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

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

August 12, 2015

Exemption No. 12444
Regulatory Docket No. FAA–2015–1236

Mr. Hanns Mercer, P.E.
Project Engineer
EnTech, Inc.
1949 Sugarland Drive, Suite 205
Sheridan, WY 82801

Dear Mr. Mercer:

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 16, 2015, you petitioned the Federal Aviation Administration (FAA) on behalf of EnTech, Inc. (hereinafter petitioner or operator) for an exemption. The petitioner requested to operate an unmanned aircraft system (UAS) to conduct aerial surveying and inspections.

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 Draganfly X4-ES.

The petitioner requested relief from 14 CFR part 21, *Certification procedures for products and parts, Subpart H—Airworthiness Certificates*. In accordance with the statutory criteria provided in Section 333 of Public Law 112−95 in reference to 49 U.S.C. § 44704, and in

consideration of the size, weight, speed, and limited operating area associated with the aircraft and its operation, the Secretary of Transportation has determined that this aircraft meets the conditions of Section 333. Therefore, the FAA finds that the requested relief from 14 CFR part 21, *Certification procedures for products and parts, Subpart H—Airworthiness Certificates,* and any associated noise certification and testing requirements of part 36, is not necessary.

The Basis for Our Decision

You have requested to use a UAS for aerial data collection[1]. The FAA has issued grants of exemption in circumstances similar in all material respects to those presented in your petition. In Grants of Exemption Nos. 11062 to Astraeus Aerial (*see* Docket No. FAA−2014−0352), 11109 to Clayco, Inc. (*see* Docket No. FAA−2014−0507), 11112 to VDOS Global, LLC (*see* Docket No. FAA−2014−0382), and 11213 to Aeryon Labs, Inc. (*see* Docket No. FAA−2014−0642), the FAA found that the enhanced safety achieved using an unmanned aircraft (UA) with the specifications described by the petitioner and carrying no passengers or crew, rather than a manned aircraft of significantly greater proportions, carrying crew in addition to flammable fuel, gives the FAA good cause to find that the UAS operation enabled by this exemption is in the public interest.

Having reviewed your reasons for requesting an exemption, I find that—

- They are similar in all material respects to relief previously requested in Grant of Exemption Nos. 11062, 11109, 11112, and 11213;
- The reasons stated by the FAA for granting Exemption Nos. 11062, 11109, 11112, and 11213 also apply to the situation you present; and
- A grant of exemption is in the public interest.

Our Decision

In consideration of the foregoing, I find that a grant of exemption is in the public interest. Therefore, pursuant to the authority contained in 49 U.S.C. 106(f), 40113, and 44701, delegated to me by the Administrator, EnTech, 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.

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

Conditions and Limitations

In this grant of exemption, EnTech, Inc. 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 Draganfly X4-ES 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

EnTech Inc.
Professional Engineers and Land Surveyors

Transportation
Municipal
Environmental
Water Resources
Land Surveying

April 16, 2015

Petition for Exemption under §333 of the FAA Modernization and Reform Act of 2012

Mr. Anthony Foxx
United States Secretary of Transportation
1200 New Jersey Ave, SE
Washington DC, 20590

Re: Exemption Request under §333 of the FAA Modernization and Reform Act of 2012 (Public Law 112-95) from 14 CFR 21; 14 CFR 36, 45.23; 45.27, 45.29; 61.113; 91.7; 91.9(b)(2); 91.103(b); 91.109; 91.119(c); 91.151(a); 91.203(a)&(b); 91.405(a); 91.407(a)(1); 91.409(a)(2); 91.417(a)&(b)

Dear Mr. Secretary,

In accordance with §333(c) of the Federal Aviation Administration (FAA) Modernization and Reform Act of 2012, EnTech, Inc. is requesting permission to use its Draganfly X4-ES Unmanned Aircraft System (UAS) to perform operations involving surveying and inspections of properties owned by both public and private entities for the use in civil engineering planning and design solutions. This letter contains the documentation pertaining to the waiver requests as per 14 CFR Part 11 and how these exemptions are in the best interest of public safety.

