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

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

August 24, 2015

Exemption No. 12574
Regulatory Docket No. FAA−2015−2359

Mr. Daniel Kruetzfeldt
Crossfield LLC
18475 Lambert Lake Road
Sonora, CA 95370

Dear Mr. Kruetzfeldt:

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 May 20, 2105, you petitioned the Federal Aviation Administration (FAA) on behalf of Crossfield LLC (hereinafter petitioner or operator) for an exemption. The petitioner requested to operate an unmanned aircraft system (UAS) to conduct aerial surveys, photogrammetry, and data collection.

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 the DJI Flame Wheel 550 and DJI Spreading Wings S1000+.

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, Crossfield LLC 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, Crossfield LLC 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 DJI Flame Wheel 550 and DJI Spreading Wings S1000+ 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 August 31, 2017, unless sooner superseded or rescinded.

Sincerely,

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

Enclosures

Daniel Kruetzfeldt
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May 20, 2015

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

Dear Sir or Madam:

Crossfield is proposing to conduct S.U.A.S. (Small Unmanned Aerial System) imaging operations for construction, mining, agriculture, and other commercial operations. Pursuant to section 333 the FAA Modernization and Reform Act of 2012, we request exemption from several provisions of the Federal Aviation Regulations, specifically portions of 14 C.F.R. Parts 61 and 91 to allow commercial operations of our unmanned aerial vehicle. Crossfield's purpose of safely conducting UAV (Unmanned Aerial Vehicle) operations within the N.A.S. aligns itself with the intent of Congress, until final regulation governing their use is implemented. Also, as every exemption Crossfield is applying has been previously approved in similar operations, we respectfully request the "summary grant" process is utilized.

Safety is absolutely at the forefront of all operations at Crossfield, and all of our operations are designed to protect people and property in the area of operation. Please read the following for a description of our operation and the explanation of the exemptions requested. Attached is the Crossfield F.O.M. (not for public view) and the user manuals for our proposed sUAS's.

The Operation; Public Benefit

Precision imaging though the use of a small, unmanned aerial vehicle to benefit several industries including mining, agriculture, and construction. Our expertise in the use of photogrammetry, LIDAR, infrared, and other imaging tools and combining those tools with powerful software will greatly benefit the public. This service will allow managers across the industry to make better informed decisions. Complex measuring, analyzing, and data collecting will greatly reduce the waste of resources. Adjusting watering rates, seeding rates, and chemical usage will assist farmers. Measuring mining and construction operations can benefit safety and efficiency.

Crossfield will utilize a F.O.M. (Flight Operation Manual) to guide all of its operations. The F.O.M. is attached, and it details the specific operational safety protocols we will use. The F.O.M. will be updated regularly as better processes are learned and new regulation is passed.

Crossfield's flight operations will be managed by a highly experienced and rated Airline Transport Pilot (A.T.P.), and the navigation and imaging systems will be managed by one of the nation's premier experts. Both have decades of experience in their relative fields, and will bring a lot of expertise and an enhanced safety culture to the operation. The professional use of UAS's will certainly benefit the public, as it will mean fewer larger, fuel carrying, higher noise footprint aircraft in the N.A.S.

The System

Crossfield is currently using, experienced with, and proposing to use the following two sUAS in a commercial capacity. Please refer to the user manuals and the F.O.M. for more detailed sUAS technical and operational information.

The following links will access the user manuals for the sUAS's:

f550_user_manual_v1.3_en.pdf

S1000_Plus_User_Manual_v1.2_en.pdf

DJI Flame Wheel 550

Wookong flight controller with GPS and attitude control

DJI Ground Station waypoint software with 2.4 GHz Ground station transmitter and 2.4 GHz data receiver

Frame Weight：478g

Diagonal Wheelbase：550mm

Takeoff Weight：1200g ~ 2400g

Propeller：8 inch and 10 inch

Battery：3S~4S LiPo

Motor：22 × 12mm (Stator size)

DJI Spreading Wings S100+

Diagonal Wheelbase: 1045mm

Frame Arm Length: 386mm

Frame Arm Weight (Including Motor, ESC, Propeller):325g

Center Frame Diameter: 337.5mm

Center Frame Weight (with Landing Gear Mounting Base, Servos): 1330g

Landing Gear Size: 460mm (Length) ×511mm (Width) ×305mm (Height), (Top width: 155 mm)

Foldable Propeller: High strength performance engineered plastics, Size 15×5.2inch

Flight Parameters: Takeoff Weight6.0Kg ~ 11.0Kg, Total Weight 4.2Kg

Power Battery: LiPo (6S、 10000mAh~20000mAh、 15C (Min), Max Power Consumption4000W

Hover Power Consumption: 1500W (@9.5Kg Takeoff Weight)

Hover Time: 15min (@15000mAh & 9.5Kg Takeoff Weight)

Working Environment Temperature-10 °C ~ +40 °C

Both Models feature autonomous control and manual control abilities. Both can be programmed to limit their altitudes, and to avoid airspace with lateral limitations They also feature the ability to automatically compensate for motor failures, and will automatically return to base for low battery situations and signal disruptions.

