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

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

May 11, 2015

Exemption No. 11520
Regulatory Docket No. FAA–2015–0330

Mr. Andrew Thurling
AeroVironment, Inc.
900 Enchanted Way
Simi Valley, CA 93065

Dear Mr. Scott:

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 January 26, 2015, you petitioned the Federal Aviation Administration (FAA) on behalf of AeroVironment, Inc. (hereinafter petitioner or operator) for an exemption. The petitioner requested to operate an unmanned aircraft system (UAS) to conduct inspecting fixed infrastructures in controlled environments..

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

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

Airworthiness Certification

The UAS proposed by the petitioner is the AeroVironment Shrike

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 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, AeroVironment, Inc. 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, AeroVironment, Inc. is hereafter referred to as the operator.

[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.

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 AeroVironment Shrike 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 May 31, 2017, unless sooner superseded or rescinded.

Sincerely,

/s/

John S. Duncan
Director, Flight Standards Service

Enclosures

900 Enchanted Way
Simi Valley, CA 93065

January 26, 2015

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

RE: Second Exemption Request for AeroVironment, Inc. Under Section 333 of the FAA Modernization and Reform Act of 2012 and 14 C.F.R. Part 11

Dear Sir or Madam,

Pursuant to Section 333 of the FAA Modernization and Reform Act of 2012 ("FMRA") and 14 C.F.R. Part 11, AeroVironment, Inc. ("AV") requests exemptions from several provisions of the Federal Aviation Regulations ("FAR"), specifically portions of 14 C.F.R. Parts 47, 61, and 91 to allow, among other things, commercial operations of its Shrike small unmanned aircraft systems ("Shrike") in areas of the United States, as further defined herein, by a Pilot in Command holding a private pilot certificate.[1]

Shrike is a lightweight, battery-powered, hand-launched, small unmanned aircraft system ("UAS") that, depending on its payload, is capable of transmitting live airborne video images and location information to a Ground Control Station ("GCS"). Shrike is designed for vertical take-off and landing ("VTOL") with a maximum weight of 7.0 pounds, a length of 34.8 inches, a width of 35.3 inches, and a wingspan of 3.0 feet. It has a flight endurance of 40 minutes with a ground speed of between 4 to 15 meters (0 to 30 knots) per second in forward flight and typically operates at an altitude of less than 400 feet AGL.

AV proposes to fly Shrike, a proven aircraft already operating in the United States under a certificate of authorization ("COA") issued by the FAA to the University of Alaska Fairbanks (Exhibit C), for the intended purpose of inspecting fixed infrastructures in controlled environments. AV's proven safety record in tandem with the controlled environments in which Shrike will be operating make it clear that this unmanned aircraft can operate safely in the National Airspace System ("NAS") without posing a threat to national security.

Shrike's capabilities combined with AV's successful unmanned flight experience to date,

[1] AeroVironment has today submitted under separate cover a second Section 333 exemption request for the Shrike aircraft. This application for a Section 333 approval differs from the other in that it requests operations within Class E and D airspace and night operations. The other submission is submitted for summary action as it does not ask for any authority not already given as reflected in the application.

make it ideally suited to conduct commercial operations in carefully controlled environments under Class E or Class G airspace and within Visual Line of Sight ("VLOS"). Some Class D airspace may be used on a case-by-case basis and would be further defined during the COA process. Shrike operations are all conducted within visual line of sight (VLOS) and typically conducted within 500 meters of observer, thus enhancing safety procedures.

Acknowledging the FAA's mission to provide the safest and most efficient airspace system in the world, commercial operations of Shrike will comply with applicable FAR provisions as well as AV's operational risk management and safety protocols as outlined and defined in the attached exhibits. Exhibits A-B and D-F are submitted confidentially[2]. AV will only fly in airspace as allowed under the exemption granted to it and will coordinate with the FAA as necessary to ensure safe operations.