EnTech is committed to obtaining a level of safety at or above the current regulations. EnTech has developed a UAS Flight Operations Manual and has detailed the operating system of the proposed UAS filed with this exemption, both of which are included within this request.

Public safety is the primary concern of EnTech. Utilizing the remote use of the Dragonfly X4-ES, public and personal safety will be heightened and the safety risks involved with the current practice will be reduced. The UAS will allow a faster and safer approach to engineering inspections and solutions with safe and efficient flights made possible with unmanned surveying and inspections. EnTech will utilize the expertise of existing personnel within the company with decades of experience flying radio controlled aircraft. EnTech will be responsible for ensuring compliance with applicable FAA regulations in relation to UAS operations, with public safety being of the utmost concern.

Performing aerial inspections and surveys utilizing a UAS has many beneficial uses to public safety and can be utilized in many different applications. Some of the beneficial uses that are in the best interest of public safety include search and rescue, natural disaster surveillance, power line inspections after storms, agricultural application surveys, and other efficient, non-invasive surveys or videography to reduce the exposure and time required for traditional inspections and surveys.

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Hazards such as downed power lines, flooding, broken or damaged pipelines and bridges, forest fires and avalanches oftentimes are located in areas where terrain is inaccessible or difficult to access safely, or simply too dangerous for foot travel. Field inspections leave employees vulnerable to environmental hazards such as snow and ice accumulation, stream crossings, seasonal water runoff, felled trees, downed power lines and blocked paths; biological hazards such as poison ivy, snakes, and natural predators; and extreme temperature changes which may cause altitude sickness, heat stroke or frost bite. The utilization of our UAS will ensure access to these areas while minimizing risk of serious injury or issue to personnel assigned to conduct these inspections, as well as a more cost-effective and timely analysis of any such events that the UAS may be deemed useful to complete such tasks. Local emergency entities will be briefed on the nature of intent of EnTech's and the UAS's capabilities which could be made available as a possible resource option.

Costs will be reduced and timelines will gain efficiency with the use of a UAS. Most applications of a traditional inspection or survey would include multiple personnel and vehicles to complete the task. The use of the UAS will minimize the planning, engineering and design of gaining the access and data to make informed decisions and generate solutions, while minimizing possible lost time of employees due to sickness or injury being sustained in a hazardous situation.

As a hobbyist in radio control aircraft since 1992 and a member of the Academy of Model Aeronautics (AMA), I respect the importance of complying with current and future regulations imposed by the FAA and hereby request an exemption in accordance with Section 333 of the FAA Modernization and Reform Act of 2012. If you have any questions or need additional information, please feel free to contact me at (307) 751-9106 or hwm@entechusa.net.

Respectfully,

Hanns Mercer

Hanns Mercer, P.E.
Project Engineer

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Petition for Exemption under §333 of the FAA Modernization and Reform Act of 2012

EnTech, Inc., requests an exemption under Section 333 of the FAA Modernization and Reform Act of 2012 for commercial flight of its Draganfly X4-ES UAS. EnTech, Inc. provides civil engineering consulting, surveying and inspection services to private and government entities. EnTech will primarily use this UAS for general land surveying and aerial photography to aid in the design and implementation of solutions based in the civil engineering field. EnTech would also expect to utilize the UAS in future operations which may consist of: (1) agricultural operations; (2) forest and wildlife conservation; (3) aerial surveying; (4) patrolling (pipelines, power lines & natural gas fields); and (5) any other operation specified by the FAA. Proposed operations will be performed in full compliance with aviation safety regulations, maintained at or below 400 feet AGL and in Line-of-sight with the Pilot-in-Command (PIC). As per 14 CFR §11.81, this petition for exemption is prepared and filed in accordance with regulation to request exemptions from the Federal Aviation Regulations (FAR's) pertaining to operation of a UAS so that operations can be commercially completed in accordance to all applicable FARs that would pertain to a small UAS. Specifically, 14 CFR §11.81 states:

> *"You must include the following information in your petition for an exemption and submit it to FAA as soon as you know you need an exemption.*
>
> *(a) Your name and mailing address and, if you wish, other contact information such as a fax number, telephone number, or e-mail address;*
>
> *(b) The specific section or sections of 14 CFR from which you seek an exemption;*
>
> *(c) The extent of relief you seek, and the reason you seek the relief;*
>
> *(d) The reasons why granting your request would be in the public interest; that is, how it would benefit the public as a whole;*
>
> *(e) The reasons why granting the exemption would not adversely affect safety, or how the exemption would provide a level of safety at least equal to that provided by the rule from which you seek the exemption;*
>
> *(f) A summary we can publish in the FEDERAL REGISTER, stating:*
>
> *(1) The rule from which you seek the exemption; and*
>
> *(2) A brief description of the nature of the exemption you seek;*
>
> *(g) Any additional information, views or arguments available to support your request; and*
>
> *(h) If you want to exercise the privileges of your exemption outside the United States, the reason why you need to do so."*

14 CFR §11.81, EnTech, Inc. submits the following information:

(a) Name and mailing address

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Sheridan, Wyoming 82801
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(b) The specific section or sections of 14 CFR from which exemption is sought:

- 14 CFR Part 21, Airworthiness Certificates
- 14 CFR 36, Noise Certification
- 14 CFR 45.23, 45.27, Aircraft Marking & Certification and Registration
- 14 CFR 45.29, Size Requirements
- 14 CFR 61.113, Pilot in Command
- 14 CFR 91.7, Civil aircraft airworthiness
- 14 CFR 91.9, Document/Flight Manuals
- 14 CFR 91.103, Preflight action
- 14 CFR 91.109, Flight Instruction
- 14 CFR 91.119(c) Minimum safe altitude
- 14 CFR 91.151, Fuel requirements for VFR flight
- 14 CFR 91.203, Civil Aircraft: Certifications required
- 14 CFR 91.405 (a); 407 (a) (1); 409 (a); 417 (a) & (b) Maintenance and Maintenance inspection

(b) The extent of relief sought is for the duration of the Grant of Exemption, unless otherwise specified. The reason to seek the relief is as follows:

I. 14 CFR 21

The proposed UAS to be utilized is well under 55 lbs weighing at the maximum payload range and weighing approximately 5.5 lbs when outfitted with all equipment and batteries. There are no flammable liquids or other hazardous materials that would propose a danger to the public. The maximum speed is 30 mph. The PIC will maintain VFR (Visual Flight Rules) and operate the UAS during the day, at or below 400 feet AGL and in line-of-sight so as not to create a hazard to users of the National Airspace System or the public.

II. 14 CFR 36

EnTech, Inc. requests relief from any associated noise certification and testing requirements of Part 36. As a note, according to the manufacturer's specifications, the UAS operates below 62db within 3 meters.

III. 14 CFR 45.23, 45.27

The UAS does not currently display marks consisting of the Roman capital letter "N" followed by the registration number of the aircraft in compliance with 14 CFR 45.23 and 14 CFR 45.27. EnTech will register the UAS with the FAA and ensure the UAS is marked as appropriate for use in the NAS for commercial purposes.

IV. 14 CFR 45.29

Relief is requested from the size requirements under this section due to the size limitations of the UAS. We propose to use marks as large as possible on the UAS as well as keep registration information with the PIC during operations on the ground.

V. 14 CFR 61.113

EnTech, Inc. employees currently do not have commercial pilot licenses and therefore request relief from 14 CFR part 61.113. The flight is only incidental to this business; and the aircraft does not carry passengers or property for compensation. To reach an equivalent level of safety, the self-imposed experience and training requirements of the Pilot in Command (PIC) would more than offset any risk introduced by using private pilots to fly an unmanned aircraft in very restricted and controlled areas.

VI. 14 CFR 91.7

Assuming no airworthiness certificate will be required due to relief from Subpart H, no regulatory standard exists for determining airworthiness. The equivalent level of safety will be achieved through the employment of flight manual and maintenance manual procedures, pilot training and analytical risk management for each event.

VII. 14 CFR 91.9

Relevant materials shall be kept in a location accessible to the PIC in compliance with the regulations.

