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

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

August 11, 2015

Exemption No. 12424
Regulatory Docket No. FAA–2015–2251

Mr. Kenneth Edward Kroeger
ARAUS LLC
7249 Parsons Court
Alexandria, VA 22306

Dear Mr. Kroeger:

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 25, 2015, you petitioned the Federal Aviation Administration (FAA) on behalf of ARAUS LLC (hereinafter petitioner or operator) for an exemption. The petitioner requested to operate an unmanned aircraft system (UAS) to conduct aerial photography, videography, surveying, inspections, and sensory data collection.

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 Spreading Wings S900.

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

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

extent necessary to allow the petitioner to operate a UAS to perform aerial data collection. This exemption is subject to the conditions and limitations listed below.

Conditions and Limitations

In this grant of exemption, ARAUS LLC is hereafter referred to as the operator.

Failure to comply with any of the conditions and limitations of this grant of exemption will be grounds for the immediate suspension or rescission of this exemption.

1. Operations authorized by this grant of exemption are limited to the DJI Spreading Wings S900 when weighing less than 55 pounds including payload. Proposed operations of any other aircraft will require a new petition or a petition to amend this exemption.

2. Operations for the purpose of closed-set motion picture and television filming are not permitted.

3. The UA may not be operated at a speed exceeding 87 knots (100 miles per hour). The exemption holder may use either groundspeed or calibrated airspeed to determine compliance with the 87 knot speed restriction. In no case will the UA be operated at airspeeds greater than the maximum UA operating airspeed recommended by the aircraft manufacturer.

4. The UA must be operated at an altitude of no more than 400 feet above ground level (AGL). Altitude must be reported in feet AGL.

5. The UA must be operated within visual line of sight (VLOS) of the PIC at all times. This requires the PIC to be able to use human vision unaided by any device other than corrective lenses, as specified on the PIC's FAA-issued airman medical certificate or U.S. driver's license.

6. All operations must utilize a visual observer (VO). The UA must be operated within the visual line of sight (VLOS) of the PIC and VO at all times. The VO may be used to satisfy the VLOS requirement as long as the PIC always maintains VLOS capability. The VO and PIC must be able to communicate verbally at all times; electronic messaging or texting is not permitted during flight operations. The PIC must be designated before the flight and cannot transfer his or her designation for the duration of the flight. The PIC must ensure that the VO can perform the duties required of the VO.

7. This exemption and all documents needed to operate the UAS and conduct its operations in accordance with the conditions and limitations stated in this grant of exemption, are hereinafter referred to as the operating documents. The operating

documents must be accessible during UAS operations and made available to the Administrator upon request. If a discrepancy exists between the conditions and limitations in this exemption and the procedures outlined in the operating documents, the conditions and limitations herein take precedence and must be followed. Otherwise, the operator must follow the procedures as outlined in its operating documents. The operator may update or revise its operating documents. It is the operator's responsibility to track such revisions and present updated and revised documents to the Administrator or any law enforcement official upon request. The operator must also present updated and revised documents if it petitions for extension or amendment to this grant of exemption. If the operator determines that any update or revision would affect the basis upon which the FAA granted this exemption, then the operator must petition for an amendment to its grant of exemption. The FAA's UAS Integration Office (AFS−80) may be contacted if questions arise regarding updates or revisions to the operating documents.

8. Any UAS that has undergone maintenance or alterations that affect the UAS operation or flight characteristics, e.g., replacement of a flight critical component, must undergo a functional test flight prior to conducting further operations under this exemption. Functional test flights may only be conducted by a PIC with a VO and must remain at least 500 feet from other people. The functional test flight must be conducted in such a manner so as to not pose an undue hazard to persons and property.

9. The operator is responsible for maintaining and inspecting the UAS to ensure that it is in a condition for safe operation.

10. Prior to each flight, the PIC must conduct a pre-flight inspection and determine the UAS is in a condition for safe flight. The pre-flight inspection must account for all potential discrepancies, e.g., inoperable components, items, or equipment. If the inspection reveals a condition that affects the safe operation of the UAS, the aircraft is prohibited from operating until the necessary maintenance has been performed and the UAS is found to be in a condition for safe flight.

11. The operator must follow the UAS manufacturer's maintenance, overhaul, replacement, inspection, and life limit requirements for the aircraft and aircraft components.

12. Each UAS operated under this exemption must comply with all manufacturer safety bulletins.

13. Under this grant of exemption, a PIC must hold either an airline transport, commercial, private, recreational, or sport pilot certificate. The PIC must also hold a current FAA airman medical certificate or a valid U.S. driver's license issued by a state, the District of Columbia, Puerto Rico, a territory, a possession, or the Federal

government. The PIC must also meet the flight review requirements specified in 14 CFR § 61.56 in an aircraft in which the PIC is rated on his or her pilot certificate.

14. The operator may not permit any PIC to operate unless the PIC demonstrates the ability to safely operate the UAS in a manner consistent with how the UAS will be operated under this exemption, including evasive and emergency maneuvers and maintaining appropriate distances from persons, vessels, vehicles and structures. PIC qualification flight hours and currency must be logged in a manner consistent with 14 CFR § 61.51(b). Flights for the purposes of training the operator's PICs and VOs (training, proficiency, and experience-building) and determining the PIC's ability to safely operate the UAS in a manner consistent with how the UAS will be operated under this exemption are permitted under the terms of this exemption. However, training operations may only be conducted during dedicated training sessions. During training, proficiency, and experience-building flights, all persons not essential for flight operations are considered nonparticipants, and the PIC must operate the UA with appropriate distance from nonparticipants in accordance with 14 CFR § 91.119.

15. UAS operations may not be conducted during night, as defined in 14 CFR § 1.1. All operations must be conducted under visual meteorological conditions (VMC). Flights under special visual flight rules (SVFR) are not authorized.

16. The UA may not operate within 5 nautical miles of an airport reference point (ARP) as denoted in the current FAA Airport/Facility Directory (AFD) or for airports not denoted with an ARP, the center of the airport symbol as denoted on the current FAA-published aeronautical chart, unless a letter of agreement with that airport's management is obtained or otherwise permitted by a COA issued to the exemption holder. The letter of agreement with the airport management must be made available to the Administrator or any law enforcement official upon request.

17. The UA may not be operated less than 500 feet below or less than 2,000 feet horizontally from a cloud or when visibility is less than 3 statute miles from the PIC.

18. If the UAS loses communications or loses its GPS signal, the UA must return to a pre-determined location within the private or controlled-access property.

19. The PIC must abort the flight in the event of unpredicted obstacles or emergencies.

20. The PIC is prohibited from beginning a flight unless (considering wind and forecast weather conditions) there is enough available power for the UA to conduct the intended operation and to operate after that for at least five minutes or with the reserve power recommended by the manufacturer if greater.

21. Air Traffic Organization (ATO) Certificate of Waiver or Authorization (COA). All operations shall be conducted in accordance with an ATO-issued COA. The

exemption holder may apply for a new or amended COA if it intends to conduct operations that cannot be conducted under the terms of the attached COA.

22. All aircraft operated in accordance with this exemption must be identified by serial number, registered in accordance with 14 CFR part 47, and have identification (N−Number) markings in accordance with 14 CFR part 45, Subpart C. Markings must be as large as practicable.

23. Documents used by the operator to ensure the safe operation and flight of the UAS and any documents required under 14 CFR §§ 91.9 and 91.203 must be available to the PIC at the Ground Control Station of the UAS any time the aircraft is operating. These documents must be made available to the Administrator or any law enforcement official upon request.

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

25. The UAS may not be operated by the PIC from any moving device or vehicle.

26. All Flight operations must be conducted at least 500 feet from all nonparticipating persons, vessels, vehicles, and structures unless:
    a. Barriers or structures are present that sufficiently protect nonparticipating persons from the UA and/or debris in the event of an accident. The operator must ensure that nonparticipating persons remain under such protection. If a situation arises where nonparticipating persons leave such protection and are within 500 feet of the UA, flight operations must cease immediately in a manner ensuring the safety of nonparticipating persons; and
    b. The owner/controller of any vessels, vehicles or structures has granted permission for operating closer to those objects and the PIC has made a safety assessment of the risk of operating closer to those objects and determined that it does not present an undue hazard.

    The PIC, VO, operator trainees or essential persons are not considered nonparticipating persons under this exemption.

27. All operations shall be conducted over private or controlled-access property with permission from the property owner/controller or authorized representative. Permission from property owner/controller or authorized representative will be obtained for each flight to be conducted.

28. Any incident, accident, or flight operation that transgresses the lateral or vertical boundaries of the operational area as defined by the applicable COA must be reported to the FAA's UAS Integration Office (AFS−80) within 24 hours. Accidents must be

reported to the National Transportation Safety Board (NTSB) per instructions contained on the NTSB Web site: www.ntsb.gov.

If this exemption permits operations for the purpose of closed-set motion picture and television filming and production, the following additional conditions and limitations apply.

29. The operator must have a motion picture and television operations manual (MPTOM) as documented in this grant of exemption.

30. At least 3 days before aerial filming, the operator of the UAS affected by this exemption must submit a written Plan of Activities to the local Flight Standards District Office (FSDO) with jurisdiction over the area of proposed filming. The 3-day notification may be waived with the concurrence of the FSDO. The plan of activities must include at least the following:
    a. Dates and times for all flights;
    b. Name and phone number of the operator for the UAS aerial filming conducted under this grant of exemption;
    c. Name and phone number of the person responsible for the on-scene operation of the UAS;
    d. Make, model, and serial or N−Number of UAS to be used;
    e. Name and certificate number of UAS PICs involved in the aerial filming;
    f. A statement that the operator has obtained permission from property owners and/or local officials to conduct the filming production event; the list of those who gave permission must be made available to the inspector upon request;
    g. Signature of exemption holder or representative; and
    h. A description of the flight activity, including maps or diagrams of any area, city, town, county, and/or state over which filming will be conducted and the altitudes essential to accomplish the operation.

31. Flight operations may be conducted closer than 500 feet from participating persons consenting to be involved and necessary for the filming production, as specified in the exemption holder's MPTOM.

Unless otherwise specified in this grant of exemption, the UAS, the UAS PIC, and the UAS operations must comply with all applicable parts of 14 CFR including, but not limited to, parts 45, 47, 61, and 91.

This exemption terminates on August 31, 2017, unless sooner superseded or rescinded.

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

Enclosures

UNITED STATES OF AMERICA
DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
WASHINGTON, DC

Regulatory Docket No. _____

IN THE MATTER OF THE PETITION FOR EXEMPTION OF:
ARAUS LLC

FOR AN EXEMPTION SEEKING RELIEF FROM THE REQUIREMENTS OF TITLE 14 OF THE CODE OF FEDERAL REGULATIONS CONCERNING COMMERCIAL OPERATION OF THE DJI S900 UNMANNED AIRCRAFT SYSTEM PURSUANT TO SECTION 333 OF THE FAA MODERNIZATION AND REFORM ACT OF 2012 (PUBLIC LAW 112-95)

Submitted on May 25, 2015

Kenneth E Kroeger on behalf of ARAUS LLC
7249 Parsons Court
Alexandria, VA 22306
410-487-1350

Dear Sir or Madam,

I, Kenneth Kroeger; hereinafter known as the petitioner, PIC, and owner of ARAUS LLC; am writing pursuant to the FAA Modernization and Reform Act of 2012 and the procedures contained within 14 C.F.R. 11, to request that I, an owner and operator of small unmanned aircraft, be exempted from the Federal Aviation Regulations ("FARs") listed below so that I may operate my SUAS commercially in airspace regulated by the Federal Aviation Administration ("FAA").

