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

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

July 28, 2015

Exemption No. 12210
Regulatory Docket No. FAA–2015–1890

Mr. David A. Floyd, PLS
David Floyd and Associates Surveying
and Mapping dba Floyd Surveying
34006 Galleron Street
Temecula, CA 92592

Dear Mr. Floyd:

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 May 10, 2015, you petitioned the Federal Aviation Administration (FAA) on behalf of David Floyd & Associates Surveying and Mapping dba Floyd Surveying (hereinafter petitioner or operator) for an exemption. The petitioner requested to operate an unmanned aircraft system (UAS) to conduct aerial land surveying and geospatial 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 DJI Professional S900 and DJI Phantom 2.

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, David Floyd & Associates Surveying and Mapping dba Floyd Surveying is granted an exemption from 14 CFR §§ 61.23(a) and (c), 61.101(e)(4) and (5), 61.113(a), 61.315(a), 91.7(a), 91.119(c), 91.121, 91.151(a)(1), 91.405(a), 91.407(a)(1), 91.409(a)(1) and (2), and 91.417(a) and (b), to the extent necessary to allow the petitioner to operate a UAS to perform aerial data collection. This exemption is subject to the conditions and limitations listed below.

[1] Aerial data collection includes any remote sensing and measuring by an instrument(s) aboard the UA. Examples include imagery (photography, video, infrared, etc.), electronic measurement (precision surveying, RF analysis, etc.), chemical measurement (particulate measurement, etc.), or any other gathering of data by instruments aboard the UA.

Conditions and Limitations

In this grant of exemption, David Floyd & Associates Surveying and Mapping dba Floyd Surveying 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 Professional S900 and the DJI Phantom 2 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 July 31, 2017, unless sooner superseded or rescinded.

Sincerely,

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

Enclosures

FLOYD SURVEYING

May 10, 2015

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

RE: David Floyd & Associates Surveying and Mapping dba Floyd Surveying
Petition for Section 333 Exemption for DJI S900 & DJI PHANTOM 2.

Dear Sir or Madam:

Pursuant to Section 333 of the FAA Modernization and Reform Act of 2012, Pub. L. No. 112-95, 126 Stat. 11 (amending 49 U.S.C.) (hereinafter, the "Reform Act") and 14 C.F.R. Part 11, David Floyd & Associates Surveying and Mapping dba Floyd Surveying ("FSI"), Land Surveyor and operator of small unmanned aircraft systems "UAS" equipped to conduct professional aerial land surveying and geospatial services, hereby applies for an exemption from the listed Federal Aviation Regulations ("FARs") to allow commercial operation of its UAS's, so long as such operations are conducted within and under the conditions outlined herein or as may be established by the FAA as required by Section 333 of the Reform Act.

As described more fully below, the requested exemption would permit the operation of small, unmanned UAS to provide safer enhancements to the already safe operations in the mapping and surveying industry presently using conventional aircraft. Approval of this exemption would thereby enhance safety and fulfill the Secretary of Transportation's responsibilities to "... establish requirements for the safe operation of such aircraft systems in the national airspace system." *Reform Act §* 333 (c).

FSI has specialized in Surveys for the Wireless community for over 15 years. Surveying in both rural and urban environments. It is the urban environment that poses the greatest threat to our wellbeing / safety and thus it is in that environment that we see the greatest good from the use of UAS's. OSHA currently requires safety harnesses and ties to be in place for any worker on a roof with a parapet less than 3 feet tall. Many new wireless facilities are being reviewed for such roofs and thus pose a safety concern to our employees. The use of our UAS's in commercial/residential areas will only provide a safer environment for our survey crews.

Surveyors have for almost a Century used the air space above homes, business and land in general to perform our duties to gather property information and ground data for government, home, land and business owners. No permission is currently required from adjacent owners to perform this work if using a manned airplane (weighing over 4,000 lbs. and caring combustion able fuel). We would like it to be the same for our UAS's. The U.S. Supreme Court has declared (United States v. Causby 1946) "the air above the minimum safe altitude of flight…is a public highway and part of the public domain". As licensed surveyor's we work in the public right of way every day and do not ask permission of adjacent owners if we can use our equipment near their home. Further, in the State of California there is a State Statue (Business and Professions Code &8774, Civil Code &846.5 and Penal Code &602.8) that gives Land Surveyors the Right of Entry upon property without their consent but only with notification. We ask that FAA allow FSI to fly its UAS's in any location you would let a manned aircraft.