As a result of the Shrike's size, weight, maximum speed, operational capability, and safety record; the distance at which it will operate from airports and populated areas; its operation within VLOS of the PIC or the observer; its operation within controlled boundaries; and its operation using visual observers to provide de-confliction from other air traffic, the Shrike does not create a hazard to users of the NAS or the public. Nor does it pose a threat to national security. Therefore, the FAA should grant AV the requested exemptions. Alternatively, if the FAA finds that modification of AV's application is required for safe operation of the Shrike in the NAS, AV requests that the FAA delineate the required modifications and process AV's application as if the modifications were already made[3].

AV recognizes that the FAA has granted exemption with similar circumstances as noted in FAA Exemption Nos. 11109, 11111, 11114, 11136, 11138.

This exemption request encompasses the following regulations with discussion for each described herein:

14 C.F.R. 61.113(a) and (b)	14 C.F.R. 91.151(b)
14 C.F.R. 61.133(a)	14 C.F.R. 91.405(a)
14 C.F.R. 91.7 (a)	14 C.F.R. 91.407(a)(1)
14 C.F.R. 91.121	14 C.F.R. 91.409(a)(2)
14 C.R.R. 91.205 (c)	14 C.F.R. 91.417(a) & (b)

[2] These documents have not been released to the public and are proprietary, commercial information exempt from release under the Freedom of Information Act.
[3] If the Secretary determines that any qualifying vehicle "may operate safely in the national airspace system, the Secretary shall establish requirements for the safe operation of such aircraft in the national airspace system." *Id.* §333(c). Applicant interprets this provision to place the duty on the Administrator to not only process applications for exemptions under section 333, but for the Administrator to craft conditions for the safe operation of the UAS, if it should be determined that the conditions set forth herein do not fulfill the statutory requirements for approval.

The name and address of the applicant are:

AeroVironment, Inc.
Address: 900 Enchanted Way, Simi Valley, CA 93065
Attn: Andy Thurling
Phone: (805) 581-2198 x1892
Fax: (805) 581-4512
Email: Thurling@avinc.com

Attn: Doug Scott
Phone: (805) 581-2187 x2694
Email: scott@avinc.com

Section 333's Mandate and the Federal Aviation Act

Grant of this exemption application for use of the Shrike in aerial surveillance pursuant to the exemption requested herein will advance the Congressional mandate in Section 333 of the FAA Reform Act to accelerate the introduction of UASs into the NAS. Section 333 directs the Secretary of Transportation to consider whether certain UASs may operate safely in the NAS before completion of the rulemaking required under Section 332 of the FAA Reform Act. To make that determination, the Secretary must evaluate which types of UASs do not create a hazard to users of the NAS or the public or pose a threat to national security in light of several criteria:

- The UAS's size, weight, speed, and operational capability;
- Operation of the UAS in close proximity to airports and populated areas; and
- Operation of the UAS within visual line of sight of the operator. FAA Reform Act § 333(b) (1).

Once the Secretary determines that such vehicles "may operate safely in the national airspace system, the Secretary shall establish requirements for the safe operation of such aircraft in the national airspace system." Id. § 333(c) (emphasis added).The Federal Aviation Act expressly grants the FAA the authority to issue exemptions. 49 U.S.C.§ 44701(f). This statutory authority, by its terms, includes exempting civil aircraft, as the term is defined under §40101 of the Act, from the requirements that all civil aircraft must have a current airworthiness certificate, 49 U.S.C. § 44711(a), and those used in commercial service must be piloted by commercial pilots. 14 C.F.R. §§ 91.61.113(a) and (b), 61.133.The grant of the requested exemption is in the public interest based on (i) the clear direction in Section 333 of the FAA Reform Act; (ii) additional authority in the Federal Aviation Act, as amended; (iii) the strong equivalent level of safety surrounding the proposed operations; and (iv) the significant public benefit, including enhanced safety and cost savings associated with utilizing UASs for agriculture, aerial survey photography, inspection and patrolling. Accordingly, AV respectfully requests that the FAA grant the requested exemption without delay.

Airworthiness

The Shrike is safe and fit for operation in the NAS under the conditions listed herein. Shrike has been safely operating under a COA issued by the FAA to the University of Alaska Fairbanks since 2013. It complies with all aspects of the North Slope Standard

Operating Procedures Manual accepted by the FAA and provided as supporting documentation. Shrike has flown a total of 225 hours.