The petitioner has been active in the RC model aviation industry for nearly 20 years with countless hours of flight time. I have both BS and MS degrees in Mechanical Engineering with a focus in flight control systems and currently pursuing a PhD in Electrical Engineering. Regarding my PIC experience, I was the PIC for Virginia Polytechnic Institute and State University's Unmanned Systems Lab from 2010~2013. Through the certification process in obtaining and operating their COA (2009-ESA-3, 2010-ESA-28, 2010-ESA-13, 2011-ESA-6-COA, 2011-ESA-61-COA-R, 2012-ESA-56-R, 2012-ESA-77), I obtained both a Pilot's Ground School Examination Certificate and obtained a continually update my 2nd Class Airmen's Medical Certificate. These operations required that I was proficient in configuring, maintaining, and operating fixed-wing, rotary-wing, and multirotor aircraft platforms. Most notable aircraft platforms that I was PIC for was the Yamaha RMAX, Aeroscout B1-100, Sig 110 and Kadet Seniors, Bergen Industrial Twin, and various other aircraft. While PIC, there were no incidents and no lapses in policy keeping, record keeping, and maintenance. Additionally, operations as PIC were improved upon to further safety of flight personal, spectators, and to ensure that operations were safe, smooth, professional, and efficient.

I am interested in operating a small unmanned aircraft systems (sUAS) such as the DJI Spreading Wings S900 commercially in airspace regulated by the Federal Aviation Administration (FAA) for the purpose of collecting aerial video, photography, and sensory data to be used in support of precision agriculture applications, mapping and inspection operations, and expansion of basic and fundamental research principles and applications relating to the above over rural areas within the United States. Finding stressed vegetation is one of the most important aspects of farming as this has a direct impact on resulting crop yields which directly affects revenue and the global market supply. Stressed vegetation can result from a variety of sources such as pests, nutrient or water deficiencies, or improper planting techniques. However, finding stressed vegetation is often the most challenging aspect for a farming operation because of the magnitude and scale of the proposition. Leveraging sUAS technologies would provide farmers real-time actionable information about the health of their crops. This would enable farmers, field management, and agronomists to independently develop an acute understanding for the location and distribution of stressed crops in their fields. This knowledge will be obtained by conducting field surveys with the sUAS providing the farmer with immediate actionable information for their fields ensuring an increase in yields and productivity. Through a heightened awareness of location and distribution of crop stress, the farmer will also be able to further ensure a reduction of applied chemical treatments and thus decrease operational costs, decrease runoff, and increase compliance with their nutrient management plans.

Commercial operations will be performed only at the request of and with the authorization and permission of clients, communities or their authorized agents in order to facilitate commerce and raise

awareness of the responsible and beneficial uses of small unmanned air systems. Operations will be conducted in accordance and under the conditions outlined herein or as may be established by the FAA as required by Section 333. Granting the request complies with the Secretary of Transportation's (FAA Administrator's) responsibilities and authority to not only integrate UAS's into the national airspace system, but to "...establish requirements for the safe operation of such aircraft systems [UAS's] in the national airspace system" under Section 333(c) of the Reform Act specific to the use of UAS's for real estate and other community related purposes. Further the petitioner will conduct ARAUS LLCs operations in compliance with the protocols described herein or as otherwise established by the FAA.

The petitioner believes that with his background and other related qualifications he can greatly contribute to the FAA in exploring the proper integration of the UAS into the NAS for purposes other than cinematography applications. For the reasons stated below the petitioner respectfully requests the grant of an exemption allowing the petitioner/PIC to operate a remote controlled sUAS for the commercial purpose of collecting aerial video, photography, and sensory data to be used in support of precision agriculture applications, mapping and inspection operations, and expansion of basic and fundamental research principles and applications relating to the above over rural areas under 400 feet and within Class G airspace within the United States.

Thank you,

ARAUS LLC

Kenneth E Kroeger

7249 Parsons Court
Alexandria, VA 22306
410-487-1350

TABLE OF CONTENTS

GLOSSARY OF ABBREVIATIONS

AGL	Above Ground Level
AOI	Area of Interest
ATC	Air Traffic Control
ATO	Air Traffic Organization
AV	Aerial Vehicle
CFR	Code of Federal Regulations
COA	Certificate of Authorization
ELOS	Equivalent Level of Safety
FAA	Federal Aviation Administration
FAR	Federal Aviation Regulation
GCS	Ground Control Station
GSC	Ground Station Commander
GPS	Global Positioning System
LOL	Loss of Link
NAS	National Airspace System
NOTAM	Notice to Airman
PIC	Pilot In Command
RC	Radio Control
Section 333	FAA Modernization and Reform Act of 2012 (FMRA) Section 333
SO	Safety Observer
SOP	Standard Operating Procedures
UA	Unmanned Aircraft
UAS	Unmanned Aircraft System
VFR	Visual Flight Rules
VLOS	Visual Line of Site
VMC	Visual Meteorological Conditions
VO	Visual Observer
VTOL	Vertical Takeoff and Landing

PUBLISHABLE SUMMARY

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

ARAUS LLC seeks exemption from the requirements of:

14 C.F.R §§ 21(h), 43.7, 43.11, 45.11 (a,b,c), 45.27(a), 45.29(3), 61.56, 61.113(a,b), 61.113, 91.7(a), 91.9(b2, c), 91.103(b2), 91.105, 91.113(b), 91.119(c), 91.121, 91.151, 91.403, 91.405(a,d), 91.407(a,b), 91.409, 91.417, to operate commercially a small Unmanned Aircraft System (sUAS) pursuant to Section 333 of the FAA Modernization and Reform Act of 2012 (FMRA). Approval of the exemptions requested by ARAUS will allow for commercial operations of the DJI S900 sUAS to be conducted for the purposes of collecting aerial video, photography, and sensory data to be used in support of precision agriculture applications, mapping and inspection operations, and the expansion of basic and fundamental research principles and applications related to the above over rural areas under 400 feet and within Class G airspace within the United States. The requested exemption should be granted because the operation of a small UAS, weighing approximately 8.2kg, inclusive of battery and payload, conducted in the strict conditions outlined below, will provide an equivalent level of safety, as Congress intended, while still allowing for commercial operations. Additionally, given the extenuating circumstances of the petitioners previous operational experience with certification of authorized UAS as PIC (2009-ESA-3, 2010-ESA-28, 2010-ESA-13, 2011-ESA-6-COA, 2011-ESA-61-COA-R, 2012-ESA-56-R, 2012-ESA-77), exceptional safety record, and requirements of PIC at that time, the petitioner would stress that the equivalent levels of safety as Congress had initially intended will be far exceeded within this request for exemption. The lightweight aircraft covered by the exemption are far safer than current conventional operations conducted with helicopters and fixed-wing aircraft weighing thousands of pounds and operating using combustible fuels, and operating in close proximity to the ground. The seven factors Congress directed the FAA to consider when approving Section 333 exemption petitions - size, weight, speed, operational capability, proximity to airports, proximity to populated areas, and operation within visual line of sight – each support the request. In particular, the aircraft are small, and will operate at slow speeds, and close to the ground in order to more safely and efficiently conduct field surveys. The substantial increase of safety and decrease of risk to human life, coupled with the low risk use of sUAS to conduct these operations, and the experience of the petitioner weighs heavily in favor of granting the exemption.

NAME AND ADDRESS OF THE PETITIONER

Kenneth Edward Kroeger
ARAUS LLC
7249 Parsons Court
Alexandria, VA 22306
Phone: 410-487-1350
Email: kkroeger@araustech.com

ARAUS LLC's OPERATIONS

The sUAS

ARAUS LLC seeks an exemption to operate the DJI S900 UAS for compensation or hire within the

NAS. The DJI S900 is a vertical takeoff and landing (VTOL) Unmanned Aircraft (UA) with a Ground Control Station (GCS) utilizing electronic laptop, tablet, or smart phone systems. The DJI S900 has a maximum gross weight of approximately 8.2kg, while having a length of 0.9m, a width of 0.9m, a height of 0.6m, and a maximum speed of approximately 20 knots. The DJI S900 UAS is equipped with six main electric powered rotors driven by Lithium Polymer batteries.

The sUAS will have the following specifications or equivalent:

Airframe: DJI S900
Control System: 3DR Pixhawk
TX: Spektrum DX8
RX: Spektrum 9020
Motors: DJI 4114-11
Propellers: DJI-Innovations Composite folding blades with 15” diameters and 5.2” fixed propeller pitch
TX Data Link: TM1000
Primary Control Link: 2.4 GHz
Primary Telemetry Link: 900 MHz
Video/Secondary Data Link: 5.8 GHz
Gimbal: Depends on Mission
Batteries: Flight: 6S 15000-20000 mAh Accessories: 4S 2500-4000mAh
Flight Time: 20+ minutes typical
Payload Max: 9.5 lbs for batteries and additional payloads
Operating velocities: Never Exceed 15m/s Typical Operating <5m/s

Flight Conditions

The proposed DJI S900 sUAS will be flown and operated within Class G airspace under 400 feet AGL. ARAUS will only operate the sUAS in visual meteorological conditions no less than 2,000 feet horizontally from a cloud or when visibility is at least 3 statute miles from the PIC. The aircraft shall only operate on privately owned land with direct written consent from the land owner to perform such operations.

Flight Operations

The proposed flight operations with the DJI S900 sUAS will be conducted in a safe, accurate, and efficient manner for the purpose of collecting aerial video, photography, and sensory data to be used in support of precision agriculture applications, mapping and inspection operations, and the expansion of basic and fundamental research principles and applications related to the above over specific rural areas with Class G airspace of the United States.

Flights using the sUAS shall be conducted by at a minimum of a two person crew, however, three is considered optimum based on the experience of the petitioner. The three person crew shall consist of a pilot-in-command (PIC), a visual observer (VO), and a ground station commander/operator (GSC). While the PIC is expected to have proficient knowledge of the sUAS, it is expected that the VO and

GSC also have demonstrable knowledge into the basic functions and operations of the specific operations of the sUAS.

The PIC has the responsibility of ensuring the safety of operations of the UAS. The PIC is the person who has final authority and responsibility for the operation and safety of flight, has been designated as PIC before or during the flight, and holds the appropriate category, class, and type rating, if appropriate, for the conduct of the flight. The responsibility and authority of the PIC as described by 14 CFR 91.3, Responsibility and Authority of the Pilot-in-Command, apply to the unmanned aircraft PIC. The PIC position may rotate duties as necessary with equally qualified pilots. The PIC must conduct a pre-takeoff briefing as applicable prior to each launch. The briefing should include but is not limited to the details entailed on the mission cards.

The purpose of the SO is to observe the surrounding operational airspace and alert the PIC if anything enters the operational areas within the UAS. The SO must be able to see the aircraft and the surrounding airspace throughout the entire flight, provide the PIC with the UA's flight path, proximity to all aviation activities and other hazards sufficiently to exercise effective control of the UA in order to comply with CFR 91.111/91.113/91.115 and prevent the UA from creating a collision hazard. Additionally, the observer must be able to communicate clearly to the pilot any instructions required to remain clear of conflicting traffic, using standard phraseology as listed in the AIM when practical.

The purpose of the GSC is to monitor additional telemetry links and information streaming from the UAS flight computers or payload computers. Additionally, the role of the GSC is to support missions of the sUAS in such a manner to ensure successful operations. By enforcing a GSC to monitor aircraft peripheral telemetry allows the PIC and SO to further conduct a narrower set of duties which allows for an increase of focus on the aircraft and associated airspace.

