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

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

April 1, 2015

Exemption No. 11262
Regulatory Docket No. FAA−2014−0720

Mr. Michael V.R. Johnson
Vice President, Aviation Operations
Avigators
2200 North Forsyth Road, Unit A-13
Orlando, FL 32807

Dear Mr. Johnson:

This letter is to inform you that we have granted your request for exemption. It transmits our decision, explains its basis, and gives you the conditions and limitations of the exemption, including the date it ends.

The Basis for Our Decision

By letter dated September 10, 2014, and December 8, 2014,[1] you petitioned the Federal Aviation Administration (FAA) on behalf of Avigators (hereinafter petitioner or operator) for an exemption. The exemption would allow the petitioner to operate an unmanned aircraft system (UAS) to conduct precision agriculture operations.

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

Discussion of Public Comments:

A summary of the petition was published in the Federal Register on September 30, 2014, (79 FR 58852). Four comments were received. The Small UAV Coalition (Coalition)

[1] By letter dated February 26, 2015, and posted to the public docket on the same day, the petitioner responded to the FAA's Request for Information.

commented in support of the petition, while an individual, the Air Line Pilots Association, International (ALPA) and the National Agricultural Aviation Association (NAAA) opposed it.

In support of the petition, the Small UAV Coalition (Coalition) stated the petitioner has proposed to abide by stronger safety measures than hobby and modeler groups operating similar aircraft. The Coalition stated that it does not believe that heightened safety measures should be required for the petitioner simply because of the commercial nature of its operations. The Coalition urged the FAA to adopt an evaluation framework for UAS operations under Section 333 of Public Law 112–95 that weighs the relative safety issues and risks of UAS by class and operational circumstances, rather than adopting artificial distinctions among unmanned aerial vehicles based on commercial and noncommercial operations. The petitioner's UAS pose considerably less safety risk than larger UAS. The Coalition asserted that because UAS operations like the petitioner's pose minimal risk to safety, they should be subject to minimal and appropriate regulations.

The Coalition noted the FAA is to consider the seven factors[2] in Section 333 as a minimum. The Coalition stated the petition shows the FAA should consider factors other than those specified in Section 333, such as location and altitude of its UAS. The Coalition maintained that the petitioner's proposed operations satisfy the seven factors in Section 333 and include several additional mitigating factors to ensure the safety and security of the proposed UAS operations. The Coalition emphasized the FAA must evaluate each factor within the context of the petitioner's proposed UAS operations.

The Coalition also commented that the FAA should grant relief from the requirement to hold an airman certificate. The Coalition further stated that if an airman certificate is required then, at a minimum the, FAA should provide an exception from the training and testing requirements in part 61 in favor of requirements pertinent to the aircraft and operation proposed. The Coalition also asserted that in section 333 Congress intended for the FAA to consider national security with respect to the operation as opposed to addressing it through pilot certification.

The FAA notes that, as discussed in the grant of exemption to Trimble Navigation Ltd. (Exemption No. 11110), neither section 333, nor the FAA's exemption authority[3] allows the FAA to exempt pilots from the statutory requirement to hold an airman certificate as prescribed in 49 USC § 44711.

The Coalition commented that a visual observer (VO) should not be required for all small UAS operations. The Coalition further asserted that the presence of one or more VOs may

[2] Section 333(b) of P.L. 112 95 states, in part: "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; …"

[3] 49 USC § 44701(f)

allow the UAS to be operated beyond visual line of sight (VLOS) of the pilot in command (PIC) and that the petitioner's proposal to operate the unmanned aircraft (UA) within VLOS of the PIC *and/or* VO should be permitted.

The FAA notes that one of the determinations for operations under section 333 is operation within visual line of sight. The PIC must maintain VLOS while operating the UA. The FAA finds that a VO complements the PIC's capability to see and avoid other aircraft, including when the PIC may be momentarily attending to other flying tasks. The VO provides an additional level of operational safety.

An individual commenter opposed to the petition stated any exemption issued should require the PIC to hold an airman's certificate with both rotorcraft and airplane ratings. The individual stated that without an understanding of rotorcraft aerodynamics, the National Airspace System (NAS) and individuals on the ground are placed in unreasonable danger.

ALPA expressed concern regarding several aspects of the petition. ALPA noted that while the proposed operations will avoid congested or populated areas and operate under VLOS in Visual Metrological Conditions (VMC), the petitioner did not provide detailed procedures for controlling the airspace or area of operation. Specifically, ALPA stated, "there must be means both to ensure that the sUAS remains within the Class G airspace under 400'AGL and to ensure that the hazard of other aircraft intruding on the operation is mitigated."

The FAA believes the limitations under which the petitioner will operate (i.e. VLOS and at or below 400 feet above ground level (AGL)) are sufficient mitigations to this risk so that the operations will not adversely affect safety.

ALPA noted that the petitioner does not state how the pilot and the observer will be able to communicate with each other. ALPA stated that text messaging, either by mobile phone or other means, could have an unknown latency and extend to several minutes. NAAA stated UAS observers must be present and able to communicate with the operator from the most minimal distance possible. The conditions and limitations regarding PIC and VO communications address those concerns.