In support of this application, AV is submitting, with a request for confidentiality, as shown, the following documents:

- Shrike Specifications and Description, Exhibit A (Confidential)
- Safety Components and Procedures, Exhibit B (Confidential)
- Shrike COA issued to the University Alaska Fairbanks, Geophysical Institute, dated Sept. 23, 2013, Exhibit C.
- AV Shrike Operations Manual, Exhibit D.(Confidential)
- North Slope Standard Operating Procedures Manual, Exhibit E.(Confidential)

National Airspace Standard Operating Procedure,.
Mandatory Operating Conditions

AV proposes that the grant of the exemption be subject to the following mandatory conditions, which are based upon operating conditions set forth for operation of UAS by public entities pursuant to Certificates of Waiver or Authorization, and with additional restrictions:

- All operations to occur in Class E or Class G airspace within controlled areas. Some Class D airspace may be used on a case-by-case basis and would be further defined during the COA process.
- Operations to be conducted over private or controlled-access property to limit the number of persons not associated with the operations place at risk.
- Permission from land owner/controller required before commencing any flight.
- Operations to occur during Visual Flight Rules Meteorological Conditions (VMC).
- Aircraft to remain within Visual Line of Sight (VLOS).
- Above Ground Level (AGL) altitude to be restricted to 400 feet.
- Flights over sensitive infrastructure such as pipelines or roads will be minimized to reduce the time the infrastructure is placed at risk, and
- Flights over sensitive infrastructure will be offset appropriately for the wind at the time of flight to reduce the risk to the infrastructure.
- Launch and recovery areas will be cordoned off to limit access only to personnel associated with the flight operation.
- A dedicated Visual Observer (usually, but not always the PIC) will be utilized to maintain overall operation situational awareness; maintain VLOS and scan for intruder traffic; monitor all radio communication to include “Guard” in accordance with any COA; and report on CTAF and other frequencies as appropriate.
- All operations conducted in vicinity of airport to remain more than 2.5 NM from centerline azimuth of runway centerline measured from runway thresholds.
- Operator will file a NOTAM for each flight.
- All required authorizations and permits will be obtained from territorial, state, county, or city jurisdictions, including local law enforcement, fire, or other governmental agencies.
- Flight operations will be conducted at least 500 feet from all nonparticipating persons (persons other than the PIC or VO), vessels, vehicles, and structures unless:

a. Barriers or structures are present that sufficiently protect nonparticipating persons from debris in the event of an accident. The operator will ensure that nonparticipating persons remain under such protection. If a situation arises where nonparticipating persons leave such protection and are within 500 feet of the UA, flight operations must cease immediately and/or;

b. the aircraft is operated near vessels, vehicles or structures where the land owner/controller has granted permission and the PIC has made a safety assessment of the risk of operating closer to those objects and;

c. operations near the PIC or VO will not present an undue hazard to the PIC or VO, per § 91.119(a).

Proposed Operating Parameters

AV proposes to conduct all flights within VLOS of a pilot and observer and all flights will be limited to a maximum altitude of 400 feet AGL. To further enhance safety and a controlled environment, AV only allows authorized personnel in the operational area. On the ground, the launch site is blocked off using cones, and there is a designated person to intercept anyone not authorized. This procedure not only protects non-authorized individuals, it also minimizes distractions for the flight crew. In addition, the airspace is covered by a NOTAM, which is filed before flight. Furthermore, the observer, who is properly trained for the operations, monitors local air traffic frequencies in order to communicate with any air traffic nearby, if required by the COA.

