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

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

July 28, 2015

Exemption No. 12187
Regulatory Docket No. FAA–2015–1720

Mr. Steve Lanaghen
Boulder Emergency Squad
P.O. Box 18887
Boulder, CO 80308

Dear Mr. Lanaghen:

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 8, 2015, you petitioned the Federal Aviation Administration (FAA) on behalf of Boulder Emergency Squad (hereinafter petitioner or operator) for an exemption. The petitioner requested to operate an unmanned aircraft system (UAS) to conduct aerial mapping, inspections, and search and rescue operations.

See Appendix A for the petition submitted to the FAA describing the proposed operations and the regulations that the petitioner seeks an exemption.

The FAA has determined that good cause exists for not publishing a summary of the petition in the Federal Register because the requested exemption would not set a precedent, and any delay in acting on this petition would be detrimental to the petitioner.

Airworthiness Certification

The UAS proposed by the petitioner is a DJI S1000.

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, Boulder Emergency Squad 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, Boulder Emergency Squad 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 S1000 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

Steve Lanaghen
Boulder Emergency Squad
P.O. Box 18887
Boulder, CO 80308
303-494-5425

May 8, 2015

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

Re: Exemption Request Section 333 of the FAA Reform Act and Part 11 of the Federal Aviation Regulations from 14 C.F.R. 45.23(b); 14 CFR Part 21; 14 CFR 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) & (b); 91.407(a) (1); 91.409 (a) (2); 91.417 (a) & (b)

Dear Sir or Madam:

Pursuant to Section 333 of the FAA Modernization and Reform Act of 2012 (the Reform Act) and 14 C.F.R. Part 11, Boulder Emergency Squad (BES), developer and operator of small Unmanned Aircraft Systems ("sUAS") equipped to conduct aerial Search and Rescue Operations in the US get higher success rates on (SAR) on operations and to help prevent contamination of lands if there was a manned aircraft accident, hereby applies for an exemption from the listed Federal Aviation Regulations ("FARs") to allow commercial operation fits sUASs, 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.

As described more fully below, the requested exemption would permit the operation of small Unmanned and relatively inexpensive UAS under controlled conditions in airspace that is 1) limited 2) predetermined 3) controlled as to access and 4) would provide safety enhancements to the already safe operations in the SAR presently using conventional aircraft. Approval of this exemption would thereby enhance safety and fulfill the Secretary of Transportation's (the FAA Administrator's) responsibilities to "... establish requirements for the safe operation of such aircraft systems in the national airspace system."

The name and address of the applicant is:

Boulder Emergency Squad (BES)
Attn: Steve Lanaghen
Phone: 303-494-5425
Email: stevelanaghen@boulderrescue.org
Address: PO Box 18887
Boulder, Colorado 80303

The conditions proposed by the applicant are drawn from order 8900.1 CHG 0. Similar exemptions have been previously granted to a private, volunteer search and rescue group in Exemption #11282 and this request largely reflects those exemptions.

Regulations from which the exemption is required

14 C.F.R. Part 21 Subpart H
14 C.F.R. 45.23(b)
14 C.F.R. 61.113 (a) & (b)
14 C.F.R. 91.7 (a)
14 C.F.R. 91.9 (b) (2) (c)
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 C.F.R. 91.151 (a)
14 C.F.R. 91.155
14 C.F.R. 91.203 (a) & (b)
14 C.F.R. 91.215
14 C.F.R. 91.405 (a)
14 C.F.R. 91.407 (a) (1)
14 C.F.R. 91.409 (a) (2)
14 C.F.R. 91.417 (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 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 is required to determine which types of sUASs do not create a hazard to users of the NAS or the public or pose a threat to national security in light of the following:

- The UAS's size, weight, speed, and operational capability
- Operation of the UAS in close proximity to airports and populated areas; and
- Operation of the UAS within visual line of sight of the operator.