ALPA asserted the UAS's lithium polymer batteries have numerous associated fire and explosion hazards as outlined in DOT/FAA/AR−09/55, "Flammability Assessment of Lithium-Ion and Lithium-Ion Polymer Battery Cell Designed for Aircraft Power Usage (January 2010)," and that the safe carriage of the batteries and the mitigations in place for known risks should be addressed. The referenced study was primarily conducted to determine how certain battery cells react in a fire situation aboard manned airplanes. Given the size of the battery and the operating conditions of the UAS, the FAA concludes that the use of a lithium polymer battery will not pose an undue safety risk for the proposed operations.

ALPA commented that command and control (C2) link failures are one of the most common failures on a UAS, and that lost link mitigations should require safe modes to prevent fly-aways or other scenarios. The FAA has inserted conditions and limitations in this exemption to mitigate the risk associated with such failures.

Regarding the petitioner's request for exemption from part 21, § 91.7, and § 91.203, ALPA noted their opposition to the attempt to avoid certifying the airworthiness of the sUAS. ALPA stated all aircraft in the NAS must operate to the same high level of safety.

ALPA also noted that the petitioner's proposed operations are for "compensation or hire," and therefore contends the pilot must hold at least a current FAA commercial pilot certificate with an appropriate category and class rating for the type of aircraft being flown, as well as specific and adequate training on the UAS make and model intended to be used. Similarly, ALPA asserted a current second-class airman medical certificate should be required. NAAA also commented on pilot qualification, stating—

> Just as manned aircraft pilots are required to undergo a rigorous training curriculum and show that they are fit to operate a commercial aircraft, so too must UAS operators. Holding a commercial certificate holds UAS operators to similar high standards as commercial aircraft operators and ensures they are aware of their responsibilities as commercial operators within the NAS. Medical requirements ensure they have the necessary visual and mental acuity to operate a commercial aircraft repeatedly over a sustained period of time.

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.

ALPA noted the petitioner must specify a means to meet see and avoid requirements in § 91.113 given the absence of an onboard pilot. The FAA notes that all flights must be operated within VLOS of the PIC and VO.

ALPA commented that while the petitioner's aircraft may not have a barometric altimeter as required by 14 CFR § 91.121. ALPA stated that processes or mitgations must be in place to ensure the UA can accurately maintain altitude including engineering processes, software development and control, electronic hardware development and control, configuration management, and design assurance to ensure the aircraft and its control system(s) operate to

the same level of safety as other aircraft operated commercially in the National Airspace System (NAS).

Regarding the fuel requirements of § 91.151, ALPA argued that using batteries as the only source of an aircraft's power is a substantial shift from traditional methods of propulsion, and requires further research to determine best safety practices. The FAA has inserted a condition and limitation that addresses this concern.

ALPA also expressed concern that the petition makes no reference to compliance with, or a request for waiver from, 14 CFR 61.195, *Flight instructor limitations and qualifications*, which defines the requirements for flight instructors. A certificated flight instructor is authorized to provide the instruction required for the certificates or ratings or currency listed in 14 CFR § 61.193. A person instructing on how to operate the UAS under the petitioner's training program would not need to be a certificated flight instructor because the instruction is not being provided for a certificate or rating listed in § 61.193. We note that none of the UAS operations proposed by the petitioner require such flight instruction because § 61.31(*l*) allows for operation of the UAS by an airman who is current per 14 CFR § 61.56 without a category and class rating. Instruction provided toward obtaining the pilot certificate required by this exemption would need to be provided by a certificated flight instructor.

ALPA expressed concern on whether the petitioner's UAS can comply with the aircraft light requirements for night operations in § 91.209, given its limited electric power. The petitioner indicates that night operations will not be conducted and this exemption limits operations to daytime only.

ALPA opposed the petitioner's request for an exemption from the aircraft maintenance and record keeping requirements. ALPA asserted that the petitioner's small UAS "should comply to the same level of safety as other aircraft operated commercially in the NAS." The FAA finds that adherence to the conditions and limitations below, is sufficient to ensure that safety will not be adversely affected.

ALPA also expressed concern that the petitioner's request is not for a single specific operation or location, but for all operations of the same general type. ALPA stated that this results in a considerable increase in the FAA's oversight tasks. The FAA notes ALPA's concern and in order to minimize potential impact to the NAS, the FAA requires that each operator secure a Certificate of Waiver or Authorization (COA) which covers specific details of the petitioner's operation. The FAA recognizes that UAS integration will generate new NAS access demand and will review and adjust accordingly.

NAAA noted that its members operate in low-level airspace, and therefore 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 that agricultural pilots depend on pilots of other aircraft to perform their see-and-avoid functions

to prevent collisions. NAAA believes UAS operations at low altitudes will increase the potential for collision with agricultural aircraft.