Operator Requirements

AV respectfully proposes that operator requirements should take into account the characteristics of the particular UAS. The Shrike is an inherently stable, lightweight aircraft that weighs 7.0 pounds (at its maximum weight) and will be operated in controlled areas. While AV will be using a PIC holding an FAA private pilot certificate, the safety concerns addressed by requiring a private pilot certificate are not present with the operation of the Shrike. Although the Shrike can be configured to give the pilot full control to the aircraft and payload during flight, the Shrike has an advanced autopilot that flies the aircraft, managing altitude and flight path within the intended flight envelope at all times when that flight mode is engaged. The autopilot limits maneuvering to simple airspeed, altitude, and turn rate changes. These limits are hard coded into the autopilot and define the aircraft's normal flight operating envelope. The autopilot manages pitch, bank, and throttle to maintain target airspeed, target turn rate, and target altitude. For in flight modes that do not use GPS, the operator manually guides the flight path by controlling target airspeed, target altitude, and target turn rate directly. In flight modes that use GPS, the autopilot controls target turn rate to fly to waypoints. The system does not allow commands that are outside of the normal operating envelope, and the operator never affects control surface movements directly. Equally significant is the fact that Shrike operates within a tight visual line of sight (500 meters) and is therefore easily maneuvered within a visual operating area. See Shrike Operations Manual, Exhibit D.

Specific Exemption Requests and Equivalent Level of Safety Showings

14 C.F.R. §§ 61.113(a) and (b), 61.133(a) - Private Pilot Privileges and Limitations: Pilot in Command; Commercial Pilot Privileges and Limitations

Regulations provide as follows: Subsections (a) and (b) of § 61.113 prohibit private pilots from operating aircraft in commercial operations, and Section 61.133(a) requires an individual operating an aircraft for compensation or hire to hold a commercial pilot certificate. The FAA has the statutory authority to waive the pilot requirements for commercial operations. 49 U.S.C. § 44701(f).Basis for exemption is as follows: AV requests an exemption from 14 C.F.R. §§ 61.113(a) and (b) and 14 C.F.R. § 61.133(a) so that the Shrike may be operated by individuals who (a) have a private pilot certificate, and (b) have completed AV's US military-approved training program for operation of the Shrike.

Based upon the design features of the Shrike, its autopilot system, and safety factors, the FAA should permit operation of UASs by operators with a private pilot certificate when the conditions described above have been satisfied. The above-described conditions are in line with those set forth in Volume 16, Chapter 4, Section 1 of FAA Order 8900.1.

AV proposes to conduct operations in accordance with these restrictions. Given these conditions and restrictions, an equivalent level of safety will be provided by allowing operation of the Shrike with a private pilot certificate. The risks associated with the operation of the Shrike (given its size, speed, operational capabilities, and lack of combustible fuel) are so much less than the level of risk associated with manned operations, both private and commercial, as contemplated by Part 61, that allowing operations of the Shrike, as set forth above, meets or exceeds the present level of safety provided under 14 C.F.R. §§ 61.113(a) & (b) and 61.133(a).

14 C.F.R. 91.7 (a) Civil Aircraft Airworthiness

This regulation requires that no person may operate a civil aircraft unless it is in airworthy condition. Should the exemption be granted allowing commercial operation of the Shrike without an airworthiness certificate, no standard will exist for airworthiness of the Shrike. Given the size of the aircraft, the speed it will operate at, the procedures for operating and maintaining the aircraft as set forth in the manuals, an equivalent level of safety will be provided.

14 C.F.R. §91.121: Altimeter Settings

This regulation requires:

Each person operating an aircraft to maintain cruising altitude by reference to an altimeter that is set "…to the elevation of the departure airport or an appropriate altimeter setting available before departure."

Basis for exemption is as follows:

As the UAS may not have a barometric altimeter, but instead GPS altitude control, an exemption may be needed. An equivalent level of safety will be achieved by the operator as the UAS uses AGL height from its initialization (launch) point, cross-referenced with MSL altitude of the launch point.

14 C.F.R. §§ 91.151 (b): Fuel Requirements for Flight in VFR Conditions

Section 91.151(b) prohibits an individual from beginning "a flight in a rotorcraft under VFR conditions unless (considering wind and forecast weather conditions) there is enough fuel to fly to the first point of intended landing and, assuming normal cruising speed to fly after that for at least 20 minutes."

The Shrike's batteries provide up to 45 minutes of powered flight. Without an exemption from 14 C.F.R. § 91.151 (b), the Shrike's flights would be extremely limited in length. Given the nature of Shrike's controlled operations, a limitation on flight time would severely comprise its intended mission.

