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

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

June 23, 2015

Exemption No. 11876
Regulatory Docket No. FAA–2014–1064

Mr. Suman Saripalli
Co-Owner
KalScott Engineering
811 East 28th Street
Lawrence, KS 66046

Dear Mr. Saripalli:

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.

The Basis for Our Decision

By letter dated December 1, 2014, you petitioned the Federal Aviation Administration (FAA) on behalf of KalScott Engineering (hereinafter petitioner or operator) for an exemption. The exemption would allow the petitioner to operate an unmanned aircraft system (UAS) to conduct research and development tests of scientific sensing payloads using small UAS, in support of current National Aeronautics and Space Administration (NASA) contracts NNX14CA35P and NNX14CA07C.

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, DJI S900, and DJI S1000.

The petitioner requested relief from 14 CFR part 21, C*ertification 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, 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 No. 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 Lab, 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,

[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.

delegated to me by the Administrator, KalScott Engineering 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.

Conditions and Limitations

In this grant of exemption, KalScott Engineering 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, DJI S900, and 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 Colombia, 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 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 June 30, 2017, unless sooner superseded or rescinded.

Sincerely,

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

Enclosures

KALSCOTT
ENGINEERING

December 1, 2014

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

Regarding: KalScott Engineering Petition for Section 333 Exemption Pursuant to Section 333 of the FAA Reform Act of 2012 and Part 11 of the Federal Aviation Regulations from 14 C.F.R. Part 21 Subpart H; 14 C.F.R. Part 27; 14 C.F.R. § 45.23(b); 14 C.F.R. § 45.27; 14 C.F.R. §§ 61.113(a) and (b); 14 C.F.R. § 91.119; 14 C.F.R. § 91.121; 14 C.F.R. § 91.151(a); 14 C.F.R. § 91.203 (a) and (b); 14 C.F.R. § 91.405(a); 14 C.F.R. § 91.407(a)(l); 14 C.F.R. §§ 91.409(a)(l) and (2); 14 C.F.R. §§ 91.417(a) and (b).

Dear Sir or Madam:

Pursuant to Section 333 of the FAA Modernization and Reform Act of 2012 ("FMRA") and 14 CFR Part 11, KalScott Engineering, ("Petitioner"), requests exemptions from several provisions of the Federal Aviation Regulations ("FAR"), specifically portions of 14 C.F.R. Parts 21, 27, 45, 61, and 91 to allow, among other things, research and development ("R&D") operations using the DJI Phantom, S900, and S1000 commercial multi-copters in the continental United States ("CONUS") by individuals who have successfully completed, at a minimum, FAA private pilot ground instruction and passed the FAA private pilot written examination, or FAA-recognized equivalents, and completed Kalscott Engineering's training program for operation of the UAS.

KalScott Engineering proposes to conduct R&D tests of scientific sensing payloads using small UAS, in support of current NASA contracts NNX14CA35P and NNX14CA07C. 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 limited, predetermined, controlled as to access, and would provide safety enhancements to the already safe operations in the aerospace industry 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." Section 333(c) of the FMRA.

KALSCOTT
ENGINEERING

I. PETITIONERS DESCRIPTION

The name and address of the applicant is:

Suman Saripalli
KalScott Engineering
811 E 28th St
Lawrence, KS 66046
suman.saripalli@kalscott.com
(785)979-1116

Regulations from which the exemption is requested:

14 C.F.R. Part 21 Subpart H
14 C.F.R. Part 27
14 C.F.R. § 45.23(b)
14 C.F.R. § 45.27
14 C.F.R. §§ 61.113(a) and (b)
14 C.F.R. § 91.119
14 C.F.R. § 91.121
14 C.F.R. § 91.151(a);
14 C.F.R. § 91.203 (a) and (b)
14 C.F.R. § 91.405(a)
14 C.F.R. § 91.407(a)(l)
14 C.F.R. §§ 91.409(a)(l) and (2)
14 C.F.R. §§ 91.417(a) and (b)

Current NASA contracts:

NNX14CA35P
NNX14CA07C

II. THE FAA'S LEGAL AUTHORITY TO GRANT THIS EXEMPTION REQUEST

This exemption request will help the FAA to fulfill Congress' goal in passing Section 333 of the FMRA. Section 333 directs the Secretary of Transportation to consider whether certain UAS may operate safely in the national airspace system (NAS) before completion of the rulemaking required under Section 332 of the FMRA. The Secretary is required to determine which types of

UAS do not create a hazard to users of the NAS or the public or pose a threat to national security in light of the UAS's size, weight, speed, and operational capability and whether operation will occur near airports or populated areas and within the visual line of sight of the operator. The FMRA illustrates Congress' intent to have the FAA issue exemptions and allow civil UAS, so long as they operate within the necessary safety parameters.

In addition, the Federal Aviation 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 § 40101 of the Act, that includes UAS, from the requirement that all civil aircraft must have a current airworthiness certificate. The Administrator may grant an exemption from a requirement of a regulation prescribed under §§ 44701(a) or (b) or in§§ 44702-44716 of the Act if the Administrator finds the exemption in the public interest.

III. THE AIRCRAFT

KalScott Engineering specifically proposes to conduct UAS operations using small UAS including the DJI Phantom, S900, and DJI S1000. The DJI Phantom, S900, and DJI S1000 are all multi-rotor aircraft built with a carbon airframe. The DJI S1000 has an empty weight of 4.2 kg (9.3 lb) with a maximum payload weight of 6.8 kg (15 lb), making the maximum takeoff weight 11 kg (24.3 lb). The DJI S900 has an empty weight of 3.3 kg (7.3lb) with a maximum payload weight of 4.9 kg (10.8 lb), making the maximum takeoff weight 8.2 kg (18.1 lb). The DJI Phantom has a maximum takeoff weight of 1 kg (2.2 lb). Both the S1000 and S900 carry 6-Cell Lithium Polymer batteries, ranging between 10,000-20,000 mAh, which facilitates up to around 15 minutes of flight time. Similarly the DJI Phantom is powered by a 3-Cell Lithium Polymer battery with 5200 mAh, which provides 10-15 minutes of flight. Both the S1000 and S900 will be equipped with the DJI A2 multi-rotor autopilot which provides a maximum cruise speed of 15 m/s (29 kts). The DJI Phantom will be equipped with the Naza-M autopilot system which provides a maximum speed of 10 m/s (19 kts). The DJI autopilots features auto-takeoff and landing, auto go home and landing, GPS waypoint navigation, direction lock, and GIS mapping. Specifications include:

<u>DJI S1000:</u>

- Diameter: 1045 mm (3.43 ft)
- Maximum Weight: 11 kg (24.3 lb)
- Number of Motors: 8
- Power of Motors: 500 W
- Maximum Cruise Speed: 15 m/s (29 kts)
- Maximum Climb Rate: 6 m/s (~1200 fpm)
- Maximum Wind Speed: 8 m/s (15.6 kts)

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DJI S900:

- Diameter: 900 mm (2.95ft)
- Maximum Weight: 8.2 kg (18.1 lb)
- Number of Motors: 6
- Power of Motors: 500 W
- Maximum Cruise Speed: 15 m/s (29 kts)
- Maximum Climb Rate: 6 m/s (~1200 fpm)
- Maximum Wind Speed: 8 m/s (15.6 kts)

DJI Phantom:

- Diameter: 350 mm (1.15ft)
- Maximum Weight: 1 kg (2.2 lb)
- Number of Motors: 4
- Power of Motors: 114 W
- Maximum Cruise Speed: 10 m/s (19 kts)
- Maximum Climb Rate: 6 m/s (~1200 fpm)
- Maximum Wind Speed: 8 m/s (15.6 kts)

KalScott Engineering agrees that the UAS will include, at minimum: geofencing at a maximum ceiling of 400' AGL, flight programming capabilities, a flight termination link available to the operator to prevent a "fly away," and safe abort procedures. If the UAS loses communications or its GPS signal, the UAS will return to a pre-determined location and land or be recovered in accordance with the Operations Manual. The UAS will have markings identifying the serial number and identification (N-number) markings as large as practicable. Further, KalScott Engineering's UAS operation will comply with all manufacturer Safety Bulletins. The UAS to be used will weigh less than 25 pounds and would be specifically authorized by the FAA. UAS operations will occur only during daytime.