While the majority of flights will be manually piloted, some flights will be preprogrammed into the DJI S900 by the PIC. This automated functionality will be used to ensure the accuracy and successful data coverage for the target area. Throughout automated flights, the PIC will always hold the transmitter, monitor basic telemetry data on the Spektrum DX8, and be prepared to abort the operation and fly the sUAS manually should an emergency situation occur. The GSC if used shall support the mission by relaying additional status to both the VO and PIC for flight time remaining, signal strength, and payload operations.

Additional checklists pertinent for each of the operators at pre-flight operations, post-flight debriefings, maintenance logs, aircraft manuals, etc are covered in the Appendices section of this proposal. These checklists are given to show the reviewer that the petitioner is thorough in their operational safety and functional checks. The checklists however are not necessarily holistic or all encompassing, therefore, ARAUS LLC may modify these lists as needed to further ensure successful operations.

AIRCRAFT AND EQUIVALNET LEVEL OF SAFETY

In consideration of the size, weight, speed, and limited operating area associated with the unmanned aircraft and its operation, ARAUS LLC's operation of the DJI S900 Platform UAS meets the conditions of FMRA Section 333, and will not require an airworthiness certificate in accordance with 14

C.F.R. Part 21, Subpart H.

Section 333 provides authority for a UAS to operate without airworthiness certification and sets forth requirements for considering whether a UAS will create a hazard to users of the NAS or the public, or otherwise pose a threat to national security. Specifically, FMRA Section 333 states the following, in part:

> *(a) In General.--Notwithstanding any other requirement of this subtitle, and not later than 180 days after the date of enactment of this Act, the Secretary of Transportation shall determine if certain unmanned aircraft systems may operate safely in the national airspace system before completion of the plan and rulemaking required by section 332 of this Act or the guidance required by section 334 of this Act.*
>
> *(b) Assessment of Unmanned Aircraft Systems.--In making the determination under subsection (a), the Secretary shall determine, at a minimum--*
>
> *(1) which types of unmanned aircraft systems, if any, as a result of their size, weight, speed, operational capability, proximity to airports and populated areas, and operation within visual line of sight do not create a hazard to users of the national airspace system or the public or pose a threat to national security; and*
>
> *(2) whether a certificate of waiver, certificate of authorization, or airworthiness certification under section 44704 of title 49, United States Code, is required for the operation of unmanned aircraft systems identified under paragraph (1).*
>
> *(c) Requirements for Safe Operation.--If the Secretary determines under this section that certain unmanned aircraft systems may operate safely in the national airspace system, the Secretary shall establish requirements for the safe operation of such aircraft systems in the national airspace system.*

In seeking this exemption, ARAUS LLC submits that the DJI S900 Platform UAS can operate safely in the NAS pursuant to FMRA Section 333, as demonstrated by: (a) the characteristics of the DJI S900 Platform UAS; (b) the pilot certification requirement; and (c) the specific operating limitations.

Additional Autopilot Characteristics Demonstrate Its Equivalent Level of Safety

The DJI S900 Platform UAS does not create a hazard to users of the NAS, the public, or otherwise pose any threat to national security considering its size, weight, speed, and operational capability. The technical specifications of the DJI S900 Platform UAS are set forth by the DJI S900 Platform Specifications and Data Sheet, attached hereto as Appendix A. However, the Pixhawk autopilot system also ensures an equivalent or exceeded level of safety required based on its functionality and performance capabilities.

The DJI S900 Platform UAS when operated with the Pixhawk autopilot system will be operated in three flight modes such as manual, semi-autonomous, and fully autonomous. Switching between the flight modes is governed by the PIC's RC TX on a 3 way position switch. Thus, in the event of any emergencies or desired change in operating mode, the PIC ultimately has a fast and effective way to command it. The manual flight mode requires that the PIC control the low-level angles, and rates of the UA. The semi-autonomous mode enables for the pilot to have an assisted flight performance. This means that the flight control system is ensuring that the position, altitude, and attitude of the aircraft is maintained steady; allowing for the PIC to issues positional and rotational commands for the aircraft to

meet. In a fully-autonomous operation the aircraft is prescribed a predefined mission prior to take-off that has been approved by the PIC. Upon entering this mode, the sUAS will perform the contents of the mission, often consisting of lawn-mower scanning patterns at varying altitudes of flight.

The Pixhawk autopilot allows for the PIC to establish flight operational boundaries establishing a virtual fence around the area of operations. The ground station system allows for the planner to:

1. Establish the boundary as a polygon defined through GPS points.
2. Define the action to take if the fence were breached (i.e. Land, RTL, RTR, Loiter, etc).
3. The location of the return point either being a return to launch or rally point after a timeout has been triggered between the action from step 2 being taken and no override from the PIC.

Additionally, the Pixhawk autopilot system provides countless ways for handling various failsafe procedures. First, GPS Failsafe's are enabled if the aircraft has lost GPS lock or experience a GPS glitch for 5 seconds or greater when operating in a flight mode that requires a GPS. Upon entering the failsafe, the aircraft may Land or return control to the PIC. However, the PIC will not be able to switch into any mode requiring GPS functionalities until the values for HDOP and VDOP are below thresholds.

Loss of Link failsafe procedures are important to ensure an ELS for the sUAS. The Pixhawk autopilot provides failsafe's such as RTL, Land, and disarm in the event loss of link events occur. Similar failsafe event triggers occur in a variety of other cases such as loss of radio control links, low battery voltage or remaining capacity, etc.

Flights to be Conducted Pursuant to Specific Operating Limitations

In seeking this exemption, ARAUS LLC proposes to commercially operate DJI S900 UAS for the special purpose of collecting aerial video, photography, and sensory data to be used in support of precision agriculture applications, mapping and inspection operations, and the expansion of basic and fundamental research principles and applications related to the above over specific rural areas with Class G airspace of the United States. In pursuing these operations ARAUS will be governed by additional specific operating limitations (similar to those requirements of 2009-ESA-3, 2010-ESA-28, 2010-ESA-13, 2011-ESA-6-COA, 2011-ESA-61-COA-R, 2012-ESA-56-R, 2012-ESA-77):

1. Operations authorized by this grant of exemption will be limited to the following aircraft described in the operating documents, rotorcraft UASs weighing less than 55 pounds maximum gross weight: DJI S900 Platform Unmanned Aircraft System. Proposed operations of any other aircraft will require a new petition or a petition to amend this grant.

2. UAS operations under this exemption will be limited to conducting operations for the purpose of precision agriculture applications, mapping and inspection operations, and the expansion of basic and fundamental research principles and applications related to the above.

3. The UAS may not be flown at an indicated airspeed exceeding 20 knots.

4. The UA must be operated at an altitude of no more than 500 feet above ground level (AGL), as indicated by the procedures specified in the operating documents unless a special request is made and approved by ATC. All altitudes reported to ATC must be in feet AGL.

5. The UAS 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.

6. The use of first person view (FPV) by the PIC or safety observer (SO) is not permitted.

7. All operations must utilize a safety observer (SO). The SO may be used to satisfy the VLOS requirement as long as the PIC always maintains VLOS capability. The SO 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 SO can perform the functions prescribed in the operating documents.

8. The SO must not perform any other duties beyond assisting the PIC with seeing and avoiding other air traffic and other ground based obstacles/obstructions and is not permitted to operate the camera or other instruments.

9. The operating documents and the grant of exemption must be accessible during UAS operations and made available to the Administrator upon request. If a discrepancy exists between the conditions and limitations contained in the grant of exemption and the procedures outlined in the operating documents, the conditions and limitations contained in the grant of exemption 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 upon request. The operator must also present updated and revised documents if it petitions for extension or amendment to the grant of exemption. If the operator determines that any update or revision would affect the basis upon which the FAA granted the exemption, then the operator must petition for 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.

10. Prior to each flight the PIC must inspect the UAS to ensure that it is in a condition for safe flight. 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. The Ground Control Station must be included in the preflight inspection. All maintenance and alterations must be properly documented in the aircraft records.

11. 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. The PIC who conducts the functional test flight must make an entry in the aircraft records.

12. The pre-flight inspection must account for all potential discrepancies, e.g. inoperable components, items, or equipment, not already covered in the relevant sections of the operating documents.

13. The operator must follow the UAS manufacturer's aircraft/component, maintenance, overhaul, replacement, inspection, and life limit requirements.

14. The operator must carry out its maintenance, inspections, and record keeping requirements, in accordance with the operating documents. Maintenance, inspection, alterations, and status of replacement/overhaul component parts must be noted in the aircraft records, including total time in service, description of work accomplished, and the signature of the authorized person returning the UAS to service.

15. Each UAS operated under this exemption must comply with all manufacturer Safety Bulletins.

16. The authorized person must make an entry in the aircraft record of the corrective action taken against

discrepancies discovered between inspections.

17. The petitioner for this proposal is considered to have extenuating circumstances allowing for him to operate the proposed UAS. Based on previous issued COAS (2009-ESA-3, 2010-ESA-28, 2010-ESA-13, 2011-ESA-6-COA , 2011-ESA-61-COA-R, 2012-ESA-56-R, 2012-ESA-77) which he had operated under, the required similar PIC Ratings shall be adhered to:

    Rating requirements for the UAS PIC depend on the type of operation conducted. The requirement for the PIC to hold, at a minimum, a current FAA private pilot certificate or the FAA accepted agency equivalent, based on the application of 14 CFR Part 61, is predicated on various factors including the location of the planned operations, mission profile, size of the unmanned aircraft, and whether or not the operation is conducted within or beyond visual line-of-sight.

    1. The PIC must hold, at a minimum, a current FAA private pilot certificate or the FAA accepted agency equivalent, based on the application or 14 CFR Part 61.under all operations:
        a. Approved for flight in Class A, B, C, D, E, and G (more than 400 feet above ground level (AGL)) airspace.
        b. Conducted under IFR (FAA instrument rating required, or the FAA accepted agency equivalent, based on the application or 14 CFR Part 61.
        c. Approved for night operations.
        d. Conducted at or within 5 NM of a joint use or public airfields.
        e. Requiring a chase aircraft.
        f. At any time the FAA has determined the need based on the UAS characteristics, mission profile, or other operational parameters.
    2. Operations without a pilot certificate may be allowed when all of the following conditions are met:
        a. The PIC has successfully completed, at a minimum, FAA private pilot ground instruction and passed the written examination, or the FAA accepted agency equivalent, based on the application. Airman Test reports are valid for the 24-calendar month period preceding the month the exam was completed, at which time the instruction and written examination must be repeated.
        b. The PIC must maintain a 2nd class Airmen's medical.
        c. Operations are during daylight hours.
        d. The operation is conducted in a sparsely populated location.
        e. The operation is conducted from a privately owned airfield, military installation, or off-airport location.
        f. Operations are approved and conducted solely within visual line-of-sight in Class G airspace.
        g. Visual line-of-sight operations are conducted at an altitude of no more than 400 feet Above Ground Level (AGL) in class G airspace at all times.
    3. The FAA may require specific aircraft category and class ratings in manned aircraft depending on the UAS seeking approval and the characteristics of its flight controls interface.

These required qualifications are also derived from FAA-2015-0150.

18. Ancillary personnel such as systems operators or mission specialists must be thoroughly familiar with and possess operational experience of the equipment being used. If the systems being used are for observation and detection of other aircraft for collision avoidance purposes, personnel must be thoroughly trained on collision avoidance procedures and techniques and have direct communication with the UAS pilot, observer, and other crewmembers.