Both of these models have operational speeds and weights that are well in line with the FAA limitations (less than 25 pounds max with payload, around 40 knots max speed) and they have been previously approved on multiple occasions. Crossfield chose DGI as a manufacturer due to their industry leading expertise and experience. These models have thousands of hours of operational history behind them, and are inherently safer due to their having 6-8 rotors for redundancy, rigid construction, and light weight.

The Flight Management

Crossfield's flight operation will be managed by an experienced Airline Transport Pilot and certified Flight Instructor (M.E.I.I.) His qualifications include over 10,000 hours of mostly commercial aircraft operations and he is currently a Captain at an airline that is renowned for its safety culture. He holds a Flight Instructor certificate with instrument and multiengine ratings, and has been an I.O.E. pilot for FAA part 135 operations. His extensive experience started with a B.S. degree in Aviation Operations, the operating of a flight school, and an accumulation of ratings and type ratings in several aircraft through careers in everything from freight to corporate aviation.

The intent of Crossfield is to use our unique aviation qualifications to enhance the safety culture of flying UAV's in the N.A.S., by bridging the gap between drone operators on the ground, and manned aircraft above. We believe that years of operating aircraft backed by all of the scientific research that create safety protocols, and having a thorough understanding of the complexities of the airspace system will benefit our operation.

Our pilots will be highly trained, will practice emergency procedures regularly, and will always have the safety of the public as the primary concern.

Exemptions requested

14CFR 61.23(a)
14CFR 61.101(e)(4)&(5)
14CFR 61.113(a)
14CFR 61.315(a)
14CFR 91.7(a)
14CFR 91.119(c)
14CFR 91.121
14CFR 91.151(b)
14CFR 91.203(a)&(b)
14CFR 91.401-417

Reasons for requesting the above exemptions

61.23(a)

The P.I.C. may have a valid U.S. driver's license in lieu of a medical certificate. This is per FAA guidance. As the sUAS can land itself the physical integrity of the PIC is not as important as that of a manned aircraft. Also, redundancy in the form of a visual observer will certainly add to safety. See previous Exemption No. 11343.

61.101(e) (4)&(5)

Recreational pilot limitations are not being applied to the use of sUAS. Though Crossfield's flight operations are managed by an A.T.P., we also request the ability to utilize recreational pilots. They will be held to the same training standards, as dictated by the F.O.M.See previous Exemption No 11343.

61.113(a)

The petitioner requests relief in order to facilitate the utilization of pilots who hold a private pilot certificate. Any pilots operating under this exemption would be required to comply with any conditions as set forth and in a similar fashion to the previously granted exemptions; it must also be noted that the aircraft carries no people, is flown over a controlled environment, and that a training program exists along with operational guidelines. See Exemption No. 11213

61.315(a)

Sport pilot limitations on commercial activity are not being applied to sUAS. . Though Crossfield's flight operations are managed by an A.T.P., we also request the ability to utilize sport pilots. They will be held to the same training standards, as dictated by the F.O.M. See previous Exemption No 11407

91.7(a)

The sUAS will be operated only when it has been deemed airworthy in accordance with the F.O.M. and manufacturer's manuals; however it will not be assigned an airworthiness certificate. Therefore, relief is needed. See Exemption Nos. 11062, 11063, 11064, 11065 etc.

91.119(c)

As discussed in Exemption 11138 (DOUGLAS TRUDEAU), operations conducted closer than 500 feet to the ground may require that the UA be operated closer than 500 feet to essential persons, or objects that would not be possible without additional relief. The petitioner requests modification, waiver or exemption and clarification concerning the terms "congested areas" and "densely populated". The Petitioner requests waiver for this condition to allow reasonable and responsible operations near persons or property as needed. It should be noted that due to the small weight, controlled area of operation, lower speeds, computer backup, and lack of flammable fluids the sUAS is inherently safer than equivalent manned aircraft.

91.121

As discussed in Exemption 11138 (DOUGLAS TRUDEAU) It is inapplicable since the UAS does not have an altimeter and instead utilizes electronic GPS with a barometric sensor for altitude information. The altitude has been proven accurate, and limits will be programmed (fencing) into the controller.

91.151(b)

Due to the small size and the confined areas the sUAS will be operated, the risks associated with them are far less than manned aircraft. The shorter duration of flight of sUAS also makes adherence to 91.151(b) impossible. As per our F.O.M., however, a strict adherence to a 5 minute reserve will be followed, or longer if required by the manufacturer. Safety is enhanced too, with auto returning software

programmed into the controller when battery conditions warrant. See exemptions Nos. 8811, 10808, 10673, etc.

