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

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

July 21, 2015

Exemption No. 12104
Regulatory Docket No. FAA–2015–0946

Prof. Andrew Bennett
Associate Professor of Mechanical Engineering
Franklin W. Olin College of Engineering
Olin Way
Needham, MA 02492-1200

Dear Mr. Bennett:

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 March 31, 2015, you petitioned the Federal Aviation Administration (FAA) on behalf of Franklin W. Olin College of Engineering (hereinafter petitioner or operator) for an exemption. The petitioner requested to operate an unmanned aircraft system (UAS) to conduct research on its own behalf and on behalf of other research groups.

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

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

Airworthiness Certification

The UAS proposed by the petitioner are a 3DRobotics Iris+ and Hobbyking Bixler.

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

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

Conditions and Limitations

In this grant of exemption, Franklin W. Olin College of Engineering is hereafter referred to as the operator.

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

1. Operations authorized by this grant of exemption are limited to the 3DRobotics Iris+ and Hobbyking Bixler when weighing less than 55 pounds including payload. Proposed operations of any other aircraft will require a new petition or a petition to amend this exemption.

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

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

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

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

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

7. This exemption and all documents needed to operate the UAS and conduct its operations in accordance with the conditions and limitations stated in this grant of exemption, are hereinafter referred to as the operating documents. The operating documents must be accessible during UAS operations and made available to the Administrator upon request. If a discrepancy exists between the conditions and

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Sincerely,

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

Enclosures

Franklin W. Olin College of Engineering

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March 31, 2015

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 Modernization and Reform Act of 2012 and 14 C.F.R. Part 11

Dear Sir or Madam,

Olin College of Engineering (Olin), a nonprofit educational institution located at 1000 Olin Way, Needham, MA 02492 and Pursuant to Section 333 of the FAA Modernization and Reform Act of 2012 ("FAA Reform Act") and 14 C.F.R. Part 11, respectfully requests exemptions from several provisions of the Federal Aviation Regulations ("FAR"), specifically Section 333 which authorizes the FAA to determine:

1. If certain 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)

We are writing to request that Olin, an owner and operator of small unmanned aircraft, be exempted from the Federal Aviation Regulations (FARs) listed below so that Olin may operate its small unmanned aircraft systems (UAS) for research on its own behalf and on behalf of other research groups in airspace regulated by the Federal Aviation Administration (FAA) as long as such operations are conducted within and under the conditions outlined herein or as may be established by the FAA as required by Section 333.

Olin has been actively involved in the technical development of UAS/UAV autonomy, command and control research to develop potential future applications to the scientific and research communities; in particular mission planning, field biology, geophysics and other autonomy and physical science communities.

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Olin has a number of small commercial UAS/UAV platforms, primarly multicopters manufactured by 3DRobotics, along with a small number of small, hobbyist-level fixed wing UAV platforms. Pictures of representative vehicles are here:

Figure 1 3DRobotics "Iris+" Quadcopter

Figure 2 Hobbyking "Bixler" Fixed Wing Trainer

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All of Olin's UAS/UAV systems are well under 55 pounds, are flown within line-of-sight of the operator, flown below 400 feet and during daylight hours only, and are restricted to fly only over Olin

Olin has equipped every vehicle with the "PixHawk" autopilot, which is manufactured by 3dRobotics. The autopilot has many useful functions to maintain controlled flight for teaching and research, most relevant of which is the ability to set limits (known as a "GPS Fence") which prohibits the UAS/UAV from flying outside of a pre-defined area.