19. The operator may not permit any PIC to operate unless the PIC meets the operator's qualification criteria and demonstrates the ability to safely operate the UAS in a manner consistent with how the UAS will be operated under the exemption, including evasive and emergency maneuvers and maintaining appropriate distances from persons, vessels, vehicles and structures. PIC qualification flight hours must be logged in a manner consistent with 14 C.F.R. § 61.51(b). Flights for the purposes of training the operator's PICs are permitted under the terms of the 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 C.F.R. § 91.119.

20. 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). If flight at night is required, a special request will be made at the FAA office closest to proposed area of operations. Flights under special visual flight rules (SVFR) are not authorized.

21. The UA may not operate within 5 nautical miles of an airport reference point as denoted on a current FAA-published aeronautical chart unless a letter of 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 must be made available to the Administrator upon request.

22. 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.

23. If the UA loses communications or loses its GPS signal, it must return to a pre- determined location within the planned operating area and land or be recovered in accordance with the operating documents.

24. The PIC must abort the flight in the event of unpredicted obstacles or emergencies in accordance with the operating documents.

25. The PIC is prohibited from beginning a flight unless (considering wind and forecast weather conditions) there is enough power to fly at normal cruising speed to the intended landing point and land the UA with 25% battery power remaining.

26. The operator must obtain an Air Traffic Organization (ATO) issued Certificate of Waiver or Authorization (COA) prior to conducting any operations under the grant of exemption. This COA will also require the operator to request a Notice to Airman (NOTAM) not more than 72 hours in advance, but not less than 48 hours prior to the operation. All operations shall be conducted in accordance with airspace requirements in the ATO issued COA including class of airspace, altitude level and potential transponder requirements.

27. All aircraft operated in accordance with the exemption must be identified by serial number, registered in accordance with 14 C.F.R. part 47, and have identification (N- Number) markings in accordance with 14 C.F.R. part 45, Subpart C. Markings must be as large as practicable.

28. Before conducting operations, the radio frequency spectrum used for operation and control of the UA must comply with the Federal Communications Commission (FCC) or other appropriate government oversight agency requirements.

29. The documents required fewer than 14 C.F.R. 91.9 and 91.203 must be available to the PIC at the Ground Control Station of the UAS any time the UAS is operating. These documents must be made available to the Administrator or any law enforcement official upon request.

30. The UA must remain clear and yield the right of way to all manned aviation operations and activities at all times.

31. The UAS may not be operated by the PIC from any moving device or vehicle.

32. Flight operations must be conducted at least 500 feet from all nonparticipating persons (persons other than the PIC, SO, operator trainees or essential 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 and/or;

b. The aircraft is operated near vessels, vehicles or structures where the owner/controller of such vessels, vehicles or structures has granted permission 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, and;

c. Operations nearer to the PIC, SO, operator trainees or essential persons do not present an undue hazard to those persons per § 91.119(a).

33. All operations shall be conducted over private or controlled-access property with permission from the land owner/controller or authorized representative. Permission from land owner/controller or authorized representative will be obtained for each flight to be conducted.

34. 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.

Addressing Typical Concerns of NAAA, ALPA, and USHPA

NAAA has previously stated that it represents the interests of small business owners and pilots licensed as commercial applicators. It has been made clear in other Section 333 requests that NAAA members operate in low-level airspace, and clear low-level airspace is vital to the safety of these operators.

> *NAAA stated that seeing and avoiding other aircraft and hazardous obstructions is the backbone for agricultural safety, and agricultural pilots depend on pilots of other aircraft to perform their see and avoid functions needed to prevent collisions. NAAA believes that UA operations at low altitudes will increase the potential of collision hazards with agricultural aircraft.*

ARAUS LLC can answer this concern by stating that it has been contacted by many operators of piloted aircraft for agricultural operations interested in the capabilities of sUAS technologies as it relates to precision agricultural applications. Additionally, ARAUS LLC answers this concern by reasoning that if indeed the airspace surrounding agricultural areas has a significantly higher percentage of congestion in the NAS, then the applications of using sUAS would ultimately benefit the pilots themselves as this would reduce their risks associated with flight while gaining the same information in a more timely and cost effective manner.

In its comments, the USHPA submitted similar concerns relative to activities of other low altitude user groups including ballooning, skydiving, powered ultralights, etc.

ARAUS LLC can address the concerns of the USHPA by stating that the concerns of operating such low-altitude groups of aircraft within a potential operating area of a sUAS presents little to no risk to both aircraft systems. Following typical right-of-way rules, the manned aircraft would ultimately have the right-of-way over the airspace. Additionally, enough time to respond to the airspace congestion would be easily possible by the PIC because of the relatively low operating speeds of the proposed aircraft groups. Additionally, with the use of both a PIC and SO to observe the surrounding airspace, a visual confirmation would be able to positively achieved by the operating crew of the sUAS and mitigation actions taken well in advance before any risk of near midair collisions.

To address further common concerns of NAAA, ALPA, and USHPA; ARAUS LLC proposes that the issuance of NOTAMs and the coordination of planned activities with the FSDO several days in advance of operations ensures that attempts have been made to address and make other pilots aware of operational activities and advise them to use their best judgements on flight plans.

Additionally, the petitioner of this proposal suggest those who are concerned about the operations of this operation, consider the experience and extenuating circumstances of the petitioner/PIC. While operating as the PIC under COA's issued to Virginia Polytechnic Institute and State University's Unmanned Systems Lab (2009-ESA-3, 2010-ESA-28, 2010-ESA-13, 2011-ESA-6-COA, 2011-ESA-61-COA-R, 2012-ESA-56-R, 2012-ESA-77), operations were professional, safe, and successful. There were no incidents where safety concerns had ever occurred with operators in the NAS. The agricultural areas similar to the areas where the above COAs had served are the intended areas of operations for ARAUS LLC. The requirements of the COAs that had been issued and the PIC had operated under provide the basis for the exemption requests and proposed equivalent levels of safety of this work.

PUBLIC INTEREST AND SAFETY

Similar to the manned aerial acquisition flight operations that have been conducted for decades, ARAUS LLC's proposed operation of the DJI S900 UAS will not implicate any privacy and/or safety issues. Specifically, the DJI S900 UAS will be operated only in compliance with operating documents (i.e., the Aerial Operations Manuals, Checklists, Maintenance Logs, and Instruction Manuals) and in accordance with the Federal Aviation Regulations. Flight operations will be conducted over private properties with the owner's permission in Class G airspace under 400feet AGL. Granting ARAUS LLC the proposed exemptions will ensure benefits to the public interest while ensuring their privacy is not intruded upon.

PRIVACY

Similar to the manned aerial acquisition flight operations that have been conducted for decades, ARAUS LLC's proposed operation of the DJI S900 UAS will not implicate any privacy issues. Specifically, the DJI S900 UAS will be operated only in compliance with operating documents (i.e., the Aerial Operations Manuals, Checklists, Maintenance Logs, and Instruction Manuals) which requires the property owner involvement and in accordance with the Federal Aviation Regulations, including the minimum altitude requirements of 14 C.F.R. § 91.119. When the sUAS is being flown, the sensory systems will be focused on the proposed data source at hand for the mission, thus minimizing

inadvertent video or still images of uninvolved persons. All data collected will be for private use only and will not be distributed through public channels. Additionally, data being collected in the proposed rural agricultural operational areas suggest that the likelihood of persons within range of the sensory imaging systems not relating to the direct commercial operations of the sUAS are slim to none. However, in the event that individuals not relating to the operation of the sUAS were captured by the sensory systems, no attempt will be made to identify any individuals filmed during the flights except in cases where they are trespassing upon or damaging customer property, or interfering with the applicant's or its customers' operations.

The Reasons Why Granting ARAUS LLC's Request Would Be in the Public Interest; That Is, How It Would Benefit the Public as a Whole.

Granting the present request for exemptions will further the public interest by allowing ARAUS LLC to collect aerial video, photography, and sensory data to be used in support of precision agriculture applications, mapping and inspection operations, and the expansion of basic and fundamental research principles and applications. Additionally, use of the DJI S900 UAS will decrease congestion of the NAS, reduce pollution, and provide significant benefits to the economy. Notably, the benefits of ARAUS LLC's proposed operation of the DJI S900 UASs will be realized without implicating any privacy issues.

The Public Will Benefit From Decreased Congestion Of The NAS.

The DJI S900 is a battery powered UAS and can serve as a safe, efficient, and economical alternative to the manned aircraft traditionally utilized to obtain aerial imagery and sensory data. By reducing the amount of manned aircraft needed to perform aerial acquisitions, an exemption allowing the use of a DJI S900 UAS would reduce the amount of manned aircraft in the NAS, reduce noise and air pollution, as well as increase the safety of life and property in the air and on the ground.

Furthermore, by reducing the number of manned aircraft operating in the NAS, congestion around airports caused by arriving and departing aircraft will be reduced. The DJI S900 UAS does not require an airport to takeoff or land. Likewise, a reduction of manned aircraft conducting aerial video and photography missions would result in fewer aircraft that must be handled by air traffic control during the ground, takeoff, departure, arrival, and landing phases of flight operations.

*The Public Will Benefit From The Safety And Efficiency Of The **DJI S900 Platform** UAS.*

Conducting aerial acquisitions with the DJI S900 UAS, instead of manned aircraft, will greatly benefit the public by drastically reducing the levels of air and noise pollution generated during traditional aerial video and still photography flight operations. By using battery power and electric motors, the DJI S900 UAS produces no air pollution, and is the most viable environmental alternative to typical manned aircraft operations. The DJI S900 UAS, while reducing the carbon footprint of aerial acquisitions, also eliminates noise pollution, as the UAS is propelled by battery powered electric motors, rather than an internal combustion engine.

By using the DJI S900 UAS to perform aerial acquisitions, the substantial risk to life and

property in the air and on the ground, which is usually associated with traditional manned aircraft flight operations, will be substantially reduced or completely eliminated. Aside from the lack of flight crew members located onboard the aircraft, the DJI S900 UAS, has less physical potential for collateral damage to life and property on the ground, and in the air, compared to the manned aircraft that typically conduct similar operations.

Performing Aerial Video and Photography Operations with the DJI S900 Platform UAS Will Benefit the Economy.

In addition to being safe and efficient, the DJI S900 UAS is an economical alternative to using manned aircraft to conduct similar aerial operations. As such, operation of the DJI S900 UAS will allow United States based companies, like ARAUS LLC, to remain competitive and contribute to growth of the U.S. economy. Specifically, with the rising cost of aviation fuel and the Environmental Protection Agency ("EPA") regulatory actions phasing out leaded aviation fuels, U.S. owned and operated companies must adopt new and alternative technology in order to remain competitive. Operating the battery powered DJI S900 UAS is one such technology that not only allows companies greater operational flexibility compared to manned aircraft, but provides such flexibility without the high operational cost of a traditional manned aircraft.

By operating the DJI S900 UAS, companies such as ARAUS LLC, can remain competitive and profitable, and therefore, provide greater job stability to employees and contractors, which will ultimately contribute to growth of the U.S. economy. Improved financial performance of U.S. companies, through commercial use of the DJI S900 UAS, provides a stable workforce that increases consumer spending; improves local, state, and federal tax revenues; and allows companies to invest in research and development in order to remain competitive both in the United States and abroad.

Performing Aerial Video and Photography Operations with the DJI S900 Platform UAS Will Benefit the Environment.

It is known that pesticides, herbicides, and fungicides used in agricultural operations can contaminate water supplies through methods of direct application, runoff, wind transport, and atmospheric decomposition. Fertilizer applications commonly involving nutrients such as phosphorus, nitrogen, and potassium are often applied in excess of the crops needs in order to ensure proper uptake by the stressed plant and account for direct/indirect losses of the application. However, much of the NPS pollution is in direct relation to the runoff and leaching effects resulting from this form of application method. As stated from the Chesapeake Bay Foundation, 40% of the nitrogen and 50% of the phosphorus pollution levels in the Chesapeake Bay result from agricultural runoffs from within the local region. Similar pollution and run-off levels are noted by the EPA across the country in other agricultural areas.