Reform Act Section 333 (a). Lastly, if the Secretary determines that such vehicles "may operate safely in the national airspace system, the Secretary shall establish requirements for the safe operation of such aircraft in the national airspace system." ID Section 333(c) (emphasis added)

The Federal Aviation Act expressively grants the FAA the authority to issue exemptions. This statutory authority by its terms includes exempting civil aircraft, as the term is defined under section 40101 of the Act that includes sUASs, from the requirement that civil aircraft must have a current airworthiness certificate.

Applicant interprets this provision to place the duty on the Administrator not only process applicants for exemptions under section 333, but for the administrator to craft conditions for the safe operation of the

UAS, if it should be determined that the conditions set forth herein do not fulfill the statutory requirements for approval.

The Administrator may grant an exemption from a requirement of a regulation prescribed under subsection (a) or (b) of this section or any sections 44702-44716 of this title if the Administrator finds the exemption in the public interest. 49 U.S.C. Section 44701(f) *see also* 49 USC Section 44711(a); 49 USC Section 44704; 14 CFR Section 91.203 (a) (1). The Administrator has recently granted such an exemption under very similar circumstances (Exemption #11282).

The Boulder Emergency Squad (BES) multirotor sUASs weigh 55 or fewer or lbs. including payload. They operate, under normal conditions at a speed of no more than 70 knots and in the case of our multirotors have a capability to hover, and move in the vertical and horizontal plane simultaneously. They will operate in a line of sight and will operate only within the sterile area made up of mountain wilderness, county parks and open space, rural land, power utility grid and towers.

Given the small size of the sUASs involved and restricted sterile environment within which they will operate, 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 UASs to commence immediately. Also due to the size of the sUASs and the restricted areas in which the relevant sUASs will operate, 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 Federal Aviation 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 and chemical spills, exemptions associated with allowing UASs for agricultural operations, the grant of the requested exemptions is in the public interest. Accordingly, the applicant respectfully requests that the FAA grant the requested exemption without delay.

AIRCRAFT AND EQUIVELANT LEVEL OF SAFETY

The applicant proposes that the exemption requested herein apply to aircraft that have the characteristics and that operate within the limitations listed herein. <u>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 agricultural services and crops dusted currently being used with conventional aircraft</u>.

1. The sUASs will weigh less than 55 lbs.
2. Flights will be operated within visual line of sight of a pilot in command (PIC) and/or visual observer (VO).
3. Maximum total flight time for each operational flight will be 120 minutes for sUAS operations. Flights will be terminated at 25% battery power reserve.
4. Flights will be operated at an altitude of no more than 400 feet AGL at speeds not to exceed 87 knots (100 miles per hour) or the maximum operating airspeed recommended by the aircraft manufacturer, whichever is less.
5. Minimum crew for each operation will consist of the sUAS Pilot and a Visual Observer.
6. sUAS Pilots will be certified by the aircraft manufacturer for operations, have passed an FAA private pilot knowledge test and maintain a class 3 airman medical certificate. Visual Observers will hold at least manufacturer's ground school certificate and a valid driver's license.

7. The UAS will only operate within a confined "sterile area" and have a "Security Perimeter" for the flight operations area.
8. *A* briefing will be conducted in regard to the planned sUAS operations prior to each day's mission activities. It will be mandatory that all personal who will be performing duties within boundaries of the safety perimeter be present for this briefing.
9. The operator will file a FAA Form 7711-1, or its equivalent, as modified in light of the requested exemption, with the appropriate Flight Standards District Office.
10. The operator will obtain the consent of all persons involved in the flying area and ensure that only consenting persons be allowed within 100 feet of the flight operation, and this radius may be reduced to 30 feet based upon an equivalent level of safety and determination. With the advanced permission of the FSDO, operations at closer range can be approved.
11. The operator will notify a Plan of Activities to the FSDO 30 minutes before the proposed flights.
12. Pilot and observer will have been trained in the operation of UAS generally and received up-to-date information on the particular UAS. Visual Observer and PIC will at all times be able to communicate by voice or radio.
13. SAR operations will be launched from and/or oral permission from the relevant property holders will be obtained.
14. If the sUAS loses communications or it loses its GPS signal, the UAS will have capability to return to a pre-determined location within the Security Perimeter and land.
15. The sUAS will have capability to abort flight in case of unpredictable obstacles or emergencies.
16. The owner shall follow the UAS manufacturer's maintenance, overhaul, replacement, inspection, and life limit requirements for the aircraft and aircraft components.
17. 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.
18. 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 or property.
19. 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 UAS with appropriate distance from nonparticipants in accordance with 14 CFR § 91.119.
20. If the UAS loses communications or loses its GPS signal, the UA must return to a predetermined location within the private or controlled-access property.