VIII. 14 CFR 91.103

This regulation dictates that a pilot conduct preflight activities. Without an FAA approved flight manual, relief is required from this regulation. Extensive pre-flight planning will provide an equivalent level of safety by using the operations plan, aircraft flight manual, maintenance manual and available weather and NOTAM information. The PIC will follow all other applicable pre-flight procedures including reviewing weather, flight battery requirements, landings, and takeoff distances and aircraft performance data before initiation of flight.

IX. 14 CFR 91.109

The Draganfly X4-ES has no onboard flight controls. An equivalent level of safety will be accomplished by conducting pilot training via the control system that communicates with the aircraft from the ground. EnTech intends to conduct this training at the radio control aircraft airport site under controlled conditions.

X. 14 CFR 91.119(c)

EnTech, Inc. requests relief from this section because the UAS will be operated below 400 feet AGL. The PIC will ensure the UAS is operated in controlled environments, as well as obtaining and assessing information regarding congested areas from the local Flight Standards District Office (FSDO) and avoiding areas of congestion. We feel that an acceptable level of safety can be achieved. Extensive range testing and additional on-site testing in a controlled environment would be conducted in real time conditions. The light-weight UAS being proposed for use in this activity, along with its precise guidance and redundant systems, create an entirely different paradigm that should be considered by regulatory bodies.

XI. 14 CFR 91.151

EnTech, Inc. requests exemption from this section due to the maximum flight time available from this UAS. The UAS total flight time is limited to 20 minutes and therefore the PIC would not be able to meet the minimum standards and still conduct the inspections. The UAS is equipped with a visual battery indicator that displays the battery levels at all time. Additionally, the UAS has a visual alarm that indicates when the battery reaches a state of 20% battery life, or approximately 4 minutes of flight time. These indicators, coupled with pilot awareness and the emergency "Return to Home" setting, will supply ample time to land the UAS safely in the event of low battery.

XII. 14 CFR 91.203

EnTech, Inc. requests relief from 14 CFR 91.203, as the appropriate airworthiness certificate does not exist for this UAS. Additionally, the certificate cannot be displayed in the aircraft due to the size and physical structure of the UAS.

XIII. 14 CFR 91.405(a), 407(a)(1), 409(a), 417(a)(b)

EnTech, Inc. requests relief from these sections of 14 CFR 91.405, 407, 409, and 417. The above-cited regulations require, in general, aircraft owners and operators to inspect the aircraft "...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." These regulations apply to aircraft with an Airworthiness Certificate. Therefore, these sections are not applicable to this UAS. Operators will adhere to requirements located within the operations manual. These FARs only concern aircraft with an airworthiness certificate and therefore would not apply in this situation. All maintenance and inspections will be conducted within the maintenance manual and operations manual.

(d) The reasons why granting this request would be in the public interest; that is, how it would benefit the public as a whole.

Personnel Safety

Performing aerial inspections and surveys utilizing a UAS has many beneficial uses to public safety and can be utilized in many different applications. Some of the beneficial uses that are in the best interest of public safety include: search and rescue, natural disaster surveillance, power line inspections after storms, agricultural application surveys, and other fast non-invasive surveys or videography to reduce the exposure and time required for traditional inspections and surveys of such matters.

Hazards such as downed power lines, flooding, broken or damaged pipelines and bridges, forest fires and avalanches oftentimes are located in areas where terrain is inaccessible or difficult to access safely, or simply too dangerous for foot travel. Field inspections leave employees vulnerable to environmental hazards such as snow and ice accumulation, stream crossings, seasonal water runoff, felled trees, downed power lines and blocked paths; biological hazards, such as poison ivy, snakes, and natural predators; and extreme temperature changes which may cause altitude sickness, heat stroke or frost bite. The utilization of our UAS will ensure access to these areas while minimizing risk of serious injury or issue to personnel assigned to conduct these inspections, as well as a more cost-effective and timely analysis of any such events that the UAS may be deemed useful to complete such tasks. Local emergency entities will be briefed on the nature of intent of EnTech's and the UAS's capabilities which could be made available for a possible resource option.