This over application is a direct result from the farmers lack in current capabilities of performing crop health assessments of their fields on a weekly or even monthly basis. Therefore, when infected or stressed crops are identified, current methods prohibit the farmer from identifying the distribution and epicenter of the stressor primarily because of the magnitude of scale of the problem. Leveraging a

specially outfitted aircraft such as the one put forward in this proposal would allow for farmers to gain insight into the health of their fields on a regular basis. The aircraft would provide the capabilities to quickly and efficiently survey their fields and collect more information than human visual assessments would ever be able to. The gained information would allow the farmer to precisely understand the distribution of stress in his/her crops and precisely target treatment plans for their fields. These aerial crop health assessments when used in precision agriculture applications would become a powerful tool for farmers to observe, measure, and respond to variability in their fields in an attempt to increase yield while simultaneously reducing their inputs ensuring a further successful agricultural operation and thus reducing operational costs, reduce environmental impact, and increase crop yields and return on investments.

REGULATIONS FROM WHICH EXEMPTION IS REQUESTED

14 C.F.R.21(h): Airworthiness Certificates

Section 21 subsection (h) states the following:

This section is too long for purpose of the proposal. Please see the appropriate CFR from the FAA.

Extent of relief ARAUS LLC seeks providing an equivalent level of safety: ARAUS requests an exemption based on the requirements for an ELS pursuant to Section 333 aircraft. This ELS is based on the size, weight, operating speed, and operational environment as described in the previous section.

14 C.F.R 43.7: Persons authorized to approve aircraft, airframes, aircraft engines, propellers, appliances, or component parts for return to service after maintenance, preventive maintenance, rebuilding, or alteration

Section 43.7 states the following:

Persons authorized to approve aircraft, airframes, aircraft engines, propellers, appliances, or component parts for return to service after maintenance, preventive maintenance, rebuilding, or alteration.

(a) Except as provided in this section and § 43.17, no person, other than the Administrator, may approve an aircraft, airframe, aircraft engine, propeller, appliance, or component part for return to service after it has undergone maintenance, preventive maintenance, rebuilding, or alteration.

(b) The holder of a mechanic certificate or an inspection authorization may approve an aircraft, airframe, aircraft engine, propeller, appliance, or component part for return to service as provided in Part 65 of this chapter.

(c) The holder of a repair station certificate may approve an aircraft, airframe, aircraft engine, propeller, appliance, or component part for return to service as provided in Part 145 of this chapter.

(d) A manufacturer may approve for return to service any aircraft, airframe, aircraft engine, propeller, appliance, or component part which that manufacturer has worked on under § 43.3(j). However, except for minor alterations, the work must have been done in accordance with technical data approved by the Administrator.

(e) The holder of an air carrier operating certificate or an operating certificate issued under Part 121 or 135, may approve an aircraft, airframe, aircraft engine, propeller, appliance, or component part for return to service as provided in Part 121 or 135 of this chapter, as applicable.

(f) A person holding at least a private pilot certificate may approve an aircraft for return to service after performing preventive maintenance under the provisions of § 43.3(g).

(g) The holder of a repairman certificate (light-sport aircraft) with a maintenance rating may approve an aircraft issued a special airworthiness certificate in light-sport category for return to service, as provided in part 65 of this chapter.

(h) The holder of at least a sport pilot certificate may approve an aircraft owned or operated by that pilot and issued a special airworthiness certificate in the light-sport category for return to service after performing preventive maintenance under the provisions of § 43.3(g).

Extent of relief ARAUS LLC seeks providing an equivalent level of safety: ARAUS LLC seeks the requested relief because the DJI S900 Platform UAS does not require an airworthiness certificate in accordance with 14 C.F.R. Part 21, Subpart H. Additionally, as the FAA has not established standards for obtained a UAS rating, this ordinance is not applicable.

14 C.F.R. 43.11: Content, form, and disposition of records for inspections conducted under parts 91 and 125 and 135.411(a)(1) and 135.419 of this chapter

Section 43.11 states the following:

(a) *Maintenance record entries.* The person approving or disapproving for return to service an aircraft, airframe, aircraft engine, propeller, appliance, or component part after any inspection performed in accordance with part 91, 125, § 135.411(a)(1), or § 135.419 shall make an entry in the maintenance record of that equipment containing the following information:

(1) The type of inspection and a brief description of the extent of the inspection.

(2) The date of the inspection and aircraft total time in service.

(3) The signature, the certificate number, and kind of certificate held by the person approving or disapproving for return to service the aircraft, airframe, aircraft engine, propeller, appliance, component part, or portions thereof.

(4) Except for progressive inspections, if the aircraft is found to be airworthy and approved for return to service, the following or a similarly worded statement—"I certify that this aircraft has been inspected in accordance with (insert type) inspection and was determined to be in airworthy condition."

(5) Except for progressive inspections, if the aircraft is not approved for return to service because of needed maintenance, noncompliance with applicable specifications, airworthiness directives, or other approved data, the following or a similarly worded statement—"I certify that this aircraft has been inspected in accordance with (insert type) inspection and a list of discrepancies and unairworthy items dated (date) has been provided for the aircraft owner or operator."

(6) For progressive inspections, the following or a similarly worded statement—"I certify that in accordance with a progressive inspection program, a routine inspection of (identify whether aircraft or components) and a detailed inspection of (identify components) were performed and the (aircraft or components) are (approved or disapproved) for return to service." If disapproved, the entry will further state "and a list of discrepancies and unairworthy items dated (date) has been provided to the aircraft owner or operator."

(7) If an inspection is conducted under an inspection program provided for in part 91, 125, or § 135.411(a)(1), the entry must identify the inspection program, that part of the inspection program accomplished, and contain a statement that the inspection was performed in accordance with the inspections and procedures for that particular program.

(b) *Listing of discrepancies and placards.* If the person performing any inspection required by part 91 or 125 or § 135.411(a)(1) of this chapter finds that the aircraft is unairworthy or does not meet the applicable type certificate data, airworthiness directives, or other approved data upon which its airworthiness depends, that persons must give the owner or lessee a signed and dated list of those discrepancies. For those items permitted to be inoperative under § 91.213(d)(2) of this chapter, that person shall place a placard, that meets the aircraft's airworthiness certification regulations, on each inoperative instrument and the cockpit control of each item of inoperative equipment, marking it "Inoperative," and shall add the items to the signed and dated list of discrepancies given to the owner or lessee.

Extent of relief ARAUS LLC seeks providing an equivalent level of safety: ARAUS requests an exemption based on the requirements for an ELS pursuant to Section 333 aircraft. Based on the size and payload capacity of the aircraft, the UAS does not have the capability to carry and maintain placards in/on the UA. Additionally, no inspection process at this time has been formalized and certified by the FAA. An ELS will be sustained as all of ARAUS flight crews will be required to keep log books of all

maintenance, repair, and flight operations for the UAS at the ground station operation point and travel accordingly with the aircraft.

14 C.F.R. 45.11(a,b,c): Marking of products

Section 45.11 states the following:

(a) ***Aircraft.*** A manufacturer of aircraft covered under §21.182 of this chapter must mark each aircraft by attaching a fireproof identification plate that—

(1) Includes the information specified in §45.13 using an approved method of fireproof marking;

(2) Must be secured in such a manner that it will not likely be defaced or removed during normal service, or lost or destroyed in an accident; and

(3) Except as provided in paragraphs (d) through (h) of this section, must be secured to the aircraft fuselage exterior so that it is legible to a person on the ground, and must be either adjacent to and aft of the rear-most entrance door or on the fuselage surface near the tail surfaces.

(b) ***Aircraft engines.*** A manufacturer of an aircraft engine produced under a type certificate or production certificate must mark each engine by attaching a fireproof identification plate. Such plate—

(1) Must include the information specified in § 45.13 using an approved method of fireproof marking;

(2) Must be affixed to the engine at an accessible location; and

(3) Must be secured in such a manner that it will not likely be defaced or removed during normal service, or lost or destroyed in an accident.

(c) ***Propellers and propeller blades and hubs.*** Each person who produces a propeller, propeller blade, or propeller hub under a type certificate or production certificate must mark each product or part using an approved fireproof method. The marking must—

(1) Be placed on a non-critical surface;

(2) Contain the information specified in § 45.13;

(3) Not likely be defaced or removed during normal service; and

(4) Not likely be lost or destroyed in an accident.

Extent of relief ARAUS LLC seeks providing an equivalent level of safety: ARAUS requests an exemption based on the requirements for an ELS pursuant to Section 333 aircraft. Based on the size and payload capacity of the aircraft, the UAS does not have the capability to carry and maintain fireproof identification plates in/on the UA. Requiring placards could become hazardous as a result of the additional weight and strain placed on the aircrafts lift capability and flight dynamics. ARAUS's flight operations personal will keep all information related to the UAS within its operations manual located at the ground station. Additionally, the UAS N-Number will be affixed with lettering as large as practically possible once received from the FAA Registration office. This exemption provides an ELS as relevant documentation and information is available to any of the flight personal including the PIC at any time.

14 C.F.R. 45.27(a): Location of marks, nonfixed-wing aircraft

Section 45.27 (a) states the following:

(a) Rotorcraft. 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.

Extent of relief ARAUS LLC seeks providing an equivalent level of safety: ARAUS is prepared to identify its UAS by serial number, register them in accordance with 14 C.F.R. part 57, and have N-Number markings on the sUAS. However, 14 C.F.R. 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. The DJI S900, due to its small size, does not have a cabin, fuselage, boom or tail to display the marks required by §45.23. Therefore, an ELS will be maintained such that each of these markings will be displayed on the "arms" of the multirotor vehicle as large as practically possible.

14 C.F.R 45.29 (3): Size of marks

Section 45.29(3) states the following:

(3) Rotorcraft, must be at least 12 inches high, except that rotorcraft displaying before April 18, 1983, marks required by § 45.29(b)(3) in effect on April 17, 1983, and rotorcraft manufactured on or after April 18, 1983, but before December 31, 1983, may display those marks until the aircraft is repainted or the marks are repainted, restored, or changed.

Extent of relief ARAUS LLC seeks providing an equivalent level of safety: The FAA has previously determined that relief from this section is not necessary, so long as the UAS in question is registered with the FAA and the markings are as large as practically possible. Therefore, an ELS will be maintained by ensuring that the above requirements are met.

14 C.F.R. 61.56: Flight Review

Section 61.56 states the following:

(a) Except as provided in paragraphs (b) and (f) of this section, a flight review consists of a minimum of 1 hour of flight training and 1 hour of ground training. The review must include:

(1) A review of the current general operating and flight rules of part 91 of this chapter; and

(2) A review of those maneuvers and procedures that, at the discretion of the person giving the review, are necessary for the pilot to demonstrate the safe exercise of the privileges of the pilot certificate.

(b) Glider pilots may substitute a minimum of three instructional flights in a glider, each of which includes a flight to traffic pattern altitude, in lieu of the 1 hour of flight training required in paragraph (a) of this section.

(c) Except as provided in paragraphs (d), (e), and (g) of this section, no person may act as pilot in command of an aircraft unless, since the beginning of the 24th calendar month before the month in which that pilot acts as pilot in command, that person has—

(1) Accomplished a flight review given in an aircraft for which that pilot is rated by an authorized instructor and

(2) A logbook endorsed from an authorized instructor who gave the review certifying that the person has satisfactorily completed the review.