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

14 C.F.R. Part 21, Subpart H: Air worthiness certificates 14 C.F.R. Section 91.203 (a) (1)
Subpart H, entitled Airworthiness Certificates, establishes the procedural requirements for the issuance of airworthiness certificates as required by FAR Section 91.203 (a) (1). Given the size and limited operating area associated with 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 both authorize the FAA to exempt aircraft from the requirement for an airworthiness certificate, upon consideration of the size, weight, speed, operational capability, proximity to airports and populated areas of the particular UAS. In all cases, an analysis of these criteria demonstrates that the UAS operated without an airworthiness certificate, in a restricted environment and under the conditions proposed will be at least as safe, or safer, than conventional aircraft (fixed wing or rotorcraft) operating with an airworthiness certificate without the retractions and conditions proposed.

The sUAS to be operated here under is less than 55 lbs. fully loaded, carries neither a pilot nor passenger, carries no explosive materials or flammable materials liquid fuels, and operates exclusively within a secured area as set out in manual. Unlike other civil aircraft, operations under this exemption will be tightly controlled and monitored by both the operator and, pursuant to the requirements, and in compliance to local public safety requirements, to provide security of the area of operation as is now done with conventional flag man. The FAA will have advance notice of all operations. These safety enhancements, which already apply to civil aircraft operated in connection to agricultural aerial applicators, provide a greater degree of safety to public and property owners than conventional operations conducted with airworthiness certificates issued under 14 C.P.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.

14 C.F .R. Section 45.23 (b). Marking of the aircraft

The regulation requires:

> When marks include only the Roman capital letter "N" and the registration of the number is displayed on limited, restricted or in a light-sport category aircraft or experimental or provisionally certified aircraft, the operator must also display on the 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 spot," "experimental," or "provisional," as applicable.

Even though the UAS will have no airworthiness certificate, and exemption may be needed as the UAS will have no entrance to the cabin, cockpit or pilot station on which the word "experimental" can be placed. Given the size of the sUAV, the two inch lettering will be impossible. The word "experimental" will be placed on the fuselage in compliance with §45.29 (f).

The equivalent level of safety will be provided by having the sUAV marked on it fuselage as required by §45.29 (f) where the pilot, observer and others working with the sUAV will see the identification of the

sUAV as "Experimental." The FAA has issued the following exemptions to this regulation to exemptions to this regulation to Exemptions Nos. 10700, 8738, 10167A.

14 C.F.R. § 61.113 (a) & (b): Private pilots Privileges and Limitations: Pilot in Command.
Sections 61.113 (a) & (b) limit pilots to non-commercial operations. Because the UAS will not carry a pilot or passengers, the proposed operations can achieve the equivalent level of safety of current operations by requiring the PIC operating the aircraft to have a sport pilot's Certificate rather than have than a commercial pilots Certificate to operate this small UAS. Unlike a conventional aircraft that carries a pilot and passengers, the sUAS is remotely controlled with no living thing onboard. The area of operation is controlled and restricted, and all flights are planned and coordinated in advance as set forth by in the S.O.P. The level of safety provided by the requirements included in the S.O.P exceeds that provided by a single individual holding a commercial pilot's certificate operating a conventional aircraft. The risks associated with the operation of the sUAS are so diminished from the level of risk associated with the operation of a commercial operations contemplated with Part 61 when drafted, that allowing operations of the sUAS as requested with a recreational pilot as the PIC exceeds the present level of safety achieved by 14 C.P.R. §61,113 (a) & (b).