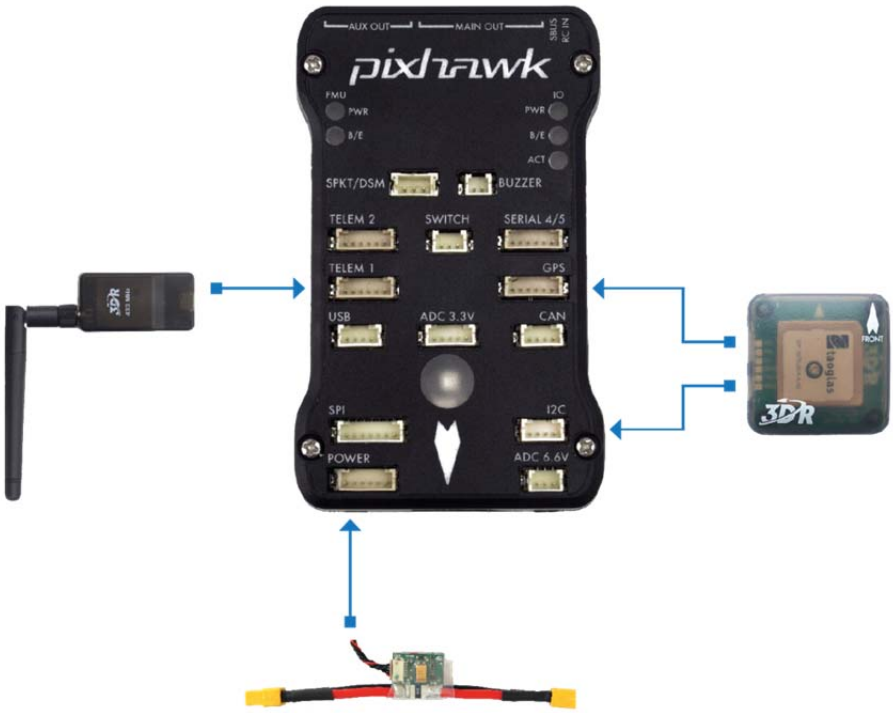

Figure 3 3DRobotics PixHawk Commercial Autopilot

Olin's research is investigating the ability to locate an "interesting phenomenon," such as a wild animal, a forest fire, stressed plants, etc. and dispatch a small UAS/UAV to collect detailed information about the location and size of the phenomenon. The operator can then capture an image from the vehicle's camera and calculate the GPS position of that image. The images are then studied by an expert who has in interest in that phenomenon. For example, the operator might capture the picture of a brush fire, whereupon a firefighting team might use that picture and location to decide on their next course of action. At this time the research is restricted to ground operations and laboratory experiments. All outdoor operations are restricted to Olin campus property and focus solely on teaching students how to fly small air vehicles in a manner

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consistent with the Academy of Model Aeronautics *Official AMA National Model Aircraft Safety Code.*

Olin's exemption request would permit its operation lightweight, unmanned (remotely controlled in line of sight) UAS's in tightly controlled and limited airspace. Specifically over Olin College property and, with written permission of the owners, over local farms and woodlands. It should be noted that none of said properties are within 5 miles of any airport. Predetermined, specifically marked areas of operation will allow Olin to operate within current safety parameters and new ones being implemented.

Granting Olin's request comports with the Secretary of Transportation's (FAA Administrator's) responsibilities 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 of the Reform Act. Further, Olin will conduct its operations in compliance with the protocols described herein or as otherwise established by the FAA.

The Extent of Relief Olin Seeks and the Reason It Seeks Such Relief:

Olin submits this application in accordance with the Reform Act, 112 P.L. 95 §§ 331-334, seeking relief from any currently applicable FAR's operating to prevent Olin contemplated research and other flight operations within the national airspace system. The Reform Act in Section 332 provides for such integration of civil unmanned aircraft systems into our national airspace system as it is in the public's interest to do so. Olin lightweight UAS's meet the definition of "small unmanned aircraft" as defined in Section 331 and therefore the integration of Olin lightweight UAS's are expressly contemplated by the Reform Act. Olin would like to operate its lightweight UAS's prior to the time period by which the Reform Act requires the FAA to promulgate rules governing such craft. The Reform Act guides the Secretary in determining the types of UAS's that may operate safely in our national airspace system. Considerations include: The weight, size, speed and overall capabilities of the UAS; Whether the UAS will be operated near airports or populated areas; and, Whether the UAS will be operated by line of sight.