(d) A person who has, within the period specified in paragraph (c) of this section, passed a pilot proficiency check conducted by an examiner, an approved pilot check airman, or a U.S. Armed Force, for a pilot certificate, rating, or operating privilege need not accomplish the flight review required by this section.

(e) A person who has, within the period specified in paragraph (c) of this section, satisfactorily accomplished one or more phases of an FAA-sponsored pilot proficiency award program need not accomplish the flight review required by this section.

(f) A person who holds a flight instructor certificate and who has, within the period specified in paragraph (c) of this section, satisfactorily completed a renewal of a flight instructor certificate under the provisions in § 61.197 need not accomplish the one hour of ground training specified in paragraph (a) of this section.

(g) A student pilot need not accomplish the flight review required by this section provided the student pilot is undergoing training for a certificate and has a current solo flight endorsement as required under § 61.87 of this part.

(h) The requirements of this section may be accomplished in combination with the requirements of § 61.57 and other applicable recent experience requirements at the discretion of the authorized instructor conducting the flight review.

(i) A flight simulator or flight training device may be used to meet the flight review requirements of this section subject to the following conditions:

(1) The flight simulator or flight training device must be used in accordance with an approved course conducted by a training center certificated under part 142 of this chapter.

(2) Unless the flight review is undertaken in a flight simulator that is approved for landings, the applicant must meet

the takeoff and landing requirements of § 61.57(a) or § 61.57(b) of this part.
(3) The flight simulator or flight training device used must represent an aircraft or set of aircraft for which the pilot is rated.

Extent of relief ARAUS LLC seeks providing an equivalent level of safety: ARAUS requests an exemption based on the requirements for an ELS pursuant to Section 333 aircraft. As the FAA has not established the necessary rating or training requirements to operate sUAS specifically, the guidelines provided by C.F.R. 61.56 are impossible to satisfy. Therefore, ARAUS LLC proposes that an equivalent level of safety can be achieved by requiring that the PIC must have accumulated and logged, in a manner consistent with 14 C.F.R. § 61.51(b), 25 hours of total time as a UAS rotorcraft pilot (with a minimum of 5 hours of those hours as a UAS pilot operating the same make and model of UAS to be used for operations under the exemption). In addition to the hour requirements, the PIC must accomplish 3 takeoffs and landings in the preceding 90 days (for currency purposes) with a minimal operational time of 15 minutes per flight.

14 C.F.R. 61.113(a)(b): Private pilot privileges and limitations: Pilot in command

Section 61.113 states the following:

(a) Except as provided in paragraphs (b) through (h) of this section, no person who holds a private pilot certificate may act as pilot in command of an aircraft that is carrying passengers or property for compensation or hire; nor may that person, for compensation or hire, act as pilot in command of an aircraft.
(b) A private pilot may, for compensation or hire, act as pilot in command of an aircraft in connection with any business or employment if:
(1) The flight is only incidental to that business or employment; and
(2) The aircraft does not carry passengers or property for compensation or hire.

Extent of relief ARAUS LLC seeks providing an equivalent level of safety: Relief from Section 61.113(a) and (b) entitled *Private pilot privileges and limitations: Pilot in command*, is requested to the extent necessary to allow ARAUS LLC to conduct commercial operations of the proposed sUAS. ARAUS LLC also submits that an equivalent level of safety will be maintained as the proposed PIC has already previously passed an airmen's ground school exam, maintains a 2nd class airmen's medical, and is familiar with required operations of UAS in the NAS from his prior experience at Virginia Tech when operating as PIC aircraft under their COA. Further, ARAUS LLC submits that all flights of the DJI S900 Platform, conducted by the PIC pursuant to the grant of this Petition: (1) will be incidental to ARAUS LLC business operations; and (2) will not carry passengers or property for compensation or hire.

ARAUS LLC submits that the equivalent level of safety established by Section 61.113(a) and (b) will be maintained because no PIC will be allowed to operate the DJI S900 Platform UAS unless that PIC has demonstrated, by meeting minimum flight-hour and currency requirements, that the PIC is able to safely operate the DJI S900 Platform UAS in a manner consistent with the exemption, including evasive and emergency maneuvers and maintaining appropriate distances from people, vessels, vehicles and structures. Considering ARAUS LLC's proposed area of operations, and the operating limitations set forth-above; the parallel nature of private pilot aeronautical knowledge requirements to those of commercial pilot requirements (See Exemption No. 11062); and the airmanship skills necessary to

safely operate the DJI S900 Platform UAS, ARAUS LLC submits that the additional manned airmanship experience of a certificated pilot would not further elevate the airmanship skills necessary for ARAUS LLC's specific proposed flight operations.

The FAA has previously stated that "The FAA has reviewed the knowledge and training requirements of sport, recreational, private and commercial certificates and concluded that a UAS PIC holding a minimum of a sport pilot certificate, and operating under this exemption, would not adversely affect operations in the NAS or present a hazard to persons or property on the ground." The petitioner of this proposal agrees that the knowledge requirements needed towards the pilot certificates of above are necessary for UAS PICs to understand the fundamental basics of operations within the NAS and the associated responsibilities. However, the petitioner also believes that because a PIC may possess a pilot certification that does not guarantee or ensure an equivalent level of safety can be guaranteed or substituted for operational experience. Additionally, in order to gain experience as a certified PIC, under current regulations must be conducted with an instructor with appropriate ratings. As the FAA has not proposed a current certification process for pilot's ratings of UAS, this would appear to be an unobtainable requirement. Additionally, if we assume that a proposed PIC is to obtain equivalent operational time through their own means, how can the FAA guarantee based on the proposed schema that they are capable of successfully performing operations without an individual with the appropriate ratings present.

The petitioner for this proposal is considered to have extenuating circumstances allowing for him to operate as PIC of the proposed UAS. Based on previously issued COAS which had only required the PIC have equivalently a student pilot certificate (which required no solo rating) (2009-ESA-3, 2010-ESA-28, 2010-ESA-13, 2011-ESA-6-COA, 2011-ESA-61-COA-R, 2012-ESA-56-R, 2012-ESA-77) which he had operated under, ARAUS LLC proposes the same stringent requirements in order to establish an equivalent safety. Additionally, the petitioner poses that these seem requirements are similar to the ones as considered by the FAA currently in FAA-2015-0150. The petitioner poses to the FAA that the proposed PIC would be capable of easily satisfying the requirements of Section III A, B, C, D, E titled Pilot Qualifications. However, do to the untimely nature of FAA rulings on exemptions, economy and environmental effects would be mounting for undue timeliness of resolving regulations of which would be satisfied anyway. These requirements are as followed:

The PIC must have accumulated and logged, in a manner consistent with 14 C.F.R. § 61.51(b), 25 hours of total time as a UAS rotorcraft pilot (with a minimum of 5 hours of those hours as a UAS pilot operating the same make and model of UAS to be used for operations under the exemption). In addition to the hour requirements, the PIC must accomplish 3 takeoffs and landings in the preceding 90 days (for currency purposes).

Rating requirements for the UAS PIC depend on the type of operation conducted. The requirement for the PIC to hold, at a minimum, a current FAA private pilot certificate or the FAA accepted agency equivalent, based on the application of 14 CFR Part 61, is predicated on various factors

including the location of the planned operations, mission profile, size of the unmanned aircraft, and whether or not the operation is conducted within or beyond visual line-of-sight.

1. The PIC must hold, at a minimum, a current FAA private pilot certificate or the FAA accepted agency equivalent, based on the application or 14 CFR Part 61.under all operations:
   a. Approved for flight in Class A, B, C, D, E, and G (more than 400 feet above ground level (AGL)) airspace.
   b. Conducted under IFR (FAA instrument rating required, or the FAA accepted agency equivalent, based on the application or 14 CFR Part 61.
   c. Approved for night operations.
   d. Conducted at or within 5 NM of a joint use or public airfields.
   e. Requiring a chase aircraft.
   f. At any time the FAA has determined the need based on the UAS characteristics, mission profile, or other operational parameters.
2. Operations without a pilot certificate may be allowed when all of the following conditions are met:
   a. The PIC has successfully completed, at a minimum, FAA private pilot ground instruction and passed the written examination, or the FAA accepted agency equivalent, based on the application. Airman Test reports are valid for the 24-calendar month period preceding the month the exam was completed, at which time the instruction and written examination must be repeated.
   b. The PIC has successfully obtained, at a minimum, a 2nd class Airmen's Medical Certificate.
   c. Operations are during daylight hours.
   d. The operation is conducted in a sparsely populated location.
   e. Operations are approved and conducted solely within visual line-of-sight in Class G airspace.
   f. Visual line-of-sight operations are conducted at an altitude of no more than 400 feet Above Ground Level (AGL) in class G airspace at all times.

These guidelines provided would satisfy the requirements of 14 C.F.R. 61.113 and given the extenuating circumstances of the previous experience of the petitioner/PIC would ensure that an equivalent level of safety has been far exceeded for the operations of the DJI S900 for ARAUS LLC.

14 C.F.R. 61.133: Commercial pilot privileges and limitations.

Section 61.133 states the following:

(a) *Privileges*—

(1) *General.* A person who holds a commercial pilot certificate may act as pilot in command of an aircraft—

(i) Carrying persons or property for compensation or hire, provided the person is qualified in accordance with this part and with the applicable parts of this chapter that apply to the operation; and

(ii) For compensation or hire, provided the person is qualified in accordance with this part and with the applicable parts of this chapter that apply to the operation.

Extent of relief ARAUS LLC seeks providing an equivalent level of safety: ARAUS requests an exemption based on the requirements for an ELS pursuant to Section 333 aircraft. First, the sUAS will not be carrying individuals. Second, as the request for exemption 14 C.F.R. 61.113 a commercial pilot certificate would not be required for operation of the DJI S900 sUAS.

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

Section 91.7 subsection (a) states the following:

(a) No person may operate a civil aircraft unless it is in an airworthy condition.

Extent of relief ARAUS LLC seeks providing an equivalent level of safety: ARAUS LLC seeks the requested relief because the DJI S900 Platform UAS does not require an airworthiness certificate in accordance with 14 C.F.R. Part 21, Subpart H. Therefore, ARAUS LLC and the PIC will ensure that the DJI S900 Platform UAS is in airworthy condition based upon its compliance with the operating documents (i.e., Pre-Flight Checklist, Post-Flight Debrief, Monthly Maintenance Log, and DJI S900 Instruction Manual) prior/after every flight, and further, determine that the aircraft is in condition for safe flight, as stated in the conditions and limitations above. The equivalent level of safety established by Section 91.7(a) will be maintained because prior to every flight, ARAUS LLC and the PIC will ensure that DJI S900 Platform UAS is in an airworthy condition based upon the UAS's compliance with its operating documents and as stated in the conditions and limitations herein.

14 C.F.R. 91.9(b2 & c): Civil aircraft flight manual, marking, and placard requirements

Section 91.9 subsections (b2 & c) states the following:

(b) No person may operate a U.S.-registered civil aircraft—

> **(2)** For which an Airplane or Rotorcraft Flight Manual is not required by § 21.5 of this chapter, unless there is available in the aircraft a current approved Airplane or Rotorcraft Flight Manual, approved manual material, markings, and placards, or any combination thereof.