The FAA recognizes these concerns and has incorporated associated conditions and limitations into this exemption, including: (a) a Notice to Airmen (NOTAM) issued for all operations; (b) operations conducted within VLOS of the pilot in command (PIC) and the VO; and (c) the UAS PIC must always yield right-of-way to manned aircraft.

NAAA stated that FAA airworthiness certification should be a requirement for all unmanned aircraft to operate within the NAS. NAAA recommended UAS be equipped with ADS-B or similar identification and positioning systems, strobe lights, high-visibility markings and registration numbers. NAAA also recommended UAS be operated strictly within the line-of-sight of the ground controller, with the assistance of a VO and clear of any low-flying manned aircraft.

Section 333 of the FAA Modernization and Reform Act of 2012 authorizes the Secretary of Transportation to determine, considering a number of factors laid out in the statute, that an airworthiness certificate is not necessary for certain operations. The Secretary has made that determination in this case and therefore the aircraft operated by the petitioner will not need to be certificated by the FAA.

Airworthiness Certification

The UAS proposed by the petitioner is a First Aerial Responder–Sight.

The petitioner requested relief from 14 CFR part 21, C*ertification procedures for products and parts, Subpart H—Airworthiness Certificates*. In accordance with the statutory criteria provided in Section 333 of Public Law 112−95 in reference to 49 U.S.C. § 44704, and in consideration of the size, weight, speed, and limited operating area associated with the aircraft and its operation, the Secretary of Transportation has determined that this aircraft meets the conditions of Section 333. Therefore, the FAA finds that the requested relief from 14 CFR part 21, and any associated noise certification and testing requirements of part 36, is not necessary.

The Basis for Our Decision

You have requested to use a UAS for aerial data collection. 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, Avigators is granted an exemption from 14 CFR §§ 61.23(a) and (c), 61.101(e)(4) and (5), 61.113(a), 61.315(a), 91.7(a), 91.119(c), 91.121, 91.151(a)(1), 91.405(a), 91.407(a)(1), 91.409(a)(1) and (2), and 91.417(a) and (b), to the extent necessary to allow the petitioner to operate a UAS to perform aerial data collection. This exemption is subject to the conditions and limitations listed below.

Conditions and Limitations

In this grant of exemption, Avigators 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 First Aerial Responder–Sight when weighing less than 55 pounds including payload. Proposed operations of any other aircraft will require a new petition or a petition to amend this exemption.

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

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

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

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

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

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

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

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

10. Prior to each flight, the PIC must conduct a pre-flight inspection and determine the UAS is in a condition for safe flight. The pre-flight inspection must account for all

potential discrepancies, e.g. inoperable components, items, or equipment. If the inspection reveals a condition that affects the safe operation of the UAS, the aircraft is prohibited from operating until the necessary maintenance has been performed and the UAS is found to be in a condition for safe flight.

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

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

13. Under this grant of exemption, a PIC must hold either an airline transport, commercial, private, recreational, or sport pilot certificate. The PIC must also hold a current FAA airman medical certificate or a valid U.S. driver's license issued by a state, the District of Colombia, Puerto Rico, a territory, a possession, or the Federal government. The PIC must also meet the flight review requirements specified in 14 CFR § 61.56 in an aircraft in which the PIC is rated on his or her pilot certificate.

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

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

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

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

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

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

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

21. Air Traffic Organization (ATO) Certificate of Waiver or Authorization (COA). All operations shall be conducted in accordance with an ATO-issued COA. The exemption holder may apply for a new or amended COA if it intends to conduct operations that cannot be conducted under the terms of the attached COA.

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

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

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

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

26. All Flight operations must be conducted at least 500 feet from all nonparticipating persons, vessels, vehicles, and structures unless:
    a. Barriers or structures are present that sufficiently protect nonparticipating persons from the UA and/or debris in the event of an accident. The operator must ensure that nonparticipating persons remain under such protection. If a situation arises where nonparticipating persons leave such protection and are within 500 feet of the UA, flight operations must cease immediately in a manner ensuring the safety of nonparticipating persons; and
    b. The owner/controller of any vessels, vehicles or structures has granted permission for operating closer to those objects and the PIC has made a safety assessment of

the risk of operating closer to those objects and determined that it does not present an undue hazard.

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

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

28. Any incident, accident, or flight operation that transgresses the lateral or vertical boundaries of the operational area as defined by the applicable COA must be reported to the FAA's UAS Integration Office (AFS-80) within 24 hours. Accidents must be reported to the National Transportation Safety Board (NTSB) per instructions contained on the NTSB Web site: www.ntsb.gov.

If this exemption permits 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 April 30, 2017, unless sooner superseded or rescinded.

Sincerely,

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

10 September 2014

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

Re: Exemption Request Under Section 333 of the FAA Reform Act and Part 11 of the Federal Aviation Regulations

Dear Sir or Madam:

Pursuant to Section 333 of the FAA Modernization and Reform Act of 2012 (the "Reform Act") and 14 C.F.R. Part 11, Northern Virginia OmniVersatile Solutions LCC (NVOS), seeks an exemption from Federal Aviation Regulations ("FARs") detailed below for the N-Cognito Unmanned Aircraft System manufactured by NVOS of the USA.