Cost-Effectiveness

Costs will be reduced and timelines will gain efficiency with the use of a UAS. Most applications of a traditional inspection or survey would include multiple personnel and vehicles to complete the task. The use of the UAS will minimize the planning, engineering and design of gaining the access and data to make informed decisions and generate solutions, while minimizing possible lost time of employees due to sickness or injury being sustained in a hazardous situation.

(e) The reasons why granting the exemption would not adversely affect safety, or how the exemption would provide a level of safety at least equal to that provided by the rule from which the exemption is sought.

The UAS consists of a lightweight, battery powered multirotor craft, a personal computer-based ground control station, and associated communications equipment. The multirotor craft's length is 36", its width is 36" and it has a height of 12.6", which can operate at a maximum speed of about 30 mph. The Draganfly X4-ES is controlled from a 2-way 900 MHz data link frequency which sends controls to the UAS and also receives data, such as battery level alarms back to the PIC. This frequency is a DSSS (Direct Sequence Spread Spectrum) transmission. These have been proven to be reliable

and not accept interference from other frequencies. The UAS is equipped with a visual battery indicator that displays the battery levels at all times. Pilots are trained to monitor the battery indication lights during flights. Additionally, the UAS has a visual alarm that indicates when the battery reaches a state of 20% battery life, or approximately 4 minutes of flight time. The UAS consists of a semi-autonomous flight mode. The aircraft will be operated with both a PIC and a ground-based Visual Observer (VO) in accordance with FAA Policy N 8900.227 Section 14, Operational Requirements for UAS. All flights will occur at no more than 400 feet AGL; operations will be conducted in a professional and controlled manner and in line of sight (LOS) of the PIC. The UAS has a Sony RX100 III zoom camera which downloads real time data via a 5.8 GHz link to the ground control station. All applicable regulations set forth by the Federal Communications Commission (FCC) will be adhered to by the PIC. This UAS has 11 onboard sensors including gyros, accelerometers, magnetoresistive, barometric and GPS sensors.

Flight operations will be limited to daytime hours with at least a 500' cloud ceiling and a 1 mile flight visibility requirement. Visual meteorological conditions and the aircraft will remain within visual line of sight of the PIC at all times. The PIC will complete the proper training and exercises at a controlled field before performing client based flight patterns.

This exemption will provide a greater level of safety to that provided by the rule from which the exemption is sought due to the current nature of conducting inspections. Because UAS flights are not currently authorized for commercial use, the small size, extreme maneuverability and zoom capabilities on the camera together allow for a safe, unimpeded inspection of critical infrastructure assets. Conducting safe inspections and land surveys are in the public interest, provide a safer alternative, and produce more accurate data for engineering evaluation.

(f) Summary to publish in the Federal Register

I. The rule from which exemption is sought

EnTech, Inc. seeks exemption under §333 of the FAA Modernization and Reform Act of 2012 (Public Law 112-95) from 14 CFR 21; 14 CFR 36, 45.23; 45.27, 45.29; 61.113; 91.7; 91.9(b) (2); 91.103(b); 91.109; 91.119(c); 91.151(a); 91.203(a)&(b); 91.405(a); 91.407(a) (1); 91.409(a) (2); 91.417(a)&(b)

II. A brief description of the nature of the exemption sought

EnTech, Inc. requests an exemption under Section 333 of the FAA Modernization and Reform Act of 2012 for commercial flight of its Draganfly X4-ES UAS. EnTech, Inc. provides civil engineering consulting, surveying and inspection services to private and government entities. EnTech will primarily use this UAS for general land surveying and aerial photography to aid in the design and implementation of solutions based in the civil engineering field. EnTech would also expect to utilize the UAS in program operations which consist of: (1) agricultural operations; (2) forest and wildlife conservation; (3) aerial surveying; (4) patrolling (pipelines, power lines & natural gas fields); and (5) any other operation specified by the FAA. Proposed operations will be performed in full

compliance with aviation safety regulations, maintained at or below 400 feet AGL and in line-of-sight with the Pilot-in-Command (PIC). As per 14 CFR §11.81, this petition for exemption is prepared and filed in accordance with regulation to request exemptions from the FAA regulations pertaining to operation of a UAS so that operations can be commercially completed in accordance to all applicable FARs that would pertain to a small

