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

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

March 13, 2015

Exemption No. 11209
Regulatory Docket No. FAA-2014-0629

Mr. William Donberg
President
Aetos Group, Inc.
2065 5 Mile Road
Traverse City, MI 49686

Dear Mr. Donberg:

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 letters dated August 19 and October 15, 2014, you petitioned the Federal Aviation Administration (FAA) on behalf of Aetos Group, Inc. (Aetos) for an exemption from Part 21; and §§ 45.23(b), 47.3(b)(2), 47.31(c), 91.7(a), 91.9(b)(2), 91.119, 91.121, 91.151(a), 91.203(a) and (b), 91.405(a), 91.407(a)(1), 91.409(a)(2), and 91.417(a) and (b) of Title 14, Code of Federal Regulations (14 CFR). The proposed exemption, if granted, would allow operation of unmanned aircraft systems (UAS) for the purpose of aerial inspection of plant infrastructure, to include flare stacks, elevated pipelines, tanks and columns, and environmental monitoring in the petrochemical industry.

Discussion of Public Comments:

A summary of the petition was published in the Federal Register on September 10, 2014 (79 FR 53824). Eight comments were received. Seven commenters, including the Association for Unmanned Vehicle Systems International (AUVSI), the Small UAV Coalition (Coalition),

the Materials Technology Institute (MTI), Congressman Dan Benishek, M.D., Congressman Dave Camp, and Senator Carl Levin, supported the petition. The Air Line Pilots Association, International (ALPA) opposed it.

In support of the petition, the 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 Pub. L. 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 Coalition suggested FAA safety regulations be proportionate to the risks posed by the particular proposed UAS operations by distinguishing between UAS. 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[1] 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, the altitude of its small unmanned aircraft vehicle (UAV) operations, and proven experience of the UAV in other countries and in the United States pursuant to a Certificate of Authorization. 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's certificate, but stated that at a minimum the FAA should provide an exception from part 61 and approve training and testing regiments that pertain to UAS commercial operations pertinent to the aircraft and operation proposed. The Coalition also asserted that Congress intended the section 333 national security criterion to focus on the operation rather than on the pilot and that shifting that focus imposes an unnecessary burden.

[1] 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; . . . ."

In response, as discussed in the grant of exemption to Trimble Navigation Ltd. (Exemption No. 11110), neither section 333 nor the FAA's authority to exempt from its regulations found in 49 USC § 44701(f), authorizes the FAA to provide exemption to the statutory requirement to hold an airman certificate as prescribed in 49 USC § 44711. The FAA notes that under this exemption the petitioner proposed to use pilots holding private certificates and it will be able to use the training program it proposed. Finally, the FAA does not agree that relying on the pilot certificate for a national security finding poses an unnecessary burden because pilots under this exemption, and the exemptions granted previously to section 333 requests, are already required to hold a pilot certificate to satisfy 49 USC § 44711.

The Coalition commented that a visual observer (VO) should not be required for all small UAS operation. The Coalition further asserted that the presence of one or more VOs may 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. As the PIC is determined to be in command of the UA, he must maintain VLOS while operating the UA. The FAA also notes that a VO complements the PICs 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.

AUVSI noted that authorizing AGI to conduct inspections and environmental monitoring of chemical plants would bring immediate and significant improvement to environmental and operational risk management in the chemical industry. AUVSI stated that AGI's exemption outlines at least an equivalent level of safety over the use of a manned aircraft and the petitioner has adequately addressed the safety requirements in a number of Federal Aviation Regulations

MTI noted that the petitioner's proposed operations would bring immediate and significant improvement to environmental and operational risk management in the petrochemical industry by: (1) reducing the risk associated with elevated human operations; (2) providing a higher quality and more efficient inspection and monitoring capability; and (3) reducing the probability of dangerous and costly unplanned events which could impact plant personnel and the surrounding ecosystem and communities.

U.S. Representatives Dan Benishek and David Camp and U.S. Senator Carl Levin each supported the petition highlighting that the proposed operations would provide significant improvements to environmental and operational risk, enhance safety, and increase efficiency.

An individual commented that the use of small UAS will not only promote increased reliability in petrochemical plants and other industries, but will unleash a new technology that could even further develop the safety and reliability of all industry as a whole.

ALPA expressed concern regarding several aspects of the petition. ALPA stated that the petitioner's reference to operations conducted within a "safe zone" is not defined, nor does the petitioner offer a means to control the airspace or area of operation. Specifically, ALPA states "there must be means both to ensure the UA remains within the defined airspace 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 while the pilot in command (PIC) and observer will be able to communicate by voice, the voice communication with the pilot is a limited mitigation if the pilot and the observer cannot both "see" (14 CFR 91.113) the small UAS and the surround [sic] area. The FAA has inserted a condition regarding PIC and visual observer (VO) communications to address this issue.

ALPA noted that the aircraft may not have a barometric altimeter as required by 14 CFR § 91.121, stating the ability to accurately maintain altitude must be addressed, and processes or mitigations, such as redundant control capability, fail-safe systems, backups and specific, validated procedures for system and equipment failures must be in place.

ALPA mentioned that while the petitioner's aircraft has a barometric sensor, the platform does not have a barometric altimeter as required by 14 CFR § 91.121, stating the ability to accurately maintain altitude must be addressed, and processes or mitigations must be in place. ALPA asserted that the processes or mitigations must include 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). The FAA finds that the alternative means of compliance proposed by the petitioner does not adversely affect safety.

