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

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

July 28, 2015

Exemption No. 12212
Regulatory Docket No. FAA–2015–0931

Mr. Gregory S. Walden
Counsel for Firestorm Emergency Services Ltd. d/b/a Firestorm UAV
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1333 New Hampshire Avenue NW
Washington, DC 20036-1564

Dear Mr. Walden:

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 April 6, 2015, you petitioned the Federal Aviation Administration (FAA) on behalf of Firestorm Emergency Services dba Firestorm UAV (hereinafter petitioner or operator) for an exemption. The petitioner requested to operate an unmanned aircraft system (UAS) to conduct emergency services[1].

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

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

Airworthiness Certification

The UAS proposed by the petitioner is a DJI Spreading Wings 1000+.

[1] The petitioner also requested authority to operate under nighttime conditions. At this time, the FAA is unable to authorize UAS operations under nighttime conditions until a further assessment is completed. When the FAA completes its review, we will proceed accordingly and no further action will be required by the petitioner.

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[2]. 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, Firestorm Emergency Services dba Firestorm UAV 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] 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.

(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, Firestorm Emergency Services dba Firestorm UAV is hereafter referred to as the operator.

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

1. Operations authorized by this grant of exemption are limited to the DJI Spreading Wings 1000+ 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

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United States Department of Transportation
Federal Aviation Administration
Docket Management System
1200 New Jersey Avenue, NE
Washington, DC 20590

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Re: Docket FAA 2015-0931; Amendment to Petition for Exemption of Firestorm Emergency Services Ltd. d/b/a Firestorm UAV under Section 333 of the FAA Modernization and Reform Act, 49 U.S.C. 44701(f), and 14 C.F.R. Part 11, to operate during nighttime conditions

On behalf of Firestorm Emergency Services Ltd. d/b/a Firestorm UAV ("Firestorm"), we hereby submit this amendment to the petition for an exemption filed on April 4, see Docket FAA 2015-0931, to allow Firestorm to operate the Spreading Wings 1000+ UAV manufactured by DJI modified by Troy Built Models called TigerStrike® TF, under nighttime conditions, to carry the patent pending Intelligent Radio Direction Finding (iRDF) system to provide emergency services such as search and rescue, preventing runaways of persons with dementia, and geo-locating a firefighter in a building filled with smoke, in both rural and urban environments. Please consider this document as part of the petition filed dated April 4, 2015.

In its petition, Firestorm stated that it "will limit its operations to daytime Visual Flight Rules ("VFR") plus 30 minutes before sunrise and 30 minutes after sunset (dusk), with each operation ending no later than 30 minutes after sunset. . . . The UAV is equipped with LED lighting visible for 3 miles. Accordingly, we do not believe an exemption from 14 C.F.R. 91.209 is necessary."

The amendment to the petition sets forth the public interest in support of nighttime operations and the operational and equipment consideration that achieve an equivalent level of safety for such operations.

Operations during nighttime hours are in the public interest. As Firestorm stated in its petition, "UAV operations will substantially benefit wandering dementia patients with wrist beacons, Emergency Locator beacons both 406 and 121.5 used by ground teams, geolocation of the firefighters' radio in wild land fire and structure fires by using the TigerStrike® technology to geolocate them using their existing radios as a beacon. Lost hikers and skiers who are equipped with the FRS radios can also be geo-located effectively. Tagged wildlife can be located

and observed with little or no interactions/risk to the animal that is being tracked or the biologist. The critical element is the speed to recovery that mitigates damage both bodily and financial."

In search and rescue involving some form of radio transmission time is of the essence. Those involved in the first responder world know that the survival percentage of victims decreases with every hour passing.

Unfortunately, most of these events happen in rural environments where access to the event is often blocked by terrain and man-made structures. The art of radio direction finding ("RFI") is further complicated by reflections and man-made interference. The process is very simple: discover the most accurate angle to the source of the radio frequency emanations to ascertain the line of bearing from the searchers location to the victim. The next step is to move location from the initial reading and take a second line of bearing with enough variance from the first that it creates an accurately that they can create an intersection. At this intersection is the most probable location of the source of the signal. Further information about the use of this technology, which contains commercially sensitive and propriety material, is being provided separately to the FAA.

Historically most aviation rescue units will not participate in search-and-rescue radio direction finding work at night because of the proximity to terrain and in many cases inclement weather. However, once they know that the ground team has geo-located the signal they will come and hoist out any victims. In certain states, Civil Air Patrol (CAP) tasked by the USAF Rescue Coordination Center (AFRCC) with inland search and rescue responsibility will not fly at night, even in good weather. So this becomes an enormous safety factor for both the searchers, ground team members and pilots that are pressed into service at night to find someone in distress.

With the integration that has been fitted to the bottom of the UAV connected to a Panasonic 7 inch tablet, the results of the automatic radio direction finding are relayed to the ground station next to the UAV pilot. If the beacon is a 406 MHz ELT, PLB, or Epirb, it will decode the signal and display the result on the map on the ground station software. Other beacons like Alzheimer's bracelets, special needs bracelets, VHF UHF handheld radios or other devices that are transmitting will show up as a line of bearing from the UAV pilot's location on the map instantly. This first reading would be available in less than five minutes from set up.

Based on terrain clearance and location to problematic structures, the altitude would be limited to 400 feet AGL. The Tiger strike equipped UAV would then fly right or left of the initial reading to establish the second line of bearing at no greater than 3,000 feet or line of sight of the lights on the UAV. Due to the very narrow aperture of this antenna (2-5) degrees, the accuracy of the results would be greater than any other commercial equipment other than military. If no signal is

determined in either scenario the speed of deployment by the firestorm UAV equipped with the Tiger strike technology allows sampling for the signal to occur at a much higher rate than by traveling by car along roads.

Operations under nighttime conditions will maintain an equivalent level of safety.

Firestorm's nighttime operations will maintain an equivalent level of safety for the reasons sets forth in its petition (i.e., operations will be conducted under 400 ft. AGL and within the line of sight of the operator) plus the fact that the UAV will be lighted sufficiently to be seen by the operator, other aircraft operators in that same airspace, and other persons on the ground. Firestorm has added a 1.5GHz anti-GPS jamming capability to increase the margin of safety of its UAS.

Sincerely,

Gregory S. Walden

Copy to: Murray Craig, Firestorm Emergency Services Ltd.