The requested exemption would support an application for a commercial Certificate of Authorization to use the system to support agriculture. The N-Cognito system consists of a lightweight (5.5 lb.) battery powered aircraft, a PC-based ground control station, and associated communications equipment. The aircraft carries an onboard geo-referenced still camera that allows it to conduct precision photogrammetry and crop scouting at the resolutions necessary for precision agriculture. This high-resolution data can direct variable seeding rates as well as the precise application of water, fertilizer, and chemicals reducing their use. This data helps farmers to maximize yields while reducing costs and impacts to the environment. By approving these exemptions, the FAA will create benefits to both agriculture and the environment which are ultimately in the public interest.

The aircraft will be operated in the field with both a Pilot in Command (PIC) and a ground-based Visual Observer (VO) in accordance with FAA Policy N 8900.227 Section 14 "Operational Requirements for UAS" with the following additional restrictions:

- All operations will occur in Class G airspace at no more than 400' AGL
- Operations will be operated over private property with the permission of the land owner
- All required permits will be obtained from state and local government prior to operation –
- The aircraft will not be operated over urban or populated areas
- The aircraft will not be operated at air shows or over an open-air assembly of people
- The aircraft will not be operated over heavily trafficked roads
- The aircraft will not be operated within 5 NM of an airport or heliport
- Operations will be limited to day, visual meteorological conditions
- Aircraft will remain within Visual Line of Sight at no greater than 1/2 NM of the PIC at all time
- While the aircraft is airborne, the VO will be positioned within voice distance to the PIC
- PIC will file a NOTAM providing radial/DME, radius, altitude, and a date/time group for each operation

The PIC and VO will meet the requirements outlined in FAA Policy N 8900.227 Section 16 Personnel Qualifications. Additionally, the PIC and VO will perform maintenance on the system and will complete a course of maintenance instruction as part of their initial training. Due to the simplicity of the system, we do not anticipate the need for a supplemental pilot.

We submit that the combination of the aircraft's light weight, historically demonstrated flight performance, fully qualified flight crew and strict operation under the guidelines established in 8900.227, the FAA can have confidence that N-Cognito operations will have an equivalent or greater level of safety of manned aircraft performing the same mission.

The name and contact information of the applicant are:

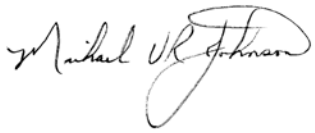
Northern Virginia OmniVersatile Solutions LLC (NVOS)
Attn: Mike Johnson
Phone: 703-980-1897
Email: mjohnson@nv-os.com

The regulations from which the exemption is requested are as follows:

14 CFR Part 21	14 CFR 91.203
14 CFR 45.23, 45.29	14 CFR 91.9
14 CFR 61.113, 61.133	14 CFR 91.109, 91.119
14 CFR 91.121, 91.151	14 CFR Subpart E (91.401 - 91.417)
FAA Policy 8900.227 Paragraph 16(c)(4)	FAA Policy 8900.227 Paragraph 16(e)(1)

We are prepared to modify or amend any part of this request to satisfy the need for an equivalent level of safety. We look forward to working with your office. Please contact us at any time if you require additional information or clarification.

Sincerely,



Michael V. R. Johnson
Vice President, Aviation Operations

Appendices:
A. Exemption Request and Equivalent Level of Safety
B. Northern Virginia OmniVersatile Solutions LLC (NVOS) Overview
C. NVOS Small Unmanned Aerial System Description

APPENDIX A

EXEMPTION REQUESTS AND EQUIVALENT LEVEL OF SAFETY

NVOS requests an exemption from the following regulations as well as any additional regulations that may technically apply to the operation of the N-Cognito UAV:

14 CFR Part 21, Subpart H: Airworthiness Certificates

This part establishes the procedures for the issuance of an airworthiness certificate. While the FAA continues to work to develop airworthiness standards for UAS, we request an experimental certificate be issued for the N-Cognito under either or both of the following provisions:

> 21.191 Experimental certificates.
> Experimental certificates are issued for the following purposes:
> **(a)** ***Research and development.*** Testing new aircraft design concepts, new aircraft equipment, new aircraft installations, new aircraft operating techniques, or new uses for aircraft.
> **(b)** ***Showing compliance with regulations.*** Conducting flight tests and other operations to show compliance with the airworthiness regulations including flights to show compliance for issuance of type and supplemental type certificates, flights to substantiate major design changes, and flights to show compliance with the function and reliability requirements of the regulations.

Since the experimental certificate can be used for commercial purposes such as market surveys, sales demonstrations, and customer crew training, we would expect that an experimental certificate would permit our commercial purpose as well.

The aircraft will not carry persons or property, will not carry fuel, and will only fly under strict operational requirements. Combined with the fact that the aircraft weighs only 5.5 pounds and is constructed primarily out of foam, we propose that the N-Cognito will be at least as safe, if not safer, than a conventionally certificated aircraft performing the same mission.