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 agrees and carefully examined the proposed operation to ensure that the vehicle design and the petitioner's operating documents addressed potential

hazards related to C2 failure. The FAA finds that the UAS to be operated by the petitioner has sufficient design features to address these hazards. The FAA also finds that the operating documents have incorporated safety procedures to be followed by all operational participants should a C2 failure to occur.

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 stated that the petition seeks an exemption from the aircraft airworthiness process, 14 CFR 21, §§ 91.7 and 91.203. The FAA discusses aspects of 14 CFR 21 with respect to the petitioner's request in the FAA analysis section.

ALPA also noted that the petitioner's proposed operations are for "compensation or hire," and argues 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. The FAA has reviewed the knowledge and training required by holders of both private and commercial certificates. In Grant of Exemption No. 11062 to Astraeus Aerial (Astraeus) (*see* Docket No. FAA-2014-0352), the FAA determined that a PIC with a private pilot certificate operating the Astraeus UAS 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 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 FAA notes that the petitioner is not proposing night operations.

ALPA also expressed concern that the petitioner's waiver 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 each operator secure a Certificate of Waiver or Authorization (COA) which covers specific details of the petitioners operation. The FAA recognizes that UAS integration will generate new NAS access demand and will review and adjust accordingly.

Airworthiness Certification

The UAS proposed by the petitioner are battery-powered quad-copters: the Aeryon Scout (weighs 3.4 pounds) and the Aeryon SkyRanger (weighs 5.3 pounds).

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 P.L. 112-95 in reference to 49 USC § 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 parts 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 inspections. The FAA has issued a grant of exemption in circumstances similar in all material respects to those presented in your petition. In Grants of Exemption No. 11062 to Astraeus Aerial (*see* Docket No. FAA-2014-0352) and 11176 to Chevron (*see* Docket No. FAA-2014-0802), 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 the enclosed Grant of Exemption Nos. 11062 and 11176;
- the reasons stated by the FAA for granting Exemption Nos. 11062 and 11176 also apply to the situation you present; and
- a grant of exemption is in the public interest.

The FAA's 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, Aetos Group, Inc. is granted an exemption from 14 CFR §§ 61.113(a), 91.7(a), 91.119(c), 91.121, 91.151(a), 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 UAS for the purpose of aerial inspection of specific chemical plant infrastructure, to include flare stacks, elevated pipelines, tanks and columns, and environmental monitoring in the petrochemical industry. This exemption is subject to the conditions and limitations listed below.

Conditions and Limitations

Relative to this grant of exemption, Aetos Group, Inc.is hereafter referred to as the operator.

The following information contained in the petition and supporting documents is hereinafter referred to as operating documents:

1) Aetos Group UAS Operations Guide
2) Aetos Group SkyRanger Checklist
3) Aetos Group Scout Checklist
4) Aetos Group Operator and Observer Training document
5) Aetos Group Spectrum Analysis

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 following aircraft described in the operating documents which are quad-copters weighing less than 7 pounds: Aeryon Scout Unmanned Aircraft System and Aeryon SkyRanger 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 are limited to conducting aerial inspection of specific chemical plant infrastructure, to include flare stacks, elevated pipelines, tanks and columns, and environmental monitoring in the petrochemical industry.

3) The UA may not be flown at an indicated airspeed exceeding 50 miles per hour.

4) The UA must be operated at an altitude of no more than 400 feet above ground level (AGL), as indicated by the procedures specified in the operating documents. All altitudes reported to Air Traffic Control (ATC) must be 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 medical certificate.

6) All operations must utilize a visual observer (VO). 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 functions prescribed in the operating documents.

7) The operating documents and this 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 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 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 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) Prior to each flight the PIC must inspect the UAS to ensure 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.

9) 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 of the flight in the UAS aircraft records.

10) The preflight 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.

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

12) 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.

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

14) The authorized person must make an entry in the aircraft record of the corrective action taken against discrepancies discovered between inspections.

15) The PIC must possess at least a private pilot certificate and at least a current third-class medical certificate. 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.

16) The operator may not permit any PIC to operate unless the PIC meets the operator's qualification criteria, completes the operator's UAS training, and 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. The VO is also required to complete any training requirements for VOs. A record of training must be documented and made available upon request by the Administrator. Flights for the purposes of training the operator's PICs and VOs (training, proficiency, and experience-building), are permitted under the terms of this

exemption. However, training operations may only be conducted during dedicated training sessions.

17) UAS operations may not be conducted during night time, 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.

18) 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 Notice to Airmen (NOTAM) as required by the operator's Certificate of Waiver or Authorization (COA). The letter of agreement with the airport management must be made available to the Administrator upon request.

19) 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.

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

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

22) 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.

23) The operator must obtain an Air Traffic Organization (ATO) issued COA prior to conducting any operations under this grant of exemption. This COA will also require the operator to request a 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.

24) 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.

25) 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.

26) The 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 UAS is operating. These documents must be made available to the Administrator or any law enforcement official upon request.

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

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

29) The UA may not be operated over congested or densely populated areas.

30) Flight operations must be conducted at least 500 feet from all nonparticipating persons, 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 vehicles or structures where the owner/controller of such 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, VO, operator trainees, or essential persons do not present an undue hazard to those persons per § 91.119(a).

31) 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.

32) 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.

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

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

Sincerely,

/s/
John Barbagallo
Acting Deputy Director, Flight Standards Service