112 P.L. 95 § 333 (a). Each of these items mitigates in favor of an exemption for Olin.

Olin hovering UAS's use multi counter-rotating propellers for extreme balance, control and stability. Olin fixed-wing UAS's are based on proven hobby-grade model aircraft which were designed to be inherently light and stable. They each typically weigh less than 55 pounds,

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including camera or other equipment. Each of Olin's small hovering unmanned aircraft are designed to primarily hover in place and operate at less than a 50 knot maximum speed. They are capable of vertical and horizontal operations but operate only within the line of sight of the remote control pilot. Olin's fixed-wing UAS's are designed to circle over an area of interest at low speed to provide a stable camera platform. They are designed to fly at less than 50 knots. In addition to the remote control pilot, Olin uses an assistant/spotter/camera operator and, if the team consists of students, a supervising faculty member, such that, at minimum, two Olin personnel, or three if two are students, govern the safe flight of an Olin aircraft at all times.

Utilizing battery power and not combustible fuels, flights generally last between five and twenty minutes. Olin does not operate its UAS's with less than twenty five percent battery capacity. Safety systems in place include a GPS mode that allows Olin UAS's to hover in place (or circle, if it is a fixed wing UAS) if communication with the radio control pilot is lost and then slowly descend the UAS at twenty five percent battery capacity. Further, Olin's fleet is programmed, in some instances, to slowly follow a predetermined set of waypoints to return to a safety point if communications are lost.

Olin is not located near, nor does operate its UAS's near airports and generally does not operate them near populated areas.

Olin's operation of its fleet of small unmanned aircraft will not "create a hazard to users of the national airspace system or the public." 112 P. L. 95 § 3 3 3 (b). Given the small size and weight of Olin's UAS's, combined with their operation in cordoned off and well-controlled areas, Olin's fleet falls within Congress's contemplated safety zone when it promulgated the Reform Act and the corresponding directive to integrate UAS's into the national airspace system.

The FAA has the authority to issue the exemption to Olin pursuant to the Federal Aviation Act, 85 P.L. 726 (1958), as amended (the "Act"). Commercial and Public Benefits Granting Olin exemption request furthers the public interest. First, Congress has already pronounced that it is in the public's interest to integrate commercially flown UAS's into the national airspace system, hence the passing of the Reform Act. Second, Olin conducts research into safe UAS operations every time it flies one of its UAS's. Flight data, visual inspections, recorded observations and flight analyses are compiled and analyzed as a part of the research effort to further enhance current safety protocols. Allowing Olin to log more flight time directly relates to its research and its ability to further enhance current safety measures. Third, Olin has received requests to supply mission data to US Government agencies, such as NASA, NOAA, and the Army Research Laboratory. Allowing Olin to conduct these flights will assist in furthering the research efforts and interests of all of these agencies.

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Granting Olin's exemption request substantially furthers the public's interest in ways known and currently unknown. Permitting Olin to immediately fly within the United States furthers advancements in publicly usable technologies or advancements in equipment available to law enforcement personnel, the military, and first responders with state of the art equipment that has the virtue of being cheaply and quickly available.

Reasons Why Olin's Exemption Will Not Adversely Affect Safety Or How The Exemption Will Provide a Level of Safety At Least Equal To Existing Rule:

Olin's exemption will not adversely affect safety. Quite the contrary, for the various reasons stated, permitting Olin to log more flight time will allow Olin to innovate and implement new and as of yet undiscovered safety protocols while exploring the advantages and limitations of computer assisted ground station monitoring.

Olin's UAS's weigh less than 55 pounds complete with cameras and sensors.

Olin only operates its UAS's below 400 feet.

Olin's UAS's only operate for 5-45 minutes per flight.

Olin lands its UAS's when they reach 25% battery power.