If an experimental airworthiness certificate is not appropriate for this application, then we request an exemption of 14 CFR Part 21, Subpart H, and the requirement for an airworthiness certificate in general, citing the equivalent level of safety outlined in the previous paragraph.

14 CFR 91.203(a) & (b) Civil aircraft: Certifications required.

The regulation provides that an airworthiness certificate, with the registration number assigned to the aircraft and a registration certificate must be aboard the aircraft. Additionally, subparagraph (b) provides that the airworthiness certificate be "displayed at the cabin or cockpit entrance so that it is legible to passengers or crew." At 5.5 lbs., the N-Cognito is too small to carry documentation, does not have an entrance, and is not capable of carrying passengers or crew. To obtain an equivalent level of safety and meet the intent of 91.203, we propose that documents deemed appropriate for this aircraft by the FAA will be co-located with the crew at the ground control station and available for inspection upon request. In order to identify the aircraft, we

propose that the information found on airworthiness and registration certificates be permanently affixed to the aircraft via placard:

Manufacturer: Northern Virginia OmniVersatile Solutions LLC (NVOS)

Model: N-Cognito
Serial Number: 14-XXXX

Registered to:
Northern Virginia OmniVersatile Operations LLC (NVOS)
320 Gordon Street
Sanford, FL 32771

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14 CFR 45.23 Display of marks; general and 45.29 Size of marks.

These regulations provide that each aircraft must display "N" and the aircraft's registration number in letters at least 3 inches high. Additionally, the aircraft must display the word "EXPERIMENTAL" in letters at least 2 inches high near the entrance to the cabin, cockpit, or pilot station. The 5.5 pound N-Cognito does not have an entrance in which the word "EXPERIMENTAL" can be placed, and may not have a registration number assigned to it by the FAA.

We propose to achieve an equivalent level of safety by including the word "EXPERIMENTAL" on the top of the aircraft, where the PIC, VO and others in the vicinity of the aircraft while it is preparing for launch will be able to see the designation. Additionally, we feel that the permanent placard discussed in the previous paragraph will provide the aircraft's registration information should it be found on the ground. Finally, we will display at the ground station a high contrast flag or banner that contains the words "Unmanned Aircraft Ground Station" in letters 3 inches high or greater. Since the aircraft will operate within 1/2 NM of the ground station, the banner should be visible to anyone that observes the aircraft and chooses to investigate its point of origin.

14 CFR 91.9 Civil aircraft flight manual, marking, and placard requirements.

This regulation provides that no person may operate an aircraft unless a current, approved flight manual is in the aircraft. We assume that the intent of this requirement is to ensure that flight manual information is available to the aircrew while operating the aircraft. We request an exemption to this requirement since the aircraft is not only too small to carry documentation, the documentation would not be available to the crew.

To obtain an equivalent level of safety and meet the intent of 91.9, we propose that a current, approved N-Cognito Flight Manual (available upon request) must be available to the crew at the

ground station anytime the aircraft is in or preparing for flight.

14 CFR 61.113 Private pilot privileges and limitations: Pilot in Command and 61.133 Commercial pilot privileges and limitations.

The regulation provides that no person that holds a private pilot certificate may act as pilot in command of an aircraft for compensation or hire. Subparagraph (b) allows a private pilot to 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.

Our proposed operations meet the requirements of 8900.227 paragraph 16 (c) (2) (c) "Operations without a pilot certificate" in which the PIC is required to complete "FAA private pilot ground instruction" and pass "the FAA Private Pilot written examination." Since there are currently no means available for the pilot of a UAS to gain the experience in an equivalent category and class in order to apply for a commercial pilot's license, we propose to generate an equivalent level of safety by requiring our pilots to complete, at a minimum, FAA commercial pilot ground instruction and pass the FAA Commercial Pilot written examination in addition to completing the private pilot requirements. Since the aircraft cannot carry passengers or property, we feel we meet the intent of 61.113 Subparagraph (b) even though the intent of this application is to conduct a business.

14 CFR 91.109 Flight instruction; Simulated instrument flight and certain flight tests

The regulation provides that "No person may operate a civil aircraft that is being used for flight instruction unless that aircraft has fully functioning dual controls." The N-Cognito ground control station is based on a small hand-held computer and while it does not offer a second set of "controls," both the PIC and VO are fully qualified pilots and able to operate the N-Cognito controls. With both the PIC and VO being capable to control N-Cognito during flight, we feel that this technique meets the intent 91.109 and provides an equivalent level of safety.

14 CFR 91.119 Minimum safe altitudes: General.

The regulation provides that over sparsely populated areas the aircraft cannot be operated closer than 500 feet to any person, vessel, vehicle, or structure. Since the aircraft will be operating at a maximum of 400 feet AGL, we cannot comply with this requirement. To provide an equivalent level of safety we will only fly over private property with the permission of the land owner. The land owner will be briefed of the expected route of flight and the associated risks to persons and property on the ground. We maintain that due to the small size of the N-Cognito, the hazard to persons, vessels, vehicles, and structures is not comparable to manned aircraft and should be considered in granting the exemption.