91.203 (a) & (b)

The sUAS fully loaded weigh less than 55 lbs. As such, there is no ability or place to carry certification and registration documents or to display them on the sUAS. In addition, there is no pilot on board the aircraft. An equivalent level of safety will be achieved by keeping these documents at the ground control point where the pilot flying the sUAS will have immediate access to them, as detailed in the F.O.M. The FAA has issued numerous exemptions to this regulation. A representative sample of other exceptions includes Exemption Nos. 9565, 9665, 9789, 9789A, 9797, 9797A, 9816A, and 10700.

91.405(a); 91.407(a)(1); 91.409 (a)(1) & (2); 91.417(a) & (b)

As discussed in Exemption 11138 (DOUGLAS TRUDEAU), the operator will perform all maintenance as specified in the F.O.M., or it will be carried out by the manufacturer. This will be done in accordance with the manufacturer's recommendations, and records will be maintained of all maintenance performed. Crossfield will actively engage in risk mitigation, and believes our own protocols when coupled with the manufacturers will equate to a level of safety required in CFR 91. This, along with the nature of the flight over controlled areas, with a small vehicle, and the ability to land quickly when a malfunction occurs should benefit safety as a whole.

Attention:

*****We are not seeking a waiver on FAR45.23 as it is understood from previously approved exemptions that the registration numbers will be as large as practicable.**

*****We are not seeking a waiver on FAR91.9(b)(2) as it is understood from previously approved exemptions that the required manuals may be located in the vicinity of the PIC, not onboard the aircraft.**

Federal registry summary

Mr. Daniel Kruetzfeldt, Airline Transport Pilot, Crossfield LLC, 18475 Lambert Lake Rd., Sonora, Ca, petitioned the FAA on behalf of Crossfield LLC for an exemption from part 61.23(a), 61.101(e)(4)&(5), 61.113(a) ,61.315(a) 91.7(a), 91.119(c), 91.121, 91.151(b), 91.203(a) and (b), 91.405(a), 91.407(a)(1), 91.409(a)(1)&(2), 91.417(a) and (b) of Title 14, Code of the Federal Regulations (14 CFR). The exemption would allow commercial operation of the DJI 550 and DJI S1000+ small Unmanned Aircraft Systems (sUAS) for precision aerial surveys.

International Authorization

Crossfield wishes to extend the exemption privileges to include international operations. Specifically, we wish to include the ability to operate within the countries of Canada and Mexico.

These requested areas will enable Crossfield to operate into known, identified markets that will equally benefit from our operation. Our intended type of operation in the agricultural, commercial, and mining operations is not confined to country borders. Several companies we intend to work with have multiple locations throughout North America. Crossfield will, of course, work with the controlling agencies to ensure compliance with local regulation. Securing the necessary requirements initially will allow unencumbered operations for Crossfield. Should approval for international operations slow or otherwise encumber the approval of our 333, we respectfully request that domestic approval takes precedence and that the international requirements are dealt with at a later date.

Summary

The inclusion of sUAS into the N.A.S. should be done in a methodical, professional manner to protect persons on the ground and in the air. This can only be accomplished when the operators are intimately familiar with the complexities and hazards presented when operating an aircraft. Crossfield not only promises to safeguard the public during this critical implementation of sUAS into the FAA system, but we intend to enhance the level of training and knowledge that currently exists in the field.

Our Unique combination of aviation and technical system expertise will benefit the public with a safe, useful product. The reduction of necessary manned aircraft flights to collect imagery from above will provide a cost benefit, safety benefit, and noise impact reduction benefit.

Appendix A***

*****Please do not publish in the public forum. The following is proprietary information. Please protect from release under the Freedom of Information act 5 U.S.C. 552 et.seq. Thank you.**

Crossfield, L.L.C. Small Unmanned Aerial System Flight Operations Manual

Section 1) General

Section2) Flight Crew Maintenance and Qualifications

Section 3) Preflight

Section 4) Normal Operations/Operating limitations

Section 5) Abnormal/Emergency Procedures

Section 6) Maintenance

Section 1) General

The following F.O.M. specifies the operating policies, procedures, and practices to be used by Crossfield, LLC during all S.U.A.V. commercial operations and training flights. The Crossfield F.O.M. will comply with the following guidelines:

1) The following rules are in addition to all applicable F.A.R.'s, and local and state regulations.
2) Where any regulation, local, or state guideline is more restrictive, the more restrictive regulation will be controlling.
3) Aircraft limitations that are more restrictive than the F.O.M. will apply.
4) The F.O.M. will be updated as new and better practices are discovered, and new regulations become effective.
5) A copy of the F.O.M. will be kept in the immediate vicinity of the P.I.C. during all commercial and training flights.
6) Crossfield LLC will make available the F.O.M upon request by any controlling agency including law enforcement officials and the FAA.