As previously stated, KalScott Engineering will incorporate the DJI A2 flight control system into the S1000 and S900. The DJI Phantom is controlled by the DJI Naza-M, which uses the same industry accepted control algorithms as the A2, and comes integrated into the airframe. The Phantom has been flown around the world by amateur hobbyists for years, and as a proven system it will serve as the pilot test-bed during the KalScott UAS pilot training program. The A2 is capable of controlling various multi-rotor platforms and offers high accuracy performance through a unique damping design and calibration algorithm. The high performance of the A2 guarantees stable flight in the presence of high vibration and winds. The A2 flight control system includes the controller unit with a built-in receiver, a power management unit, an inertial measurement unit, a Bluetooth unit, and a GPS & Compass. Detailed descriptions of each subsystem can be seen below.

Controller Unit:

- Output signals for up to eight electronic speed controllers (ESCs)
- Built-in receiver based on DJI DESST technology, which is compatible with Futaba FASST and DJI DESST transmitters
  - Two available ports for connecting Spektrum or JR DSM2 satellite receivers.
- Two CAN-Bus ports
  - Sensors
  - Power Management
- Four independent and configurable output channels

Power Management Unit:

- Provides dual Battery Eliminator Circuits (BECs)
  - PW port provides power to the whole flight control system with current no more than 2A
  - PX port provides 3A at 5V and V-SEV signal
- Two CAN-Bus ports for connecting peripheral devices

Inertial Measurement Unit:

- High quality components, with build in damper, precisely calibrated with temperature compensation in all gyros and sensors
- Built-in pressure sensor for altitude determination

Blue Tooth Unit

- Connects to ground station for real-time parameter configuration, flight monitoring, and waypoint navigation

GPS & Compass

- Determines aircraft inertial position
- Measures geomagnetic field for correcting heading estimations

IV. OPERATING PARAMETERS

Petitioner 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

operations conducted with conventional aircraft. Further details about the aircraft and operating procedures are available in the Operations and Training Manual.

The limitations and conditions to which KalScott Engineering agrees to be bound when conducting R&D under an FAA issued exemption include:

A. UAS Pilot and Observer

1. UAS operations will be conducted by, at minimum, pilots holding a private pilot certificate and at least a current third-class medical certificate.
2. All UAS operations must utilize a visual observer ("VO").
3. The pilot-in-command ("PIC") and VO must be able to communicate verbally at all times.
4. Prior to operations, the pilot must have accumulated and logged a minimum of 200 flight cycles, or more as required by the FAA, and 25 hours of total time as a UAS rotorcraft pilot. The pilot must also have accumulated and logged prior to operations at least ten hours as a UAS pilot with a similar UAS type (single blade or multi-rotor). Prior documented flight experience that was obtained in compliance with applicable regulations may satisfy this requirement.
    a. Training, proficiency, and experience-building flights can also be conducted under the FAA's grant of exemption to accomplish the required flight cycles and flight time.
    b. During training, proficiency, and experience-building flights, all persons not essential for flight operations are considered nonparticipants, and the pilot must operate the UA with appropriate distance from nonparticipants in accordance with 14 C.F.R. § 91.119.
5. KalScott Engineering will generate an internal pilot training program, based on the manufacturer UAS manuals and experience with multirotor aircraft, which incorporates proper aircraft operations and safety standards.
    a. Prior to any flight operations authorized by this grant of exemption, the PIC and VO must have successfully completed the KalScott training program, as outlined in the Operations and Training Manual.
    b. A record of completion of this training process must be documented and made available to the Administrator upon request.
6. KalScott Engineering will require all pilots conducting UAS operations to provide proof of pilot and third-class medical certification.