Consideration about risks related to ground impacts. N-Cognito will not be operated over congested areas nor over any open air assembly of persons. In the event of power unit failure

and operating at 400 feet altitude, the PIC will be able to conduct an emergency landing without undue hazard to persons or property on the ground.

14 CFR 91.121 Altimeter settings.

The regulation provides that aircraft shall maintain cruising altitudes by reference to an altimeter setting available within 100 nautical miles of the aircraft. The aircraft will fly below 400 feet AGL and will not need to maintain hemispherical cruising altitudes in order to de-conflict with other aircraft. As such, an appropriate altimeter measurement presented to the pilot should be Above Ground Level and should be based on the barometric pressure at the point of launch. To provide an equivalent level of safety, the N-Cognito's AGL altimeter will be set to zero on the ground prior to every flight. Since the average flight will be around 60 minutes, even rapid changes in barometric pressure will have limited effect on the safety of the flight.

14 CFR 91.151 Fuel requirements for flight in VFR conditions.

The regulation provides that no person may begin a flight in an airplane under day-VFR conditions unless there is enough fuel to fly to the first point of intended landing and to fly after that for at least 30 minutes. We feel the intention of this paragraph is to provide a reserve of energy as a safety buffer for go-arounds and other delays to landing.

The N-Cognito is battery operated and the maximum duration of flight from a single battery charge is 3+ hours. Since the aircraft will never fly more than 1/2 nm from the point of intended landing, a full battery charge at launch will ensure that we easily meet the reserve energy requirement of this paragraph. We request an exemption to the word "fuel" and ask for an equivalent interpretation with the word "energy".

14 CFR Subpart E (91.401 - 91.417) - Maintenance, Preventive Maintenance, and Alterations

The regulation provides that the operator is primarily responsible for maintaining the aircraft in an airworthy condition, including compliance with part 39 and 43. Paragraphs 91.407 and 91.409 require that the aircraft be "approved for return to service by a person authorized under 43.7" after maintenance and inspection. It is our intention that the PIC perform maintenance and inspection of the aircraft and "be authorized to approve the aircraft for return to service." The PIC will ensure that the aircraft is in an airworthy condition prior to flight and conduct detailed inspections after every 10 flight hours. Additionally, the N-Cognito Autopilot conducts an automated preflight prior to each launch. Maintenance performed by the PIC is limited to repairing small cracks, replacing a propeller, and updating software and firmware. All other maintenance will be performed by NVOS at the Depot level. The PIC will document work performed in accordance with 91.417. We feel that due to the size, construction, and simplicity of the aircraft, the PIC can ensure an equivalent level of safety.

8900.227 Paragraph 16(c) (4) PIC Medical and Paragraph 16(e) (1) Observer Medical.

This policy provides that both the PIC and VO must have a valid FAA second-class medical certificate issued under Part 67 in order to perform as a pilot or observer. The aircraft weighs 5.5 pounds and is constructed out of foam. Requiring the crew to meet the same medical requirements as a commercial pilot carrying passengers in a large aircraft is an unnecessary requirement. We propose that the minimum medical requirements be vision corrected to 20/20 and a valid, state issued driver's license. Due to the size and weight of the aircraft, the greatest hazard of our proposed operation will be driving to the launch site. A licensed driver is medically qualified to operate a much larger vehicle such as a Light Sport Aircraft. The 20/20 vision requirement will ensure that the PIC and VO can see and avoid air traffic. Given the unlikely event that both the PIC and VO become medically incapacitated while the aircraft is in flight, the N-Cognito will recover autonomously to the landing location designated prior to launch without crew intervention. Each of our personnel have at least 10 years of experience with UAVs.

APPENDIX B

Northern Virginia OmniVersatile Solutions LLC (NVOS) Overview:

NVOS is based in the United States. Northern Virginia OmniVersatile Solutions, LLC, ("NVOS"), a Delaware limited liability company has its headquarters and manufacturing location at 320 Gordon Street, Sanford, FL 32771.

NVOS began its experience in aviation operations in 2011 with the development of an UAS (Ultralight) for the U.S. Army's Rapid Equipping Force and has fielded our SUAS (N-Cognito) to a joint Department of Defense and Department of Homeland Security project.

Out of 16 SUAS companies the Pentagon's ISR Task Force considered to provide a potential solution to meet the needs of the Afghan National Army for a SUAS, NVOS was down selected as one of three.

NVOS is a Service Disabled Veteran Owned company whose Cage Code is 6PZ72. NVOS is a Small Business under NAICS Codes: 336411 Aircraft Manufacturing; 336412 Aircraft Engine and Engine Parts Manufacturing; and 336413 Other Aircraft Part and Auxiliary Equipment Manufacturing.

NVOS is not on the GSA schedule.

NVOS is not a foreign-owned, foreign-controlled, or a foreign-influenced company.