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 an airworthy condition. As there will be no airworthiness certificate issued for the aircraft. Should this 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 SOP for maintenance and use of safety check lists prior to each flight and equivalent level of safety will be provided.

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 placard, or any combination thereof.
> The sUAS, given its size and configuration has no ability or place to carry such a flight manual on the aircraft, not only because there is no pilot onboard, but because there is no room or capacity to carry such an item on the aircraft.

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

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 the flight. As the FAA approved rotor craft flight manuals will not be provided as set forth in sections

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

14 C.F.R. §91.109: Flight instruction

Section 91.103 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.

sUASs and remotely controlled aircraft, by their design do not have fully functioning 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 functioning dual controls for a number of aircraft and for flight instruction in experimental aircraft. See exemption Nos.5778K & 9862A. The equivalent level of safety provided by that neither a pilot nor passengers will be carried in the aircraft and by the size and speed of the aircraft.

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

Section 91.119 establishes safe altitudes for operations of civil aircraft. Section 91.119 (d) allows helicopters to be operated at less than the minimums prescribed provided the person operating the helicopter complies with any route or altitudes prescribed for helicopters by the FAA. As exemption is for the sUAS that is a helicopter and the exemption requests authority to operate at altitudes of up to 400 AGL rotorcraft and 1000 AGL for fixed-wing, or not more than 200 above an elevated platform such as radio towers, an exemption may be needed to allow such operations. As set forth by herein, except for the limited conditions stated in the SOP, the UAS will never operate higher than 400 AGL rotorcraft and 1000 AGL for fixed-wing. It will however be operated in a restricted area with a security perimeter, where buildings and people will not be exposed to operations without their pre-obtained consent.

The equivalent level of safety will be achieved given the size, weight, speed of the UAS as well as the location where it is operated. No flight will be taken without the permission of the property owner or local officials. Because of the advance notice to the property owner and participants in the activity, all affected individuals will be aware of the planned flight operations as set forth in the SOP. Compared to flight operations with aircraft or rotorcraft weighing more far more than the maximum 55lbs. proposed herein and the lack of flammable fuel, any risk of associated with these operations is far less than those presently presented with conventional aircraft operating at or below 500 AGL. In addition, the low-altitude operations of the sUAS will ensure separation between these small UAS operations and the operations of conventional aircraft that must comply with Section 91.119.

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 sUAS 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, pursuant to the Manual and Safety Check list, confirming the altitude of the launch site shown on the GPS altitude indicator before flight.

14 C.F.R. §91.151(a): Fuel Requirements for Flight in VFR Conditions

Section 91.151 (a) prohibits and 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 battery powering the sUAS provides approximately 20-40 minutes of powered flight. To meet the 30 minute reserve requirement in 14 CFR §91.151, sUAS flights would be limited to approximately 10 minutes in length at the most. 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 or night VFR conditions is reasonable.

Applicant believes that an exemption from 14 CFR (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 small UAS, 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 risk that Section 91.15l(a) was intended to alleviate given the size speed of the small UAS. Additionally, limiting sUAS flights to 10 minutes would greatly reduce the utility for which the exemption will be granted.

Applicant believes that an equivalent level of safety can be achieved by limiting flights to 30 minutes or 25% of battery power whichever happens first. This restriction would be more than adequate to return the sUAS to its 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.

14 C.F.R. §91.155: Basic VFR weather minimums

Section 91.155 establishes safe distances from clouds for flight visibility. All flights will be made in visual line of sight from the ground to an altitude of no more than 400 feet. The sUAS will never fly into or above the clouds while remaining within visual line of sight. If cloud cover drops below the 500 foot minimum, a sUAS can operate safely at a lower altitude. Given the size and speed of the small UAS, operating under these conditions should be sufficient to mitigate risk.

Similar exemptions have been granted to other operations, including Exemptions 5357, 11208, 11112.

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 cockpit entrance so that it is legible to passengers or crew.