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

Extent of relief ARAUS LLC seeks providing an equivalent level of safety: ARAUS requests an exemption based on the requirements for an ELS pursuant to Section 333 aircraft. First, the FAA has yet to put in place the necessary procedures or process for approving manuals for UAS operations. Second, given the size and the configuration of the UAS, there is no method in which to carry a flight manual aboard the DJI S900 while maintaining a feasible and safe operational weight. Additionally, a manual aboard an unmanned aircraft poses no use to the PIC operating from the ground. Therefore, an ELS is achieved by maintaining all proper manuals and records at the ground station where a PIC or FAA inspector may have access to them. On August 8, 2014, the FAA issued a memorandum entitled

"Interpretation regarding whether certain required documents may be kept at an unmanned aircraft's control station." This document stated that in the case of sUAS, "maintaining these documents at the pilot's control station would meet the intent of the rule as the pilot would be able to produce the documents for his or her own information or to an FAA inspector." In regards to subsection c, the requests for relief of the previous sections relating to part 45 above apply here.

14 C.F.R. 91.103(b2): Preflight action

Section 91.103 subsections (b2), states the following:

(b) For any flight, runway lengths at airports of intended use, and the following takeoff and landing distance information:

(2) For civil aircraft other than those specified in paragraph (b)(1) of this section, other reliable information appropriate to the aircraft, relating to aircraft performance under expected values of airport elevation and runway slope, aircraft gross weight, and wind and temperature.

Extent of relief ARAUS LLC seeks providing an equivalent level of safety: ARAUS requests an exemption based on the requirements for an ELS pursuant to Section 333 aircraft. ARAUS is mandating that the flight operations crew well versed in the flight operations, vehicle characteristics, and mission; flights however will not be conducted at airports and therefore the information in this section does not apply.

14 C.F.R. 91.105: Flight crewmembers at stations

Section 91.105 states the following:

(a) During takeoff and landing, and while en route, each required flight crewmember shall—

(1) Be at the crewmember station unless the absence is necessary to perform duties in connection with the operation of the aircraft or in connection with physiological needs; and

(2) Keep the safety belt fastened while at the crewmember station.

(b) Each required flight crewmember of a U.S.-registered civil aircraft shall, during takeoff and landing, keep his or her shoulder harness fastened while at his or her assigned duty station. This paragraph does not apply if—

(1) The seat at the crewmember's station is not equipped with a shoulder harness; or

(2) The crewmember would be unable to perform required duties with the shoulder harness fastened.

Extent of relief ARAUS LLC seeks providing an equivalent level of safety: ARAUS requests an exemption based on the requirements for an ELS pursuant to Section 333 aircraft. Operations of the UAS will not be conducted by the flight operations crew unless all personal are in attendance, alert, at their appropriate positions, and understand the purpose of their role and duty on the flight. However, the UAS is not carrying flight crewmembers and therefore an exemption is requested.

14 C.F.R. 91.113(b): Right-of-way rules: Except water operations

Section 91.113 subsection (b) states the following:

(b*) General.* When weather conditions permit, regardless of whether an operation is conducted under instrument flight rules or visual flight rules, vigilance shall be maintained by each person operating an aircraft so as to see and avoid other aircraft. When a rule of this section gives another aircraft the right-of-way, the pilot shall give way to that aircraft and may not pass

over, under, or ahead of it unless well clear.

Extent of relief ARAUS LLC seeks providing an equivalent level of safety: ARAUS requests an exemption based on the requirements for an ELS pursuant to Section 333 aircraft. ARAUS makes this request in the specific case of the UAS passing under a right-of-way aircraft. As the proposed UAS altitude is at or below 400 feet AGL, and the data collection sources of interest are at or below 400 feet AGL, the proposed UAS operations pose no danger or threat to other aircraft within the NAS. However, in the event that another aircraft enters the vicinity of the UAS, the PIC operating under VFR will be able to yield the correct right-of-way and thus ensuring an ELS.

14 C.F.R. 91.119(b)(c): Minimum safe altitudes: General

Section 91.119 subsections (c) states the following:

Except when necessary for takeoff or landing, no person may operate an aircraft below the following altitudes:
(c) ***Over other than congested areas.*** An altitude of 500 feet above the surface, except over open water or sparsely populated areas. In those cases, the aircraft may not be operated closer than 500 feet to any person, vessel, vehicle, or structure.

Extent of relief ARAUS LLC seeks providing an equivalent level of safety: ARAUS LLC seeks the requested relief because the DJI S900 sUAS will only be operated at altitudes less than 400 feet AGL. An ELS will be maintained as the areas of operations will contain a significantly spare density of hazards and the sUAS will operated within VLS of the PIC at all times. Similar requests for exemption have been approved using this ELS definition.

14 C.F.R. 91.121: Altimeter Settings

Section 91.121 states the following:

(a) Each person operating an aircraft shall maintain the cruising altitude or flight level of that aircraft, as the case may be, by reference to an altimeter that is set, when operating—

(1) Below 18,000 feet MSL, to—

(i) The current reported altimeter setting of a station along the route and within 100 nautical miles of the aircraft;

(ii) If there is no station within the area prescribed in paragraph (a)(1)(i) of this section, the current reported altimeter setting of an appropriate available station; or

(iii) In the case of an aircraft not equipped with a radio, the elevation of the departure airport or an appropriate altimeter setting available before departure;

Extent of relief ARAUS LLC seeks providing an equivalent level of safety: ARAUS requests an exemption based on the requirements for an ELS pursuant to Section 333 aircraft. Considering the limited altitude of the proposed operations, relief from 14 CFR 91.121 is sought to the extent necessary to comply with the applicable conditions and limitations stated below. This relief is required to allow flight operations of the DJI S900 Platform UAS, which utilizes a barometric pressure sensor, Global Positioning System (GPS), and a radio communications telemetry data link to downlink altitude information from the UA to the PIC at the ground control station (GCS). ARAUS LLC seeks the

requested relief because the DJI S900 Platform altimeter may be set on the ground to zero feet AGL.

The equivalent level of safety established by Section 91.121 will be maintained because the altitude information of the DJI S900 UAs will be provided to the PIC via GPS and Barometric pressure equipment and a radio communications telemetry data link, which downlinks from the UA to the GCS for active monitoring of the flight path and altitude. This altitude information, combined with the proposed operation of the DJI S900 UAS within visual line of sight, at or below 500 feet AGL, will ensure a level of safety equivalent. The altitude information will be generated by GPS equipment installed onboard the aircraft. The FAA has previously granted relief from Section 91.121 specific to UAS.

14 C.F.R. 91.151: Fuel requirements for flight in VFR conditions

Section 91.151 states the following:

(b) No person may begin a flight in a rotorcraft 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, to fly after that for at least 20 minutes.

Extent of relief ARAUS LLC seeks providing an equivalent level of safety: ARAUS requests an exemption based on the requirements for an ELS pursuant to Section 333 aircraft. Relief is requested to the extent required to allow flights of the lithium polymer battery powered DJI S900 Platform UA during daylight hours in visual meteorological conditions (VMC), under visual flight rules (VFR), for a total duration of 20 minutes to the first point of intended landing and, assuming normal cruising speed, to fly after that for at least 5 minutes. ARAUS LLC seeks the requested relief because without an exemption from Section 91.151(b), the flight time duration of the battery powered DJI S900 Platform UA impossibly constrain the practicality of the flight operations that ARAUS LLC proposes to conduct pursuant to this Petition.

Significantly, as set forth below, the technical specifications of the DJI S900 Platform operating documents, and ARAUS LLC's proposed operating limitations, ensure that ARAUS LLC will safely operate the battery powered DJI S900 UA during daylight hours in visual meteorological conditions (VMC), under visual flight rules (VFR), with enough battery power to fly for a total duration of 18 minutes to the first point of intended landing and, assuming normal cruising speed, to fly after that for at least 5 minutes.

A grant of this exemption would ensure an equivalent level of safety established by 14 C.F.R. Section 91.151(b) as a result of (1) the technical specifications of the DJI S900 UAS; (2) the limitations on the proposed flight operations; and (3) the location of the proposed flight operations. Accordingly, ARAUS LLC and the PIC will ensure the safe operation of the DJI S900 Platform UA during daylight hours in VFR conditions, with enough battery power to fly for a total duration of 18 minutes to the first point of intended landing and, assuming normal cruising speed, to fly after that for at least 5 minutes.

Here, as in Exemption No. 11109, the technical specifications of the DJI S900 Platform UAS;

the limitations on the proposed flight operations; and the location of the proposed operations, will ensure an equivalent level of safety established by 14 C.F.R. Section 91.151(b). Furthermore, safety will be ensured as the DJI S900 Platform UAS are equipped to provide audible and visual warnings to the PIC at the GCS and from the UAS when the UA experiences low battery voltage, the first warning occurring at approximately 33% remaining battery power, and again at approximately 10% remaining battery power. At the critically low battery level, the DJI S900 Platform UAS will descend and land automatically at a predetermined descent rate.

Significantly, previous exemptions granted by the FAA concerning Section 91.151 establish that safety is not adversely affected when the technical characteristics and operating limitations of the UAS are considered. Relief has been granted for manned aircraft to operate at less than the minimums prescribed in Section 91.151, including Exemption Nos. 2689, 5745, and 10650. Moreover, the FAA has previously granted relief from Section 91.151 specific to UAS.

14 C.F.R. 91.403: General

Section 91.403 states the following:

(a) The owner or operator of an aircraft is primarily responsible for maintaining that aircraft in an airworthy condition, including compliance with part 39 of this chapter.
(b) No person may perform maintenance, preventive maintenance, or alterations on an aircraft other than as prescribed in this subpart and other applicable regulations, including part 43 of this chapter.
(c) No person may operate an aircraft for which a manufacturer's maintenance manual or instructions for continued airworthiness has been issued that contains an airworthiness limitations section unless the mandatory replacement times, inspection intervals, and related procedures specified in that section or alternative inspection intervals and related procedures set forth in an operations specification approved by the Administrator under part 121 or 135 of this chapter or in accordance with an inspection program approved under § 91.409(e) have been complied with.
(d) A person must not alter an aircraft based on a supplemental type certificate unless the owner or operator of the aircraft is the holder of the supplemental type certificate, or has written permission from the holder.

Extent of relief ARAUS LLC seeks providing an equivalent level of safety: ARAUS requests an exemption based on the requirements for an ELS pursuant to Section 333 aircraft. ARAUS intends to fully comply with the maintenance requirements to keep an aircraft in an airworthy condition. However, the implications that “prescribed in this subpart and other applicable regulations, including part 43 of this chapter” impose is the reason an exemption is being requested. To achieve an ELS to 14 C.F.R. 91.403, ARAUS will maintain its UAS in an airworthy condition and adhere to all manufacturer requirements for inspecting and maintaining the DJI S900. Maintenance records will be available to the flight crew before, during, and after operations.

14 C.F.R. 91.405 (a)(d): Maintenance Required

Section 91.405 subsections (a & d) states the following:

Each owner or operator of an aircraft—
(a) 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;
(d) When listed discrepancies include inoperative instruments or equipment, shall ensure that a placard has been installed as required by § 43.11 of this chapter.

Extent of relief ARAUS LLC seeks providing an equivalent level of safety: ARAUS requests an exemption based on the requirements for an ELS pursuant to Section 333 aircraft. The FAA has previously determined that relief from 14 C.F.R. 91.405 is warranted. As ARAUS has made clear, operators will inspect the sUAS prior and post each flight and maintain rigorous logging procedures of any findings or maintenance. ARAUS is also asking for exemption of the placard requirements of 43.11. As previously stated, due to the small size and practical limitations of the sUAS, there is no room or feasible way to fix placards. To achieve an ELS, ARAUS will keep logbooks detailing all inspections, maintenance, and repairs to the sUAS. ARAUS will also follow DJI's guidelines for inspection and maintenance. As the FAA has determined in Exemption Nos. 11136 and 11138, following the manufacturer's guidelines will achieve an equivalent level of safety to 14 C.F.R. 91.405(a) and (d), because of the small size of the sUAS in question and the limited nature of operations.