28936 Old Town Front Street, Ste 203, Temecula, CA 92590 Phone (951) 694-8647
Email: fsi@floydsurveying.com

The name and address of the applicant ("Applicant") is:

David Floyd & Associates Surveying and Mapping dba Floyd Surveying
Attention: David A. Floyd, pls
34006 Galleron Street
Temecula, CA 92592
Telephone: (949) 200-0626
Email: dfloyd@floydsurveying.com

The Applicant hereby requests exemption from the following FARs:

14 CFR Part 21
14 C.F.R. 45.23(b)
14 CFR 61.113 (a) & (b)
14 C.F.R. 91.7 (a)
14 CFR 91.9 (b) (2)
14 C.F.R. 91.103
14 C.F.R. 91.109
14 C.F. R. 91.119
14 C.F.R. 91.121
14 CFR 91.151 (a)
14 CFR 91.203 (a) & (b)
14 CFR 91.405 (a)
14 CFR 407 (a) (1)
14 CFR 409 (a) (1) & (2)
14 CFR 417 (a) & (b)

This exemption application is expressly submitted to fulfill Congress' goal in passing Section 333(a) through (c) of the Reform Act. This law directs the Secretary of Transportation to consider whether certain unmanned aircraft systems ("UAS") may operate safely in the national airspace system ("NAS") before completion of the rulemaking required under Section 332 of the Reform Act. In making this determination, the Secretary of Transportation is required to determine which types of unmanned aircraft systems do not create a hazard to users of the NAS or the public or pose a threat to national security in light of (i) the UAS's size, weight, speed, and operational capability, (ii) operation of the UAS in close proximity to airports, and (iii) operation of the UAS within visual line of sight of the operator. *Id.* § 333 (b) (1). Lastly, if the Secretary of Transportation determines that such vehicles "may operate safely in the national airspace system, the Secretary of Transportation shall establish requirements for the safe operation of such aircraft in the national airspace system." *Id.* § 333 (c) (underline added).[1]

The Federal Aviation Act, 49 U.S.C. (the **"Act")** expressly grants the FAA the authority to issue exemptions. This statutory authority by its terms includes exempting "civil aircraft," as the term is defined under §40102 of the Act that includes UAS's from the requirement that all civil aircraft must have a current airworthiness certificate.

The FAA Administrator may grant an exemption from a requirement of a regulation prescribed under the Act if the Administrator finds the exemption in the public interest. 49 U.S.C. § 44701 (f). *See also* 49 USC § 44711 (a); 49 USC § 44704; 14 CFR § 91.203 (a) **(1).**

FSI's UAS's are rotorcraft, weighing 55 or fewer lbs. including payload. They will operate, under normal conditions, at a speed of no more than 50 knots and FSI will not operate their UAS in known or forecast winds greater than 35 knots. They will operate only in line of sight of the Pilot in Charge (PIC). Such operations will ensure that the UAS's will, "not create a hazard to users of the national airspace system or the public." Reform Act 333 (b).

Given the small size of the UAS's involved and the lack of flammable fuel, the Applicant falls squarely within that zone of safety (an equivalent level of safety) in which Congress envisioned that the FAA must, by exemption, allow commercial operations of UAS's to commence immediately. Also due to the size of the UAS's, approval of the application presents no national security issue. Given the clear direction in Section 333 of the Reform Act, the authority contained in the Act, as amended; the strong equivalent level of safety surrounding the proposed operations, and the significant public benefit, including enhanced safety, reduction in environmental impacts, including reduced emissions associated with allowing UAS for surveying and mapping operations, the grant of the requested exemption is in the public interest. Accordingly, the Applicant respectfully requests that the FAA grant the requested exemption without delay.

The Applicant proposes that the exemption requested herein apply to civil aircraft that have the characteristics and that operate with the limitations listed herein. These limitations provide for at least an equivalent or even higher level of safety to operations under the current regulatory structure because the proposed operations represent a safety enhancement to the already safe mapping and surveying operations conducted with conventional aircraft.

These limitations and conditions to which FSI agrees to be bound when conducting commercial operations under an FAA issued exemption include:

1. Each UAS will weigh less than 55 lbs.

2. Flights will be operated within line of sight of a pilot and/or observer.

3. Maximum total flight time for each operational flight will be determinate on battery capacity. Current battery technology for the UAS allows for a 20 minute operations. Should battery technology increase operational flight times, flights will be terminated at 20% battery power reserve. Future battery technology will likely increase operational flight times, and as such, the maximum flight time will continue to increase. However, in any event, all operational flights will be terminated at 20% of capacity remaining.