B. Operational Parameters

1. Aircraft will not carry pilots or passengers, and aircraft will not carry explosive materials or flammable liquid fuels.
2. UAS must be operated within visual line of sight of the pilot at all times.
3. UAS may not be flown at ground speeds exceeding 30 knots.
4. Flights will be operated at an altitude of no more than 400 feet above ground level.
5. Each UAS operation will be completed within 20 minutes flight time or with 25% battery power remaining, whichever occurs first. At 30% battery the UAS will enter a return and land sequence; at 20% it will land immediately.
6. UAS will not be operated over any person (other than participating KalScott Engineering personnel) at an altitude that is hazardous to persons or property on the surface in the event of a UAS failure or emergency.
    a. Distance from participating persons will be specified in the Operations Manual.
    b. Operations will be conducted as far as practicable from nonparticipating persons.
7. The UAS flight will be aborted in the event of unpredicted obstacles or emergencies in accordance with the Operations Manual.
8. Prior to operations, a flight demonstration, administered by an operator approved and qualified pilot will be successfully completed and documented. Documentation will be made available for review by Administrator upon request.
9. The operator must obtain an Air Traffic Organization (ATO) issued Certificate of Waiver or Authorization (COA) prior to conducting any operations under this grant of exemption.
    a. This COA will also require the operator to request a Notice to Airmen (NOTAM) not more than 72 hours in advance, but not less than 48 hours prior to the operation.
10. Operations will be limited to sparsely populated areas, under the land owners consent, for which a COA has been issued.
11. Petitioner will display signage notifying the public of UAS operations before beginning operations. Signs will be approximately 18" x 24" in size and will be placed in locations that will be visible from adjacent roadways at least 5 minutes prior to UAS operations.
12. Before conducting operations, the radio frequency spectrum used for operation and control of the UAS will comply with the FCC or other appropriate government oversight agency requirements.

13. The UAS pilot will establish a working relationship with a representative at the local Flight Standards District Office ("FSDO") with which to periodically review safety procedures and other operations to further enhance safety. Under normal circumstances, the operator will submit a written Plan of Activities to the local FSDO at least 48 hours prior to conducting operations. In an emergency situation, the operator will submit a written Plan of Activities 24 hours prior to conducting operations, unless sooner authorized by the FSDO. The Plan of Activities will include:
    a. Dates and times for all flights;
    b. Name and phone number of the operator for the UAS and for the person responsible for on-site operations;
    c. Make, model, and serial or N-number of UAS;
    d. Name and certificate number of pilot(s);
    e. Signature of exemption holder or representative;
    f. Description of flight activity, including maps/diagrams of area over which operations are occurring and essential altitudes.
14. The documents required under 14 C.F.R. § 91.9 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.
15. The UAS must remain clear and yield the right of way to all other manned operations and activities at all times (including, but not limited to, ultralight vehicles, parachute activities, parasailing activities, hang gliders, etc.).
16. KalScott Engineering will ensure safety to first responder aircraft and helicopter traffic. Upon notification from manned aircraft controllers or through visual identification of manned aircraft, KalScott Engineering will immediately suspend the UAS flight until the airspace is cleared.
17. UAS operations may not be conducted during night, as defined in 14 C.F.R. § 1.1. All operations must be conducted under visual meteorological conditions (VMC). Flights under special visual flight rules (SVFR) are not authorized.
18. The UAS may not be operated by the PIC from any moving device or vehicle.
19. The UAS 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.

20. The UAS may not operate in Class B, C, or D airspace without approval from the FAA. The UAS may not operate within 5 nautical miles of the geographic center of a non-towered airport as denoted on a current FAA published aeronautical chart unless an agreement with that airport's management is obtained, and the operation is conducted in accordance with a NOTAM as required by the Operator's COA. The letter of agreement with the airport management should be made available to the Administrator upon request.
21. Altitude information will be provided to the UAS pilot via a digitally encoded telemetric data feed, which downlinks from the aircraft to a ground-based on-screen display. The UAS will have a GPS altitude readout. Prior to each flight, a zero altitude initiation point will be established and confirmed for accuracy by the PIC.
22. 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. Further flight operations may not be conducted until the incident, accident, or transgression is reviewed by AFS-80 and authorization to resume operations is provided.

C. Operations Manual

1. The Operator must follow the procedures as outlined in its Operations Manual.
2. The Operations Manual must be maintained and made available to the Administrator upon request.