NVOS is focused on providing small unmanned aerial vehicles which are easy to use, reliable, simple, and affordable. NVOS has selected the best of breed subsystems to build a highly affective and desirable hand launched unmanned aerial system. Our customer focus ranges from military organizations, Homeland Security, farmers, ranchers, law enforcement, first responders, construction companies, oil and electric power providers, forest managers, wildlife managers, etc..

NVOS N-Cognito Production Facilities

NVOS 6,000 Square Feet Operations and Production Center
320 Gordon St, Sanford, FL

APPENDIX C

NVOS SMALL UNMANNED AERIAL SYSTEM DESCRIPTION

The NVOS N-Cognito is a hand launched small unmanned aerial system (SUAS) which NVOS developed as easy to launch, operate, land, and maintain. Additionally, the SUAS N-Cognito is one of the most affordable on the market.

N-Cognito Specifications:

- **Wing Span:** 75 inches/1900 mm
- **Length:** 51 inches / 1300 mm
- **Cruise Speed:** 25 mph / 40km/hr
- **Max Speed:** 62 mph / 100 km/hr
- **Stall Speed:** 9 mph / 15 km/hr
- **Autonomous capabilities**: Auto-Return to Home if lost communications or lost data link; Auto-Loiter, Auto-Landing, Emergency Auto-Landing if Low Power Emergency
- **Maximum Altitude:** 15,000 ft / 4572 meters MSL
- **Maximum Range:** 6+ miles / 10+ km
- **Maximum Take-off Weight:** 7.7 lbs. / 3500 grams
- **Maximum Wind Speed:** 35 knots
- **Normal Flight Time:** 3+ hours; various battery configurations available
- **Payload:** 1.0 lbs.
- **Power Source:** Lithium polymer or Lithium ion batteries. Charging of batteries can be completed via: standard wall outlet, direct connection to vehicle battery, or via the vehicle's cigarette lighter.

The key element of the N-Cognito is the system's autopilot which automatically compensates for wind versus relying on the operator's sense of feel for what the impact of the wind is at launch or at the altitude the system is flying. All flight operations are GPS and autopilot controlled making the system extremely easy to operate and navigate. The autopilot serves in a "cruise control" like manner limiting the operator from placing the N-Cognito in an unusual attitude while maintaining desired altitude. At any point if the signal between the Ground Control Station (GCS) and the N-Cognito is lost, the N-Cognito will return to the designated home station and loiter or land as pre-programmed. Camera positioning is also GPS controlled allowing for the most sophisticated camera targeting available. The flight control system employs not only GPS positioning but a variety of sensors including: barometric pressure, temperature, and wind speed to ensure an amazingly stable platform.

Landing styles/types – Aided or Autonomous

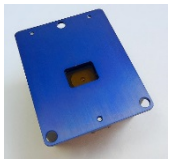
- In "Aided" landing mode the autopilot continues to assist the pilot in maintaining altitude and stability as the pilot controls N-Cognito to the desired landing location.
- In "Autonomous" Landing mode without human intervention, the NVOS UAV autopilot can land N-Cognito consistently within a narrow and limited landing area, even in crosswinds. The autopilot intelligently manages the landing

pattern and glideslope to minimize overshoot or undershoot. If signal is lost

and cannot be reestablished for some reason, the NVOS autopilot will initially return to home location and loiter. Once the battery level reaches a critically low level, the auto-pilot will automatically enter landing mode.

Payloads

The following cameras are current payloads available for the N-Cognito: electro-optical, thermal, high definition, and multispectral.



ADC Micro Multispectral Camera

High Definition Camera

Thermal Camera

Operations

The N-Cognito can be operated in both semi and fully autonomous flight modes. Creating pre-planned flight paths to fly in autonomous mode is as simple as clicking on the map to designate preplanned waypoints creating a flight path. In semiautonomous mode, the operator clicks on the map and the N-Cognito automatically flies to the point on the map where the operator designated. Waypoints can be changed in flight simply by clicking and dragging waypoints on the digital map.

Training

Due to the N-Cognito autopilot and Xbox controller interface training is minimal. We have fully trained Homeland Security Agents in five (5) days including classroom instructions, flight simulator training, day, and night operations.

N-Cognito Operating Manual

N-Cognito's User Manual is available upon request.

Propulsion System

- Engines – N-Cognito is powered by electric brushless DC motor
- Batteries – Lithium polymer and Lithium Ion batteries

Maintenance

The N-Cognito is nearly maintenance free and requires only one tool to assemble and disassemble. N-Cognito can be either assembled or disassembled within 4-minutes. Preflight is performed automatically prior to each launch to make certain that all components are fully functional prior to flight.

With N-Cognito's simplicity of design there is very little for the N-Cognito Operator to maintain. Line replaceable items such as: propellers, motor, damaged wings, batteries, etc. can be replaced by the operator. Any significant damage to a N-Cognito will be repaired by NVOS Aviation.