4. Flights will be operated at an altitude of no more than 400 feet AGL unless prior approval from Air Traffic Control is authorized and a Notice to Airmen (NOTAM) is filed and published.

5. Minimum crew for each operation will consist of the UAS pilot and a visual observer.

6. The UAS pilot will be Pilot in Command ("PIC").

7. The UAS pilot will have been trained in operation of UAS's generally and received up-to-date information on the particular UAS to be operated.

8. All required permissions and permits will be obtained from territorial, state, county or city jurisdictions, including local law enforcement, fire, or other appropriate governmental agencies.

9. If the UAS's lose communications or lose their GPS signal, the UAS's will have capability to return to and land at a pre-determined and pre-programmed location.

10. The UAS's will have the capability to abort a flight in case of unpredicted obstacles or emergencies.

Aircraft to be used:

The DJI professional S900 and DJI Phantom 2 Aircraft are small all-electric drone that provides precision 3D mapping, real-time thermal infrared and high definition video capabilities. The systems deploy quickly in nearly every environment due to their light weight. The S900 and Phantom 2 have been previously approved for use by the FAA.

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

Subpart H, entitled Airworthiness Certificates, establishes the procedural requirements for the issuance of airworthiness certificates as required by FAR § 91.203 (a) (1). Given the size and limited operating area associated with the aircraft to be utilized by the Applicant, an exemption from Part 21 Subpart H meets the requirements of an equivalent level of safety under Part 11 and Section 333 of the Reform Act. Section 44701 (t) of the Act and Section 333 of the Reform Act both authorize the FAA to exempt aircraft from the requirement for an airworthiness certificate upon consideration of the size, weight, speed, operational capability, and proximity to airports and populated areas of the particular UAS. In all cases, an analysis of these criteria demonstrates that the UAS's operated without an airworthiness certificate, in the restricted environment and under the conditions proposed herein will be at least as safe, or safer, than a conventional aircraft (fixed wing or rotorcraft) operating with an airworthiness certificate without the restrictions and conditions proposed.

The UAS's to be operated hereunder are less than 55 lbs. fully loaded, carries neither a pilot nor passenger, carries no explosive materials or flammable liquid fuels, and operates exclusively within a secured area as set out in the Safety Checklist. Unlike other civil aircraft, operations under this exemption will be tightly controlled and monitored by the Applicant pursuant to the Safety Checklist's requirements, and under the requirements and in compliance with local public safety requirements, to provide security for the area of operation as is now done with conventional aerial mapping and surveying. These safety enhancements, which already apply to civil aircraft operated in connection with mapping and surveying operations, provide a greater degree of safety to the public and property owners than conventional operations conducted with airwo1thiness certificates issued under 14 C.F.R. Part 21, Subpart H. Lastly, application of these same criteria demonstrates that there is no credible threat to national security posed by the UAS, due to its size, speed of operation, location of operation, lack of explosive materials or flammable liquid fuels, and inability to carry a substantial external load.

II. 14 C.F.R. § 45.23 (b). Marking of the Aircraft

This regulation requires:

> "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."

Even though the UAS's will have no airworthiness certificate, an exemption may be needed as the UAS's will have no entrance to the cabin, cockpit or pilot station on which the word "Experimental" can be placed. Given the size of the UAS's, two-inch lettering will be impossible. The FAA has issued the following exemptions to this regulation in Exemptions Nos. 10700, 8738, 10167 and 10167A.

III. 14 C.F.R. § 61.113 (a) & (b): Private Pilot Privileges and Limitations: Pilot in Command

Sections 61.113 (a) & (b) limit private pilots to non-commercial operations. Because the UAS's will not carry a pilot or passengers, the proposed operations can achieve the equivalent level of safety of current operations by requiring the PIC's operating the UAS's to have a private pilot's license rather than a commercial pilot's license to operate this UAS's. Unlike a conventional aircraft that carries the pilot and passengers, the UAS's are remotely-controlled with no living thing on board. The area of operation is controlled and restricted, and all flights are planned and coordinated in advance. The risks associated with the operation of the UAS's are so diminished from the level of risk associated with commercial operations contemplated by Part 61 when drafted, that allowing operations of the UAS's as requested with a private pilot as the PIC exceeds the present level of safety achieved by 14 C.F.R. §61.113 (a) & (b).