The Purpose of the Crossfield F.O.M. is to set forth the guidelines that will ensure all flight operations place the utmost importance on public safety. Public safety will always be the paramount consideration in all operations. The protection of property and the insurance of public confidence in the safety of our operations are also of prime consideration.

Section 2) Flight crew maintenance and qualifications

1) The PIC must hold either an airline transport, commercial, private, recreational, or sport pilot certificate.

2) The PIC must 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.

3) The PIC must 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.

4) 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. 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.

5) 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, including evasive and emergency maneuvers and maintaining appropriate distances from persons, vessels, vehicles and structures.

6) The PIC will have logged a minimum of 10 hrs of experience with UAV's prior to operating in a commercial environment.

Section 3) Preflight

1) The aircraft will be thoroughly checked prior to any flight. The check will include, but not be limited to:

a) 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.

b) Condition of rotors ensuring no cracks, nicks, excessive abrasion, and security.

c) Security of all mounted sensory equipment. All equipment will have a secondary mounting to prevent separation during flight. This can be in the form of a cable or other means that adequately supports the weight of the sensor should the main mounting system fail.

d) Security of all aircraft components to prevent load shift and or possible failure.

e) The operator must follow the UAS manufacturers; maintenance, overhaul, replacement, inspection, and life limit requirements for the aircraft and aircraft components.

f) 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. 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.

g) 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.

h) Each UAS operated must comply with all manufacturer safety bulletins.

2) The operating area will be evaluated and secured by the following means:

a) Reasonable precautions will be made to protect people and property under the flight path.

b) Current FAA charts will be referenced to check for all restricted and special use airspace prior to any flight. Permission from the controlling agency will be acquired prior to flying.

c) Current NOTAMs will be checked prior to each flight.

d) A manual test flight will be conducted at each operational location to evaluate actual weather conditions, equipment functionality, and frequency security.

e) A visual inspection of all areas to be flown to check for, at a minimum: Schools, airports, heliports, open assemblies of people, power lines, towers, etc.

f) 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.

g) 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.

h) The designated takeoff and landing area will be clearly marked and secured to within a 20' radius of the UAS.

Section 4) Normal Operations/Operating limitations

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

2) 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.

3) 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.

4) 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.

5) 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.

6) The PIC will be as visible as possible to the public. He/she will be readily identifiable as the operator of the UA.

7) 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.

8) 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.

9) The UA will not be operated within 1,000' of an active school or an open air assembly of people not affiliated with the operation.

10) Operations within 2 miles of a heliport, seaplane base, or private runway will coordinate such activities with the owner or operator of such facilities.

11) Operations within the lateral boundaries of class B and C airspace, and within 30n.m of a class B airport will get authorization from the controlling A.T.C. (see FAR 91.215) for flights without an approved transponder.

12) Air Traffic Organization (ATO) Certificate of Waiver or Authorization (COA). All operations shall be conducted in accordance with an ATO-issued COA. The operator 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.

13) 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.

14) 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.

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

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

17) All Flight operations must be conducted at least 500 feet from all nonparticipating persons, vessels, vehicles, and structures unless: 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.

Section 5) Weather Limitations

1) 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.

2) 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.

3) The UA will not be operated when weather conditions prevent the UA from being able to return to base with a minimum of 20kts ground speed.

4) The UA will not be operated with more than a 10 knot wind gust.

5) The UA will not be operated in visible moisture or active precipitation.

Section 5) Emergency/Abnormal Operations

1) If the UAS loses communications or loses its GPS signal, the UA will be programmed to return to a pre-determined location within the private or controlled-access property.

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

3) 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

4) The PIC will practice emergency procedures each calendar month. Procedures for evading manned aircraft, assuming manual control, automatic return to base, and equipment failure scenarios will be practiced.

5) The PIC will execute an immediate vertical descent if a manned aircraft of any type encroaches on the vicinity of the UA.

Section 6) Maintenance

The UV will be kept in a safe, airworthy condition. The operator may replace parts, but the parts themselves will be repaired or supplied by the manufacturer. The following will always apply:

1) The UA will be inspected prior to each flight.
2) The UA will have a thourough inspection every 10 Hrs. flight time which will include:
a) Battery condition inspection.
b) Full control functionality check.
c) Lights
d) Emergency programming checks
e) Rotor inspection
f) Overall structural condition
3) Any other inspection as required by the manufacturer's manual.
4) The Inspections will be recorded, and all maintenance performed will be documented including the date, item effected, and maintenance performed.