(g) Any additional information, views or arguments available to support request

EnTech, Inc. respectfully submits these exemptions as our means to continuously produce quality engineering solutions utilizing the safest and most economical means possible to the community. The use of the UAS will promote a safer environment as a possible substitution to traditional methods used in the engineering field. Not only will the UAS provide a better workplace for our employees, it will also amass extensive data and video to be reviewed uncountable times by professionals to improve and protect vital infrastructure and prevent any unnecessary environmental and personal safety issues. I look forward to striving to meet and exceed the FAA regulations set forth in the upcoming small UAS rules in the near future.

(h) Request to exercise the privileges of this exemption outside the United States

We do not request to exercise the privileges of this exemption outside the United States.

Respectfully submitted,

Hanns Mercer, P.E.
Project Engineer
EnTech, Inc.
1949 Sugarland Dr. Ste: 205
Sheridan, Wyoming 82801
P: (307) 673-1542 Ext. 28

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FLIGHT OPERATIONS MANUAL

Area & Environment

- **Hazards / Site Selection**
  - Check for wires / cables
  - Animals
  - People / bystanders
  - Property in the vicinity
  - Site is away from nonessential participants
  - Ability to maintain adequate buffer zones between aircraft and personnel;
  - Minimize departures and landings over populated areas
  - Take into account local topography, ensuring a visible line of sight towards the UAS at all times. Ensure the telemetry connection is not obstructed.
  - Investigate potential alternative landing sites in case take-off site is obstructed.
- **Psychological consideration** (are you well rested, rushed, are you being pressured by client)
- **Weather considerations**
  - Temperature
  - Visibility
  - Precipitation
- **Wind Speed**
  - Upper winds / at altitude
  - Rotor (lee side of large objects)
- **Notify** any bystanders or nearby property owners of your intentions (permission)
- **Discuss flight plan** with your co-pilot or spotter
- **If flying in controlled airspace, have you notified airspace authority**
  - NOTAMs
  - Can you reach authorities
  - Do you need to maintain communication?
- **First Aid Kit** stocked, readily accessible and visible to anyone in the area.

UAS Equipment

- Walk-around
- Crack in joints and structural members
- Loose or damaged screws, ties, fasteners, straps
- Loose or damaged wiring
- Loose or damaged connections (solder, plugs, etc.)
- Inspect prop mounts and screws and apply slight counter pressure on arms to check for loosened components
- FPV , inspect / clean FPV (Camera) Lens and insure it is secured and connects are firmly attached
- Camera settings are correct (still images, video, framerate)

- Battery / Batteries are fully charged, properly seated and Secured
- Fail-safe equipment functioning
  - RTH (return to home)
  - Firmware Airport Proximity Detection Functioning
- Props are smooth and free of damage / defect (check blade, surface and hub)
- Prop adapters are tight / secure
- Ensure voltage alarm is connected
- Ensure arming / idle timeout is properly configured
- Correct model is selected in transmitter (if applicable)
- Check RC transmitter shows the right range and centering for all sticks
- Perform range test

Mission Plan

- All actions and contingencies for the mission planned.
- Contingency planning should include safe routes in the event of a system failure, degraded performance, or lost communication link, if such a failsafe exists.
- Mission plans and flight plans should be shared with other operators in the vicinity.

