as a manned aircraft within close proximity to the designated flight area, the PIC will immediately land the sUAS and operations will only resume after the hazard is clear of the area
- Only one sUAS will be airborne at any given time over a specific site, and at least 2NM away from any other sUAS operation.
- Minimum crew for each operation will consist of the sUAS PIC. An observer is not specified since all operations will be limited to visual line of sight (VLOS) operations and that the recent proposals of the 'Operation and Certification of Small unmanned Aircraft Systems' (RIN: 2120-AJ60, Federal Register Number: 2015-03544) does not require such an observer. However, if the FAA decides in this exemption request, or in future regulations that a flight observer is necessary, than uMAP will comply.
- The sUAS PIC will establish a working relationship with a representative at the local FSDO with which to annually review safety procedures and other operations to further enhance safety.
- All operations will be confined to a Limited Access Area (LAA), which are areas that are sparse in population and/or where access is limited to personnel with jobsite clearance. This will ensure that all persons near the sUAS operations will be given an operations and safety briefing of the planned sUAS operations and/or uMAP can effectively prohibit persons from entering the flight perimeter boundaries during the flight operations.

APPENDIX C: Pilot training protocol

With safety the highest priority, proper sUAS flight training is imperative. While uMAP seeks highly qualified pilots who have extensive knowledge within the NAS, operations of sUAS are unique to manned aircraft as well as to other types of sUAS. Therefore, the following pilot training is required in addition to at least a Private Pilots Certificate.

- The PIC must possess a Private Pilot's Certificate and a valid third-class medical certificate
- The PIC must have accumulated and logged a minimum of 200 flight cycles and 25 hours of total time as a UAS rotorcraft pilot and at least 10 hours logged as a UAS pilot with a similar UAS type (single blade or multirotor).
- The PIC must have accumulated and logged a minimum of five hours as UAS pilot with the make and model of UAS to be utilized for operations under the exemption and three take-offs and landings in the preceding 90 days.
- The PIC will be trained in advance for the safe operation of the sUAS to be operated. This will include operation of the sUAS both in normal and emergency modes of operation, and will include familiarization with the operation manual (or similar) if published by the sUAS manufacturer. Training will also include types of maneuvers to be performed and the safe operation in relation to persons, property and applicable airspace.
- Further, the PIC must have also satisfied any additional qualifications/training/experience that are required by the sUASs manufacturer (i.e. flight operations and procedures manual).

At this time, uMAP does not require pilots to hold a Commercial Pilot Certificate. As shown below in Table C1, the overall knowledge of a Private Pilot vs. a Commercial Pilot is sufficient for the flight maneuvers required for sUAS operations.

Table C1: Private pilot vs. Commercial Pilot knowledge (Taken from Exemption No. 11062).

Commercial Knowledge	Private Knowledge
****Airplane Single Engine Land (ASEL) used for comparison****	
§ 61.125 Aeronautical knowledge. *(a) General.* A person who applies for a commercial pilot certificate must receive and log ground training…	**§ 61.105 Aeronautical knowledge.** *(a) General.* A person who is applying for a private pilot certificate must receive and log ground training…
(b) **Aeronautical knowledge areas.**	(b) **Aeronautical knowledge areas.**
(1) Applicable Federal Aviation Regulations of this chapter that relate to commercial pilot privileges, limitations, and flight operations;	(1) Applicable Federal Aviation Regulations of this chapter that relate to private pilot privileges, limitations, and flight operations;
(2) Accident reporting requirements of the National Transportation Safety Board;	(2) Accident reporting requirements of the National Transportation Safety Board;
(3) Basic aerodynamics and the principles of flight;	(10) Principles of aerodynamics, powerplants, and aircraft systems;
(4) Meteorology to include recognition of critical weather situations, windshear recognition and avoidance, and the use of aeronautical weather reports and forecasts;	(6) Recognition of critical weather situations from the ground and in flight, windshear avoidance, and the procurement and use of aeronautical weather reports and forecasts;

Table C1 continued.