The UAS fully loaded weighs no more than 55lbs and is operated without an onboard pilot. As such, there is no ability or place to carry certification and registration documents or display them on the sUAS. An equivalent level of safety will be achieved by keeping these documents at the ground control point where the pilot flying the sUAS will have immediate access to them, to the extent they are applicable to the sUAS. The FAA has issued numerous exemptions to this regulation. A representative sample of other exemptions includes Exemption Nos. 9565, 9665, 9789, 9789A, 9797, 9816A, 10700.

14 C.F.R. §91.215: ATC transponder and altitude equipment and use.

Section 91.215 requires transponder equipment for aircraft within Class A, B and C airspace or within 30 nautical miles of an airport listed in Appendix D, section 1. BES intends to operate within Boulder County, a portion of which lies within 30 nautical miles of Denver International Airport (DIA). At its nearest, Boulder County lies approximately 25 miles from DIA. However, the Denver/Colorado Springs sectional chart specifies that DIA's class B airspace does not extend the full 30 nautical miles due to mountainous terrain. As such, all sUAS operations within Boulder County at an altitude of 400 feet AGL will not enter any Class A, B or C airspace. Additionally, ATC transponder equipment would exceed the payload capacity for the sUAS and make flight impossible. Given the size, speed and altitude restriction of 400 feet AGL, the sUAS can operate safely within Boulder County without entering or affecting aircraft in class A, B or C airspace.

14 C.F.R. §91.405 (a); 407 (a) (2); 417 (a) & (b)

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 section and Part 43 apply only to aircraft with an airworthiness certificate, these sections will not apply to the application. Maintenance will be accomplished by the operator pursuant to the flight manual and operating handbook as referenced in the Manual. An equivalent level of safety will be achieved because these small UASs 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 can land immediately and will be operating from no higher than 400 feet. As provided in the SOP, the operator will ensure that the UAS is in working order prior to initiating flight, perform required maintenance, and keep a log of any maintenance preformed. Moreover, the operator is the person most familiar with the aircraft and best suited to maintain the aircraft in an airworthy condition to provide the equivalent level of safety.

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.P.R. §21, subpart H; 14 C.F.R 45.23 (b); 14 C.P.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) and 91.417 (a) & (b) to operate commercially a small unmanned vehicle (55lbs or less) in the Agricultural 3d Mapping Service Operations.

Approval of exemptions allowing commercial operations of sUASs in the Agricultural 3d mapping/scanning and tower inspection industry will enhance safety by reducing risk. Conventional operations using jet or piston aircraft operate at extremely low altitudes just feet from the equipment and livestock and structures; and present the risks associated with vehicles that weigh in the neighborhood of 3,000-5,000 lbs., carrying large amounts of jet A or other fuel in most cases helicopters operating with 140 gallon fuel tanks. The sUAS will carry no passengers or crew and, therefore, will not expose them to the risks associated with manned aircraft flights.

The operations of small UASs, weighing less than 55 lbs., conducted in the strict conditions outlined above, will provide an equivalent level of safety supporting the grant of the Part 21 and allowing commercial operations. These lightweight UA V s operate at slow speeds, close to the ground and in sterile environment and, as a result, are far safer than conventional operations conducted with a piston and or turbine aircraft operating close to the ground.

Public Acknowledgement/Privacy

Aircraft that are going to be covered are seen in Appendix A

Appendix A.

DJI S1000

See attached Pilot Operating Handbook (POH) and User Manual
Airframe similar to Exemption #11184

S1000 Controller

Controller similar to Exemption #11184

Ground Control Station

Satisfaction of the criteria provided in Section 333 of the Reform Act of 2012 - size, weight, speed, operating capabilities, proximity to populated areas and or close proximity to airports and operations within visual line of sight provides more than adequate justification for the grant of the requested

exemptions allowing commercial operation of applicant's UAS in the agricultural scanning services industry.

Sincerely,

Steve Lanaghen
Boulder Emergency Squad (BES)

CC: Board Members BES