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

The regulation requires that no person may operate a civil aircraft unless it is in airworthy condition. As there will be no airworthiness certificate issued for the aircraft, should this exemption be granted, no FAA regulatory standard will exist for determining airworthiness. Given the size of the aircraft and the requirements contained in the Safety Checklist for maintenance and use of the Safety Checklist prior to each flight, an equivalent level of safety will be provided.

V. 14 C.F.R. § 91.9 (b) (2): Civil Aircraft Flight Manual in the Aircraft

Section 91.9 (b) (2) provides:

> "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's, given their size and configuration have no ability or place to carry such a flight manual on the aircraft, not only because there is no pilot on board, but because there is no room or capacity to carry such an item on the UAS's.

The equivalent level of safety will be maintained by keeping the flight manual at the ground control point to which the UAS's pilots flying the UAS's will have immediate access. The FAA has issued the following exemptions to this regulation: Exemption Nos. 8607, 8737, 8738, 9299, 9299A, 9565, 9565B, 10167, 10167A, 10602, 32827, and 10700.

VI. 14 C.F.R. § 91.103: Preflight action

This regulation requires each pilot in command to take certain actions before flight to insure the safety of flight. As FAA-approved rotorcraft flight manuals will not be provided for the aircraft.

An exemption will be needed. The PIC will take all actions including reviewing weather, flight battery requirements, landing and takeoff distances and aircraft performance data before initiation of flight.

VII. 14 C.F.R. § 91.109: Flight instruction

Section 91.109 provides 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's and remotely piloted aircraft, by their design do not have fully functional dual controls. Flight control is accomplished through the use of a control box that communicates with the aircraft via radio communications. 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. 5778K & 9862A. The equivalent level of safety is provided by the fact that neither a pilot nor passengers will be carried in the aircraft and by the size and speed of the aircraft.

VIII. 14 C.F.R. § 91.119: Minimum safe altitudes

Section 91.119 establishes safe altitudes for operation of civil aircraft. Section 91.119(d) allows helicopters, powered parachutes and weight-shift-control aircraft to be operated at less than the minimums prescribed because their low speed and responsive controls allow operations to be conducted, "without hazard to persons or property on the surface ...".As UAS possess similar flight and control characteristics, and as the exemption requests authority to operate at altitudes up to 400 AGL, an exemption may be needed to allow such operations. As set forth herein, except for the limited conditions stated in the Safety Checklist, the UAS's will never operate at higher than 400 AGL.

Compared to flight operations with aircraft or rotorcraft weighting far more than the maximum 55lbs. proposed herein and the lack of flammable fuel, any risk associated with these operations is far less than those presently presented with conventional aircraft operating at or below 500 AGL in the mapping and surveying industry. In addition, the low-altitude operations of the UAS's will ensure separation between these UAS operations and the operations of conventional aircraft that must comply with Section 91.119.

IX. **14 C.F.R. § 91.121 Altimeter Settings**

This regulation requires each person operating an aircraft to maintain cruising altitude by reference to an altimeter that is set "... to the elevation of the departure airport or an appropriate altimeter setting available before departure." As the UAS's may not have a barometric altimeter, but instead a GPS altitude read out, an exemption may be needed. An equivalent level of safety will be achieved by the operator confirming the altitude of the launch site shown on the GPS altitude indicator before flight.

X. 14 C.F.R. § 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."

The current battery technology powering UAS's is much more limited than that of combustion powered flight. As such, the Applicant's UAS's cannot presently and likely may never will meet the reserve requirement in 14 CPR § 91.151. Given the limitations on the UAS's proposed flight area and the location of its proposed operations within a predetermined area, a longer time frame for flight in daylight VFR conditions is reasonable. As no night flight will occur, that portion is inapplicable.

Applicant believes that an exemption from 14 CPR § 91.151 (a) falls within the scope of prior exemptions. *See* Exemption 10673 (allowing Lockheed Martin Corporation to operate without compliance with FAR 91.151 (a)). Operating the UAS's in a tightly controlled area where only people and property owners or official representatives who have signed waivers will be allowed, with less than 30 minutes of reserve fuel, does not engender the type of risks that Section 91.151 (a) Was intended to alleviate given the size, speed and limited operating area of the UAS's.