AV believes that an exemption from 14 C.F.R. § 91.151(b) is safe and consistent with the scope of a prior exemption. See Exemption 10673 (allowing Lockheed Martin Corporation to operate without compliance to 91.151(a)). Operating the Shrike, a small UAS, without 20 minutes of reserve fuel does not engender the type of risks that Section 91.151(b) was meant to prevent. The fact that the Shrike carries neither pilot, passenger, nor cargo, also enhances its safety. Given its size, weight and construction material, the risks are less than contemplated by the current regulation.

Similar exemptions have been granted to others, including Exemptions 2689F, 5745, 10673 , 11062-11067, 11080, 11109, 11136, and 11138.

14 C.F.R. 91.205 (c) Visual Flight Rules (night operations)

With regard to nighttime operations, AV contends that such operations may be conducted at least as safely as during the day using a similar concept of operations. Data supporting this can be found in a recent NASA-funded flight test series, which concluded that "statistical analyses of mean visual acquisition distances, overall aircraft visibility, and other parameters revealed no degradation in safety when operating at night. Moreover, when statistically significant differences were identified, the data favored night operations over daytime...Across three weeks of experimental testing, no systematic degradation of safety was observed when operating the...sUAS at night, even with the addition of light pollution."[4]

An exemption is need from 91.205 in that the specified equipment will not be on the aircraft. An equivalent level of safety will be provided by the restricted area of operation and operating within VLOS at all times. No other aircraft will be in the airspace that operations are planned.

14 C.F.R. §§ 91.405(a); 91.407(a)(1); 91.409(a)(2); 91.417(a)(b): Maintenance Inspections and Records

Section 91.405(a) requires that an aircraft operator or owner "[s]hall have that aircraft inspected as prescribed in subpart E of this part and shall between required inspections, except as provided in paragraph (c) of this section, have discrepancies repaired as prescribed in part 43 of this chapter." Section 91.407 similarly makes reference to

[4] *Final Report of the Evaluation of the Safety of Small Unmanned Aircraft System (sUAS) Operations in the National Airspace System (NAS) at Night, Year 2," Igor Dolgov, PhD., Department of Psychology, New Mexico State University; Dallas Brooks, Physical Sciences Lab, New Mexico State University; Bryan Hudson, AeroVironment, December 24, 2014*

requirements in Part 43; Section 91.409(a)(2) requires an annual inspection for the issuance of an air worthiness certificate. Section 91.417(a) requires that an owner or operator keep records showing certain maintenance work that has been accomplished by certificated mechanics, under Part 43, or licensed pilots and records of approval of the aircraft for return to service.

Maintenance of the Shrike will be accomplished by the owner/operator pursuant to the manuals provided by AV. An equivalent level of safety will be achieved because the Shrike is small in size, will carry no external payload, will operate only in restricted pre-determined areas, and is not a complex mechanical device. The Shrike operator will ensure that it is in working order prior to initiating flight, perform required maintenance, and keep a log of any maintenance that is performed. Moreover, the operator is the person most familiar with the aircraft and is best suited to maintain the aircraft in an airworthy condition and to ensure an equivalent level of safety. Maintenance is very easy as the operator can simply swap out consumable parts (much like plug and play) and is trained in these procedures – a licensed airplane and power mechanic is not necessary.

The Shrike comes with one Field Repair Kit ("FRK"). The FRK includes the items necessary to complete field repairs or routine maintenance.

To the extent that notice need be filed in the Federal Register of this exemption request, AV submits the following:

> Applicant request permission to conduct commercial operations with its Shrike UAS for the purpose of conducting agriculture, aerial survey photography, inspection and patrolling. Exemptions are sought from the following regulations:
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> | | |
> |---|---|
> | 14 C.F.R. 61.113(a) and (b) | 14 C.F.R. 91.151(b) |
> | 14 C.F.R. 61.133(a) | 14 C.F.R. 91.205 (c) |
> | | 14 C.F.R. 91.405(a) |
> | 14 C.F.R. 91.7 (a) | 14 C.F.R. 91.407(a)(1) |
> | | 14 C.F.R. 91.409(a)(2) |
> | 14 C.F.R. 91.121 | 14 C.F.R. 91.417(a) & (b) |

Respectfully submitted,

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