D. Pre-Flight Inspections and Maintenance

1. Prior to each flight, the pilot will inspect the UAS to ensure it is in condition for safe flight. If the inspection reveals a discrepancy, the aircraft will be prohibited from operating until the necessary maintenance has been performed and the UAS is found to be in a condition for safe flight.
2. All maintenance and alterations will be properly documented in the aircraft records.
3. Any UAS that undergoes maintenance or alterations that affect the UAS operation or flight characteristics will undergo a functional flight test in accordance with the Operations Manual.
4. Petitioner will institute a rigorous maintenance program to ensure airworthiness of the UAS. Operator will follow the manufacturer's UAS aircraft/component, maintenance, overhaul, replacement, inspection, and life limit requirements.
    a. When unavailable, requirements must be established in the Operations Manual, including for the following:
        i. Actuators / Servos;
        ii. Powerplant (motors);
        iii. Propellers;

iv. Electronic speed controller;
v. Batteries;
vi. Remote command and control;
vii. Ground control station (if used); and
viii. Any other components as determined by the operator.

5. Operator will develop procedures to document and maintain a record of the UAS maintenance, preventative maintenance, alterations, status of replacement/overhaul component parts, and the total time in service of the UAS. These procedures will be added to the Operations Manual.
6. Operator will develop UAS technician qualification criteria. These criteria will be added to the Operations Manual.

V. SPECIFIC SECTIONS OF 14 C.F.R. FROM WHICH PETITIONERS SEEK AN EXEMPTION

KalScott Engineering requests exemption from the following Federal Aviation Regulations (FARs) to the extent necessary to enable the requested UAS operations for the reasons detailed below.

A. 14 C.F.R. Part 21 Subpart H Airworthiness Certificates

Subpart H, entitled Airworthiness Certificates, establishes the procedural requirements for the issuance of airworthiness certificates. Given the size and limited operating area associated with the aircraft to be utilized, 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. The Federal Aviation Act and Section 333 of the FMRA 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 operated without an airworthiness certificate, in the proposed environments and under the conditions proposed 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 DJI Phantom, S900, and S1000 to be operated hereunder are less than 25 pounds each including payload, carries neither a pilot nor passenger, carries no explosive materials nor flammable liquid fuels, and will operate exclusively within the parameters stated in the Operations Manual. Unlike other civil aircraft, operations under this exemption will be tightly controlled and monitored by both the operator and under the requirements and in compliance with local public safety requirements, to provide security for the area of operation. The FAA will have advance notice of all operations via notices to airmen (NOTAMS). Finally, these UAS, as a result of their size, weight, speed, operational capability, and operation within visual line of sight

do not create a hazard to users of the national airspace system or the public or pose a threat to national security.

B. 14 C.F.R. Part 27: Airworthiness Standards: Normal Category Rotorcraft

14 CFR Part 27 sets forth the procedural requirements for airworthiness certification of normal category rotorcraft. To the extent the Petitioner's DJI Phantom, S900, and S1000 would otherwise require certification under Part 27, as a rotorcraft, Petitioner requests an exemption from Part 27's airworthiness standards for the same reasons identified in the exemption request from item A. 14 CFR Part 21, Subpart H.

C. 14 C.F.R. § 45.23(b) Display of Marks; General; 14 C.F.R. § 45.27 Location of Marks; Non-Fixed Wing Aircraft

Section 45.23(b) requires markings in letters not less than 2 inches nor more than 6 inches high the words such as "limited, "restricted," and "experimental," as applicable. Section 45.27 requires that each operator of a rotorcraft must display on that rotorcraft horizontally on both surfaces of the cabin, fuselage, boom, or tail the marks required by§ 45.23.

Given the size of the UAS, two-inch lettering will not be feasible. The UAS will also have no entrance to the cabin, cockpit, or pilot station on which the applicable words can be placed. An equivalent level of safety will be achieved by having any required words displayed on the aircraft, as applicable, in letters of legible size, in a location where the pilot, observer, and others working with the UAS will see the identification. The FAA has issued exemptions to § 45.23 in Exemptions Nos. 10700, 8738, 10167, 10167A, and 11062. The FAA issued an exemption to 45.27 in Exemption No. 8496B.