14 C.F.R. 91.407 (a)(b): Operation after maintenance, preventative maintenance, rebuilding, or alteration

Section 91.407 subsections (a & b) states the following:

(a) No person may operate any aircraft that has undergone maintenance, preventive maintenance, rebuilding, or alteration unless—

(1) It has been approved for return to service by a person authorized under § 43.7 of this chapter; and

(2) The maintenance record entry required by § 43.9 or § 43.11, as applicable, of this chapter has been made.

(b) No person may carry any person (other than crewmembers) in an aircraft that has been maintained, rebuilt, or altered in a manner that may have appreciably changed its flight characteristics or substantially affected its operation in flight until an appropriately rated pilot with at least a private pilot certificate flies the aircraft, makes an operational check of the maintenance performed or alteration made, and logs the flight in the aircraft records.

(c) The aircraft does not have to be flown as required by paragraph (b) of this section if, prior to flight, ground tests, inspection, or both show conclusively that the maintenance, preventive maintenance, rebuilding, or alteration has not appreciably changed the flight characteristics or substantially affected the flight operation of the aircraft.

Extent of relief ARAUS LLC seeks providing an equivalent level of safety: ARAUS requests an exemption based on the requirements for an ELS pursuant to Section 333 aircraft. The FAA has previously determined that relief from 14 C.F.R. 91.407 is warranted. This section prevents any aircraft from operation that "has undergone maintenance, preventative maintenance, rebuilding, or alteration unless (1) it has been approved for return to service by a person authorized under § 43.7 of this chapter; and (2) the maintenance record entry required by §43.9 or §43.11, as applicable, of this chapter has been made." However, ARAUS has already previously requested exemptions from 43.7 and 43.11 as described previously. ARAUS has requested that our proposed operators will have the capability to maintain and repair the sUAS to an equivalent level of safety pursuant to Section 333 for both the type of sUAS, intended use, and operating environment.

An ELS will be achieved because ARAUS flight operational personal will regularly inspect and maintain its sUAS in accordance with appropriate manuals. ARAUS will keep detailed inspection, maintenance, and flight logs that will always be available to personal or FAA inspectors.

14 C.F.R. 91.409: Inspections

Section 91.409 states the following: This segment is too long to place into the body of this submission. Please look up the details of this section.

Extent of relief ARAUS LLC seeks providing an equivalent level of safety: ARAUS requests an exemption based on the requirements for an ELS pursuant to Section 333 aircraft. ARAUS makes this request because this section is only applicable to aircraft maintaining an airworthiness certificate.

14 C.F.R. 91.417: Maintenance records

Section 91.417 states the following: This segment is too long to place into the body of this submission. Please look up the details of this section.

Extent of relief ARAUS LLC seeks providing an equivalent level of safety: The FAA has previously determined that relief from 14 C.F.R. 91.417 is warranted. ARAUS requests exemption as it is only applicable to aircraft with airworthiness certificates. Because this sUAS will not possess an airworthiness certificate, the exemption request is valid. An ELS will be achieved because ARAUS flight operational personal will regularly inspect and maintain its sUAS in accordance with appropriate manuals. ARAUS will keep detailed inspection, maintenance, and flight logs that will always be available to personal or FAA inspectors.

The FAA May Prescribe Any Other Conditions For Safe Operation.

In accordance with Section 333 of the FAA Modernization and Reform Act of 2012 (FMRA) and 14 C.F.R. § 21.16 entitled Special Conditions, ARAUS LLC requests that the FAA prescribe special conditions for the intended operation of the DJI S900 UAS, which contain such safety standards that the Administrator finds necessary to establish a level of safety equivalent to that established by 14 C.F.R. Part 21, Subpart H, and 14 C.F.R §§ 21(h), 43.7, 43.11, 45.11 (a,b,c), 45.27(a), 45.29(3), 61.56, 61.113(a,b), 61.113, 91.7(a), 91.9(b2, c), 91.103(b2), 91.105, 91.113(b), 91.119(b,c), 91.121, 91.151, 91.403, 91.405(a,d), 91.407(a,b), 91.409, 91.417. Such special conditions will permit safe operation of the UAS for the limited purpose of conducting aerial video and photography over certain areas of the United States for compensation or hire. FMRA Section 333 sets forth the requirements for considering whether a UAS will create a hazard to users of the NAS or the public, or otherwise pose a threat to national security; and further, provides the authority for such UAS to operate without airworthiness certification in accordance with any requirements that must be established for the safe operation of the UAS in the NAS.

Likewise, the Administrator may prescribe special conditions pursuant to 14 C.F.R. § 21.16, for operation of the DJI S900 UAS, since the airworthiness regulations of 14 C.F.R. Part 21 do not contain adequate or appropriate safety standards, due to the novel or unusual design features of the aircraft. Section 21.16, entitled Special Conditions, states the following:

> *If the FAA finds that the airworthiness regulations of this subchapter do not contain adequate or appropriate safety standards for an aircraft, aircraft engine, or propeller because of a novel or*

unusual design feature of the aircraft, aircraft engine or propeller, he prescribes special conditions and amendments thereto for the product. The special conditions are issued in accordance with Part 11 of this chapter and contain such safety standards for the aircraft, aircraft engine or propeller as the FAA finds necessary to establish a level of safety equivalent to that established in the regulations.

This Petition is made pursuant to the FAA Modernization and Reform Act of 2012 (FMRA) Section 333, which directs the Secretary of Transportation to determine if certain UAS may operate safely in the NAS. As such, ARAUS LLC's request for exemption may be granted pursuant to the authority of FMRA Section 333 and 14 C.F.R. Part 11, as set forth above. FMRA Section 333 sets forth the requirements for considering whether a UAS will create a hazard to users of the NAS or the public, or otherwise pose a threat to national security; and further, provides the authority for such UAS to operate without airworthiness certification.

As discussed in detail above, ARAUS LLC will operate the DJI Spreading Wings S900 UAS safely in the NAS, without creating a hazard to users of the NAS, or the public, or otherwise pose a threat to national security.

CONCLUSION

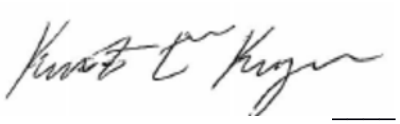
As set forth herein, ARAUS LLC seeks an exemption pursuant to 14 C.F.R. § 11.61 and Section 333 of the FAA Modernization and Reform Act of 2012 (FMRA), which will permit safe operation of the DJI S900 UAS commercially, without an airworthiness certificate, for the limited purpose of collecting aerial video, photography, and sensory data types of to be used in support of precision agriculture applications and association of expanded basic research principles and applications over specific areas within the United States. By granting this Petition, the FAA Administrator will be fulfilling the Congressional mandate of the FAA Modernization and Reform Act of 2012, while also advancing the interests of the public, by allowing ARAUS LLC to safely, efficiently, and economically operate the DJI S900 UAS commercially within the NAS.

WHEREFORE, in accordance with the Federal Aviation Regulations and the FAA Modernization and Reform Act of 2012, Section 333, ARAUS LLC respectfully requests that the Administrator grant this Petition for an exemption from the requirements of 14 C.F.R Sections 21(h), 43.7, 43.11, 45.11 (a,b,c), 45.27(a), 45.29(3), 61.56, 61.113(a,b), 61.113, 91.7(a), 91.9(b2, c), 91.103(b2), 91.105, 91.113(b), 91.119(c), 91.121, 91.151, 91.403, 91.405(a,d), 91.407(a,b), 91.409, 91.417, and permit ARAUS LLC to operate a DJI S900 Platform UAS commercially for the limited purpose of collecting aerial video, photography, and sensory data to be used in support of precision agriculture applications, mapping and inspection operations, and the expansion of basic and fundamental research principles and applications related to the above over rural areas under 400 feet and within Class G airspace within the United States

Dated: May 25, 2015

Respectfully submitted,

ARAUS LLC



Kenneth E Kroeger

Kenneth E Kroeger
7249 Parsons Court
Alexandria, VA 22306
410-487-1350

APPENDICES

APPENDIX A: DJI Spreading Wings S900 TECHNICAL SPECIFICATIONS

ARAUS LLS only utilizes safe and reliable UASs. DJI is an industry leader in small UAS production. DJI UASs are loaded with ground breaking software enabling the user to set parameters which will not allow flight into controlled airspace. Parameters can also be set to limit flight to no higher than a predetermined and set altitude as well as limit flight to a predetermined and set distance. In addition, DJI software provides real-time altitude and location information to the PIC via the linked monitor (smart phone/tablet devices). An additional full manual for the DJI S900 has been attached to the proposal.

1 DJI Spreading Wings S900

1.1 Aircraft

- 1.1.1 Diagonal Wheelbase – 900mm
- 1.1.2 Frame Arm Length – 358mm
- 1.1.3 Frame Arm Weight – 316g
- 1.1.4 Center Frame Diameter – 272mm
- 1.1.5 Center Frame Weight – 1185g

1.2 Propulsion

- 1.2.1 Stator Size – 41x14mm
- 1.2.2 kV – 400rpm/V
- 1.2.3 Max Power – 500W
- 1.2.4 Weight (witch Cooling Fan) – 158g

1.3 ESC

- 1.3.1 Working Current – 40A
- 1.3.2 Working Voltage – 6S LiPo
- 1.3.3 Signal Frequency (Hz) – 30~450
- 1.3.4 Drive PWM Frequency – 8kHz
- 1.3.5 Weight (with Radiators) – 35g

1.4 Propeller

- 1.4.1 Size 15x5.2 inch
- 1.4.2 Weight – 13g

1.5 Flight Parameters

- 1.5.1 Takeoff Weight Minimum – 3.3kg
- 1.5.2 Takeoff Weight Maximum – 8.2kg
- 1.5.3 Power Battery – LiPo 6S 10Ah – 20Ah 15C(Min)
- 1.5.4 Max Power Consumption – 3kW
- 1.5.5 Hover Power Consumption – 1kW
- 1.5.6 Approximate Flight Time – 18 min.
- 1.5.7 Working Environment Temperature – -10C ~ +40C
- 1.5.8 Hover Accuracy (Ready to Fly) – Vertical: 0.8m Horizontal: 2.5m
- 1.5.9 Max Yaw Angular Velocity – 200deg/s
- 1.5.10 Max Tilt Angle – 35deg
- 1.5.11 Max Ascent Speed – 6m/s
- 1.5.12 Max Descent Speed – 2 m/s
- 1.5.13 Max Flight Speed – 15m/s (NOT RECOMMENDED)

DJI S900 operation and users manuals are attached.

APPENDIX B: Spektrum DX8 TECHNICAL SPECIFICATIONS

ARAUS LLS only utilizes safe and reliable remote control systems. Spektrum is an industry leader in spread spectrum technologies for aircraft control. Spektrum remotes are loaded with ground breaking software enabling the user direct and reliable control over their aircraft system even when operating in cluttered radio environments. In addition, Spektrum radios provide real-time altitude, location, and fuel information to the PIC via a linked telemetry module. For this commercial operation, ARAUS LLC will be deploying the Spektrum DX8 radio system. Please see the attached documents for appropriate manual and operating documents.

Spektrum DX8 operation and users manuals are attached.

APPENDIX C: ADDITIONAL CHECKLISTS

Checklists for Packing, Preflight, Postflight, Mission Cards, and Accident Reports are attached. The lists are to give the reviewers an idea of operations for ARAUS LLC. ARAUS LLC notes however these lists may not be holistic or all-inclusive and therefore may be modified as needed to better ensure successful flight operations.