Commercial Knowledge	Private Knowledge
****Airplane Single Engine Land (ASEL) used for comparison****	
(5) Safe and efficient operation of aircraft;	(7) Safe and efficient operation of aircraft, including collision avoidance, and recognition and avoidance of wake turbulence;
(6) Weight and balance computations;	(9) Weight and balance computations;
(7) Use of performance charts;	(8) Effects of density altitude on takeoff and climb performance;
(8) Significance and effects of exceeding aircraft performance limitations;	**Related to other areas within the private requirements but not referenced specifically**
(9) Use of aeronautical charts and a magnetic compass for pilotage and dead reckoning;	(4) Use of aeronautical charts for VFR navigation using pilotage, dead reckoning, and navigation systems;
(10) Use of air navigation facilities;	(4) Use of aeronautical charts for VFR navigation using pilotage, dead reckoning**, and navigation systems**; (5) Radio communication procedures;
(11) Aeronautical decision making and judgment;	(12) Aeronautical decision making and judgment; and
(12) Principles and functions of aircraft systems;	(10) Principles of aerodynamics, powerplants, and aircraft systems;
(13) Maneuvers, procedures, and emergency operations appropriate to the aircraft;	(7) Safe and efficient operation of aircraft, including collision avoidance, and recognition and avoidance of wake turbulence; (11) Stall awareness, spin entry, spins, and spin recovery techniques for the airplane and glider category ratings;
(14) Night and high-altitude operations; **	**Although not mentioned in § 61.105, 3 hours of night flight training is required for the private per § 61.107 and § 61.109. For this comparison, high-altitude operations are considered not applicable.**
(15) Procedures for operating within the National Airspace System; and	(3) Use of the applicable portions of the "Aeronautical Information Manual" and FAA advisory circulars; (13) Preflight action that includes— (i) How to obtain information on runway lengths at airports of intended use, data on takeoff and landing distances, weather reports and forecasts, and fuel requirements; and (ii) How to plan for alternatives if the planned flight cannot be completed or delays are encountered.
(16) Procedures for flight and ground training for lighter-than-air ratings.**	**For this comparison (ASEL), these operations are considered not applicable.**
§ 61.127 Flight proficiency. (a) *General.* A person who applies for a commercial pilot certificate must receive and log **ground** and flight training	**§ 61.107 Flight proficiency.** (a) *General.* A person who applies for a private pilot certificate must receive and log **ground** and flight training
(b) *Areas of operation.* (1) For an airplane category rating with a single-engine class rating:	(b) *Areas of operation.* (1) For an airplane category rating with a single-engine class rating:
(i) Preflight preparation;	(i) Preflight preparation;

Table C1 continued.

Commercial Knowledge	Private Knowledge
****Airplane Single Engine Land (ASEL) used for comparison****	
(ii) Preflight procedures;	(ii) Preflight procedures;
(iii) Airport and seaplane base operations;	(iii) Airport and seaplane base operations;
(iv) Takeoffs, landings, and go-arounds;	(iv) Takeoffs, landings, and go-arounds;
(v) Performance maneuvers;	(v) Performance maneuvers;
(vi) Ground reference maneuvers;	(vi) Ground reference maneuvers;
(vii) Navigation;	(vii) Navigation;
(viii) Slow flight and stalls;	(viii) Slow flight and stalls;
(ix) Emergency operations;	(x) Emergency operations;
(x) High-altitude operations; and	**For this comparison, high-altitude operations are considered not applicable.**
(xi) Postflight procedures.	(xii) Postflight procedures.
Not referenced specifically	(ix) Basic instrument maneuvers;
Not referenced specifically	(xi) Night operations, except as provided in §61.110 of this part; and

APPENDIX D: Utilized aircraft

At this time, uMAP does not own sUASs for commercial operation and has not specified the particular aircrafts in which will be operated. Instead, uMAP has specified that both rotorcraft and fixed wing UAS systems will be within our fleet of operating aircraft. With the emerging technologies of UAS growing rapidly and becoming more affordable, it would benefit uMAP to have the liberty to utilize various aircraft and to have the ability to upgrade without regard to the particular exemption status. In order to provide as much aircraft detail as possible, uMAP will be limited to the aircraft that meet the following specifications:

- All aircraft (rotor and fixed wing) will:
    - Have a weight less than 55 lbs
    - Operate at speeds slower than 50 knots
    - All equipment mounted to the aircraft(s) will be performed by the manufacturer
    - All aircraft will be products of reputable companies with at least 3 years of operation (e.g. SenseFly, DJI, Aeryon, Trimble, Skycatch, etc.).
    - All aircraft will use radio frequency that comply with the Federal Communications Commission requirements. As a general rule, flight controls and data links will not interfere with manned aircraft communication and radio frequencies will range between 900 mhz and 5.8 ghz.
    - Be able to safely operate in wind conditions greater than 20 mph.
    - Have proven and built in safety features. These can include, but are not limited to:
        - Emergency landing
        - Return to 'Home'
        - Restart propeller
        - Ground proximity detection
        - Self-monitoring capabilities such as battery levels, wind speeds, etc.