D. 14 C.F.R. §§ 61.113(a) and (b) Private Pilot Privileges and Limitations

Sections 61.113 (a) and (b) limit private 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 private pilot's license rather than a commercial pilot's license to operate this small UAS. Unlike a conventional aircraft that carries the pilot and passengers, the UAS is 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 as set forth in the Operations Manual. The level of safety provided by the requirements included in the Operations Manual 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 UAS are so diminished from the level of risk associated with commercial operations contemplated by Part 61 when drafted, that allowing operations of the UAS as requested with a private pilot as the PIC exceeds the present level of safety achieved by 14 C.F.R. §§ 61.113 (a) and (b). The FAA issued an exemption to this regulation in Exemption No. 11062.

E. 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 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 this exemption is for a sUAS that is a helicopter and the exemption requests authority to operate at altitudes up to 400' AGL. As set forth herein, except for the limited conditions stated in the Manual, the UAS will never operate at altitudes higher than 400' AGL. It will however be operated in an area with 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. Compared to flight operations with aircraft or rotorcraft weighing far more than the maximum 25lbs 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 400' AGL. In addition, the low-altitude operations of the UAS will ensure separation between these small UAS operations and the operations of conventional aircraft that must comply with Section 91.119. The FAA issued an exemption to this regulation in Exemption No. 11062.

F. 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." The UAS will have a barometric altimeter for measuring relative altitude changes, but the displayed altitude on the ground station will be GPS measurements, therefore an exemption may be needed. An equivalent level of safety will be achieved by the operator, pursuant to the Operations Manual, confirming the altitude of the launch site shown on the GPS altitude indicator before flight. The FAA issued an exemption to this regulation in Exemption No. 11062.

G. 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." Complying with the 30 minute reserve requirement in 14 C.F.R. § 91.151, would unnecessarily limit the length of KalScott Engineering's UAS flights. The batteries powering the DJI Phantom, S900, and S1000 provide approximately 15 minutes of flight time. To meet the 30 minute reserve requirement in 14 C.F .R. § 91.151, UAS flights would not be possible. 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 conditions is reasonable.

Operating the small UAS in a tightly controlled area where only personnel and property owners will be present does not engender the type of risks that§ 91.15l(a) was intended to alleviate given the size and speed of the small UAS. KalScott Engineering believes that an equivalent level of safety can be achieved by limiting flights to 12 minutes or 25% of battery power, whichever happens first. The FAA issued an exemption to this regulation in Exemption No. 11062 and 10673.

H. 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:
   i. 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 fully loaded weighs no more than 25 lbs and is 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.

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

I. 14 C.F.R. § 91.405(a) Maintenance Required; 14 C.F.R. § 91.407(a)(l) Operation After Maintenance, Preventive Maintenance, Rebuilding or Alteration; 14 C.F.R. §§ 91.409(a)(l) and (2) Inspections; 14 C.F.R. §§ 91.417(a) and (b) Maintenance Records

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 Petitioner. Maintenance will be accomplished by the operator pursuant to the Operations Manual. An equivalent level of safety will be achieved because these small UAS 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' AGL. As provided in the Operations Manual, 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 performed. 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. The FAA issued an exemption to these regulations in Exemption No. 11062.

J. Such Other Relief as the FAA Deems Appropriate to Enable the Requested Operations

KalScott Engineering also requests exemption from such other FARs as the FAA deems appropriate to enable the requested operations. If, during the effective dates of any Grant of Exemption issued pursuant to this Petition, the FAA issues interim or final rules for small UAS, KalScott Engineering requests that it be relieved of the requirements of any conditions and limitations of said exemption and allowed to comply with any less burdensome applicable regulations that may have become effective.

VI. Conclusion

Based on the satisfaction of the criteria provided in Section 333 of the FMRA regarding size, weight, speed, operating capabilities, proximity to airports and populated areas, operation within visual line of sight, and national security, KalScott Engineering requests that the FAA grant it the necessary exemptions under Section 333 of the FMRA as requested herein to allow R&D test flights in support of current NASA contracts NNX14CA35P and NNX14CA07C.

KALSCOTT
ENGINEERING

Sincerely,

Suman Saripalli
Co-Owner
KalScott Engineering