Reliability

The N-Cognito is designed for maximum reliability and performance over its lifecycle. The only components which experience routine wear are props, batteries, and motor. With a large capacity fuselage and being made of foam, the electronic components of the N-Cognito are protected from environmental conditions and contact with any external objects.

Safety

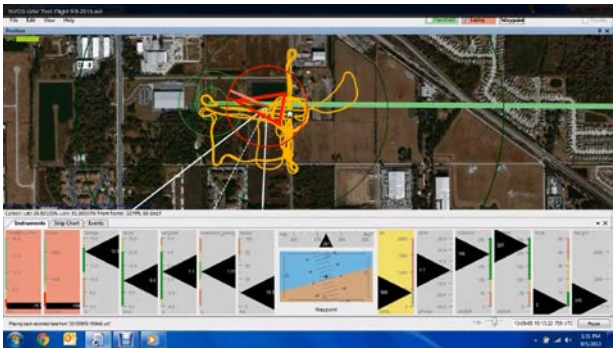
N-Cognito has several design factors which improve safe operations:

- N-Cognito is made of foam and will cause minimal damage if it comes into contact with another object.
- Prop is mounted in the rear of the fuselage limiting any damage to N-Cognito or external objects in the event of contact.
- If signal connection is lost between N-Cognito and the ground control station, N-Cognito will return to its designated home location and loiter or land whichever is programmed.
- Automatic preflight ensures all flight systems are fully operational prior to launch.
- In the event of low battery N-Cognito will conduct an auto-landing.
- N-Cognito's autopilot reduces the workload on the pilot allowing the pilot to focus on situational awareness using the telemetry and map provided by the ground control station.
- Complete color coded telemetry display of N-Cognito's status including: altitude, airspeed, flight attitude, battery power level, time remaining at current power setting, and wing load. Any status which is Satisfactory: is represented as "green"; Marginal status is represented as "yellow"; and Critical status is represented as "red".

Command and Control System

The N-Cognito Ground Control Station allows the operator simultaneous control over aircraft and payloads. The touch screen control allows for quick navigation and data entry while the display screen provides all essential flight data to the operator. Telemetry data is transmitted to the command station at least once per second.

Displayed on GCS:



- ✓ N-Cognito Position (latitude/longitude and map overlay)
- ✓ Navigation Route
- ✓ N-Cognito Altitude
- ✓ N-Cognito Heading
- ✓ N-Cognito Airspeed
- ✓ N-Cognito Attitude
- ✓ Range to Home Stations
- ✓ Time to Home Station
- ✓ Waypoint locations
- ✓ Date/time
- ✓ Sensor heading and orientation relative to N-Cognito
- ✓ Power setting (Amps)
- ✓ Battery level (Volts)
- ✓ Time remaining at current power setting (Minutes)

All instruments have customizable min/max values and position

Onboard Flight Instruments

The UAV is equipped with an Inertial Navigation System (3axis gyroscope, 3axis magnetometer, GPS receiver, and static pressure sensor and secure radio link to the operator).

Frequency Allocations

900 MHz, 2.4 GHz OR 5.8 GHz

Navigation System

Specific maps can be downloaded to the display screen (such as air sectional and geographic maps) which are overlaid with GPS positional data. Waypoints can be created before and during flight operations, thus creating specific locations and flight sequences for the aircraft. During flight waypoints can be clicked and dragged to change their location and/or altitude.

Emergency Procedures and System Failures

Failure Handling – The N-Cognito has extensive failure detection and handling capabilities. All failures are deemed to be either fatal or nonfatal. Failures classified as fatal result in a Fatal Condition Response (FCR); and failures classified as non-fatal result in a Non-Fatal Condition Response (NFCR).

Sensor Failure – Failure of onboard flight instruments/sensors will degrade the UAS performance and will result in either a FCR or a NFCR, depending on their severity. If the UAS experiences a sensor failure, it will respond by alerting the pilot in command and maintain loiter at location until action is taken.

Motor Failure – In case of motor failure, the pilot in command will be alerted and an aided or autonomous landing will take place.

Airframe Failure – If airframe is damaged in ways that impacts flight characteristics, the N-Cognito autopilot will alert the pilot in command and attempt to maintain stable flight.

Navigation System Failure – In a navigation system failure, degraded GPS will result in the N-Cognito loitering at its current location until GPS signal is restored or the pilot in command takes aided control.

Power Failure – A complete battery failure which results in power loss to the N-Cognito will result in N-Cognito gliding to the ground.

Low Battery Condition – Pilot in command will be alerted of a low battery condition and will land the aircraft as soon as possible. Once the critical low level is reached, the N-Cognito will conduct an autonomous landing.

Line of Sight Loss – All flight operations will be conducted with the N-Cognito within visual sight of the pilot. If the pilot's view becomes obstructed and line of sight is lost, the pilot may instruct N-Cognito to loiter in place until line of sight is re-established, to return to the takeoff position, or to land at the current position. In addition, a moving map display provides an accurate location of N-Cognito.

Security

The system and communication links are encrypted by the manufacturer's proprietary software. N-Cognito can only communicate with the pilot in command's ground station.