Olin's remote control pilots operate all Olin UAS's by Visual Line of Sight.

Olin remote control pilots have a second spotter, plus video and telemetry backup should they somehow lose sight of the UAS.

Olin's aircraft are controlled with unaltered, hobby-grade 2.4GHz spread-spectrum radios for control and 900MHz radios for telemetry. Both radio systems are common standards used throughout the hobby / amateur community. The 900MHz radios are designed and sold by 3DRobotics, makers of the commercial PixHawk autopilot (seen in Figure 3).

Olin staffs each flight with a remote control pilot and camera operator and, if the testing team is all-student, a faculty supervisor.

Olin UAS's have GPS flight modes whereby they hover and then slowly land if communication with the remote control pilot is lost, battery power is below25% or the vehicle leaves the pre-determined flight area.

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Olin actively analyses electronic flight data and other sources of information to constantly update and enhance safety protocols.

Olin only operates in secured areas that are strictly controlled, are away from airports and populated areas and have written permission from the property owner.

Olin conducts extensive briefings prior to and after each flight, during which safety carries primary importance;

Olin always obtains all necessary permissions and permits prior to operation;

Olin provides a level of safety at least equal to existing rules, and in nearly every instance, greater than existing rules.

Summary the FAA may publish in the Federal Register:

14 .F.R. 21 and 14 C.F.R. 91: Airworthiness Certificates, Manuals and the Like. 14 C.F.R. 21, Subpart H, entitled Airworthiness Certificates, sets forth requirements for procurement of necessary airworthiness certificates in relation to FAR§ 91.203(a)(l). The size, weight and enclosed operational area of Olin's UAS's permits exemption from Part 21 because Olin UAS's meet an equivalent level of safety pursuant to Section 3 3 3 of the Reform Act. The FAA is authorized to exempt aircraft from the airworthiness certificate requirement under both the Act (49 U.S. C. § 44701 (f)) and

A. Section 333 of the Reform Act. Both pieces of legislation permit the FAA to exempt UAS's from the airworthiness certificate requirement in consideration of the weight, size, speed, maneuverability and proximity to areas such as airports and dense populations. Olin's UAS's meet or exceed each of the elements.

14 C.F.R. 91.7 (a) prohibits the operation of an aircraft without an airworthiness certificate. As no such certificate will be applicable in the form contemplated by the FARs, this Regulation is inapplicable.

14 C.F.R. § 91.9 (b) (2) requires an aircraft flight manual in the aircraft. As there are no pilots or passengers, and given the size of the UAS's, this Regulation is inapplicable. An equivalent level of safety will be achieved by maintaining a manual at the flight operations center. The FAA has previously issued exemptions to this regulation in Exemption Nos. 8607, 8737, 8738, 9299, 9299A, 9565, 95658, 10167, 10167A, 10602, 10700 and 32827.

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14 C.F.R. § 91.121 regarding altimeter settings is inapplicable insofar as Olin's UAS's utilize electronic global positioning systems and internal gyroscopes to provide spatial coordination.

14 C.F.R. § 91.203 (a) and (b) provides for the carrying of civil aircraft certifications and registrations. They are inapplicable for the same reasons described above. The equivalent level of safety will be achieved by maintaining such certifications and registrations at the Olin research laboratory/flight operations center.

B. 14 C.F.R. § 45.23: Marking of the Aircraft. Applicable Codes of Federal Regulation require aircraft to be marked according to certain specifications. Olin's UAS's are, by definition, unmanned. They therefore do not have a cabin, cockpit or pilot station on which to mark certain words or phrases. Further, two-inch lettering is difficult to place on such small aircraft. The FAA has previously issued exemptions to this regulation through Exemptions Nos. 8738,10167, 10167A and 10700.