Applicant believes that an equivalent level of safety can be achieved by limiting flights based on expected battery life, currently 20 minutes, or 20% of battery power when future technology expands the battery life. This restriction would be more than adequate to return the UAS's to their

planned landing zone from anywhere in its limited operating area.

Similar exemptions have been granted to other operations, including Exemptions 2689F, 5745, 10673, and 10808.

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

The regulation provides in pertinent part:

> "(a) except as provided in § 91.715, no person may operate a civil aircraft unless it has within it the following:
>
> (1) 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's fully loaded weigh no more than 55 lbs. and are operated without an onboard pilot. As such, there is no ability or place to carry certification and registration documents, or to display them on the UAS's.

An equivalent level of safety will be achieved by keeping these documents at the ground control point where the UAS's pilots flying the UAS's will have immediate access to them, to the extent they are applicable to the UAS's. The FAA has issued numerous exemptions to this regulation. A representative sample of other exemptions includes Exemption Nos. 9565, 9665, 9789, 9789A, 9797, 9797A, 9816A, and 10700.

XII. **14 C.F.R. § 91.405** (a); **407** (a) **(1); 409** (a) **(1) & (2); 417** (a) & **(b): Maintenance Inspections**

These regulations require 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 ...," and others shall inspect or maintain the aircraft in compliance with Part 43.

Given that these sections and Part 43 apply only to aircraft with an airworthiness certificate, these sections will not apply to the UAS's as proposed to be operated by the Applicant. Maintenance will be accomplished by the Applicant pursuant to the flight manual and operating handbook. An equivalent level of safety will be achieved because these UAS's are very limited in size and will carry a small payload and operate only in restricted areas for limited periods of time. If mechanical issues arise, the UAS's can land immediately and will be operating from no higher than 400 feet AGL. The Applicant will ensure that the UAS is in working order prior to initiating flight, perform required maintenance, and keep a log of any maintenance performed. Moreover, the Applicant is person most familiar with the aircraft and best suited to maintain the aircraft in an airworthy condition to provide the equivalent level of safety.

SUMMARY

Pursuant to 14 C.F.R. Part 11, the following summary is provided for publication in the Federal Register, should it be determined that publication is needed:

Applicant seeks an exemption from the following rules:

14 C.F.R. § 21, subpart H; 14 C.F.R 45.23 (b); 14 C.F.R. §§ 61.113 (a) & (b); 91.7 (a); 91.9 (b) (2); 91.103 (b); 91.109; 91.119; 91.121; 91.151 (a); 91.203 (a) and (b); 91.405 (a); 91.407 (a) (1); 91.409 (a) (2); 91.409 (a) (1) & (2) and 91.417 (a) & (b) to operate commercially small unmanned aircraft systems (55 lbs. or less) in mapping and surveying operations.

Approval of exemptions allowing commercial operations of UAS's in the mapping and surveying industry will enhance safety by reducing risk. Conventional mapping and surveying operations, using jet or piston power aircraft, operate at extremely low altitudes and in extreme proximity to people and structures; and present the risks associated with vehicles that weigh in the neighborhood of 4,000 lbs., carrying large amounts of jet A or other fuel. Such aircraft must fly to and from the mapping or surveying location. In contrast, a UAS's weighing fewer than 55 lbs. and powered by batteries eliminates virtually all of that risk given the reduced mass and lack of combustible fuel carried on board. The UAS's are carried to the mapping or surveying site and not flown. The UAS's will carry no passengers or crew and, therefore, cannot and will not expose them to the risks associated with manned aircraft flights.

The operation of UAS's, weighing less than 55 lbs., conducted in the strict conditions outlined above, will provide an equivalent level of safety supporting the grant of the exemptions requested herein, including exempting the Applicant from the requirements of Part 21 and allowing commercial operations. These lightweight aircraft operate at slow speeds and close to the ground, as a result, are far safer than conventional operations conducted with turbine helicopters or other manned aircraft operating in close proximity to the ground and people.

Satisfaction of the criteria provided in Section 333 of the Reform Act – size, weight, speed, operating capabilities, proximity to airports and operation within visual line of sight and national security – provide more than adequate justification for the grant of the requested exemptions allowing commercial operation of Applicant's UAS's in the mapping and surveying industry.

Very truly yours,

David A. Floyd, PLS #7676

28936 Old Town Front Street, Ste 203, Temecula, CA 92590 Phone (951) 694-8647
Email: fsi@floydsurveying.com