C. 14 C.F.R. § 61.113: Private Pilot Privileges and Limitations. Pursuant to 14 C.F.R. §§ 61.113 (a) & (b), private pilots are limited to non-commercial operations. Olin can achieve an equivalent level of safety as achieved by current Regulations because Olin's UAS's do not carry any pilots or passengers. Further, while helpful, a pilot license will not ensure remote control piloting skills. Olin's model aircraft pilot vetting and training programs (based upon completion of an Academy of Model Aircraft recommended and a self-administered UAS flight training program and internal procedures) will. Also, the risks attendant to the operation of Olin's UAS's is far less than the risk levels inherent in the commercial activities outlined in 14 C.F.R. § 61, et seq.

D. 14 C.F.R. 91.119: Minimum Safe Altitudes. 14 C. F. R. § 91.119 prescribes safe altitudes for the operation of civil aircraft. It allows Helicopters to be operated at lower altitudes in certain conditions. Olin's UAS's will never operate at an altitude greater than 400 AGL. Olin will, however, operate its UAS's in sectioned off areas with security perimeters, providing a level of safety at least equivalent to those in relation to minimum safe altitudes. Given the size, weight, maneuverability and speed of Olin's UAS's, an equivalent level of safety will be achieved.

E. 14 C.F.R. 91.405 (a); 407 (a) (1); 409 (a) (2); 417(a) & (b): Maintenance Inspections. The above-cited Regulations require, amongst other things, aircraft owners and operators to "have [the] aircraft inspected as prescribed in subpart E of this part and shall between

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required inspections, except as provided in paragraph C of this section, have discrepancies repaired as prescribed in part 43 of this chapter."

These Regulations only apply to aircraft with an airworthiness certificate. They will not, therefore, apply to Olin should its requested exemption be granted. Even so, Olin conducts an extensive maintenance program that involves regular software updates and constant inspection for assessment and replacement/repair of any damaged hardware. Therefore, an equivalent level of safety will be achieved. Olin is using currently manufactured UAS's for its research which have been produced in significant numbers, which also allows Olin to avail itself of the higher reliability and expertise of the vehicle manufacturers which will further help in keeping all vehicles safe.

F. Summary

Olin seeks an exemption from the following Regulations: 14 C.F.R. 21, subpart H; 14 C.P.R. 45.23(b); 14 C.F.R. §§ 61.113 (a) & (b); 14 C.F.R. § 91.7 (a); 14 C.F.R. § 91.9 (b)(2); 14 C.F.R. § 91.103(b); 14 C.F.R. § 91.109; 14 C.F.R. § 91.119; 14 C.F.R. § 91.121; 14 C.F.R. § 91.151(a); 14 C.F.R. §§ 91.203(a) and (b); 14 C.F.R. § 91.405 (a); 14 C.F.R. § 91.407 (a)(1); 14 C.P.R.§ 91.409 (a)(2); 14 C.P.R.§ 91.409 (a)(2); and, 14 C.P.R.§§ 91.417 (a) & (b) to commercially operate its fleet of small unmanned hovering and lightweight unmanned fixed-wing aircraft and to conduct its own research and to supply data to other groups that request it, such as NASA, The US Army, NOAA, physical scientists, biologists, search and rescue. Granting Olin's request for exemption will reduce current risk levels and thereby enhance safety.

Further, Olin operates at lower altitudes and in controlled airspace. Olin has been analyzing flight data and other information in compiling safety protocols and the implementation of a flight operations manual that exceeds currently accepted means and methods of safe flight for these vehicles. There are no people on board Olin UAS's and therefore the likelihood of death or serious bodily injury is significantly limited. Olin's operation of its UAS's, weighting less than 55 pounds and traveling at speeds lower than 50 knots, in cordoned off areas will provide at least an equivalent level of safety as that achieved under current FARs.

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Olin respectfully requests that the FAA grant its exemption request without delay. The FAA has the authority to issue the exemption sought by Olin pursuant to the Federal Aviation Act, 85 P.L. 726 (1958), as amended (the "Act").

Sincerely,

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