Public Awareness

- Be courteous and polite
- You are an ambassador and your actions will affect other pilots and the industry in general
- Be professional / appear professional

Pre-Flight/Run-Up

- Verifying all transmitter, on-board aircraft and camera batteries are fully charged; (confirm voltages)
- Ensure no frequency conflicts with both video and transmitter / receiver
- Checking all control surfaces for signs of damage, loose hinges, and overall condition; Looking over the wing/rotors to ensure they are in good structural condition and properly secured;
- Check motor/engine and mounting attached to the airframe;
- Study propellers / mounting hardware (tight) / rotor blades for chips and deformation;
- Check the landing gear for damage and function
- Test electrical connections, plugged in and secure
- Ensure photo / video equipment mounting system is secure and operational.
- Check location of GPS equipment controlling the autopilot.
- Check the IMU movements in the ground control software.
- UAS in stabilization mode, ensure control surfaces move towards the correct positions
- UAS / Drone is in a level location safe for takeoff
- FPV / Power up ground station

- FPV / Power up Video receiver
- If using Video recorder turn on camera system
- Camera settings are correct (still images, video, framerate)
- SD camera memory clear and inserted into the camera
- Action / Start filming
- All transmitter controls move freely in all directions
- All transmitter trims in neutral position
- All transmitter switches in correct position(typically away)
- Transmitter throttle to zero
- Radio transmitter on
- Connect / power on battery to airframe
- Ensure led indicators and audible tones are correct
- Timer on (if applicable)
- FPV, confirm video is in monitor / goggles
- Scan for nearby cars / people / animals
- Say "CLEAR!"
- Arm flight controller
- Increase throttle slightly listening for any abnormalities
- Short 20-30 second hover at 3-5 feet (listen for vibrations / loose items)
- Confirm Voltage levels are correct

In-Flight

- Basics: If flying manually, always keep your fingers on the controller/transmitter.
- Never let the UAS out of your sight even for a second.
- Climb to a safe altitude away from potential hazards and to reduce noise pollution.
- Keep aircraft at a safe operating distance from people, electric utility lines and buildings.
- If the UAS must be flown over buildings or people, use a lightweight UAS and maintain a safe altitude for recovery and make every effort to minimize exposure.
- Spotter: Use a spotter whenever possible and appropriate.
- Do not fly UASs within distance defined by local laws of any private/commercial airport/helipad
- Do not fly around a pre-existing UAS flying site without a frequency-management agreement.
- Do not interfere with operations and traffic patterns at any airport
- Landing: Regardless of whether of a manual or automated UAS landing, scan landing area for potential obstruction hazards.
- Announce out loud "Preparing to Land".
- Carefully land the aircraft away from obstructions and people.

Post-Flight

- Shutting Down: Turn the power off to the aircraft and/or disconnect the batteries.
- Turn off the transmitter.
- Turn the power off to the photo equipment.
- Visually check aircraft for signs of damage and/or excessive wear.
- Remove the unused fuel if applicable. Secure the aircraft.
- Check pictures: Verify that the UAS camera actually took the pictures.
- LOG FLIGHT

Draganflyer X4-ES Helicopter Tech Specs

Draganflyer X4- Emergency Services Configuration

Helicopter Size

- **Dimensions**
  - Width: 87cm (36.25in)
  - Length: 87cm (36.25in)
  - Top Diameter: 106cm (41.8in)
  - Height: 32cm (12.6in)

Weight & Payload

- Helicopter Weight: 1,625g (57oz)
- Payload Capability: 850g (30oz)
- Maximum Gross Take-Off Weight: 2,475g (87oz)

RF Communications*

- **900 MHz Data Link**
  - Link Type: Helicopter to Ground & Ground to Helicopter (Two-Way)

    - Helicopter Antenna: Wired Whip Antenna
    - Controller Antenna: ½ Wave Whip Antenna
    - RF Data Rate: 200kbps
    - Receiver sensitivity: -101dBm
    - Transmission Technique: DSSS (Direct Sequence Spread Spectrum)
    - Frequency band: 902 – 925 MHz
    - Certifications: FCC, IC, C-TICK, Anatel, IDA
    - Data Link Channel Selection: Automatic (13 Channels)

- **5.8GHz Video Link**
    - Link Type: Helicopter to Ground & Ground to Helicopter (Two-Way)
    - Helicopter Access Point Antenna: Omni-Directional
    - Base Station Receiver Antennas: Integrated Antenna Array (Hi-gain 4 antenna system)
    - Transmission Power: 25dBm
    - Receiver Sensitivity: -96dBm
    - Transmission Technique: WiFi
    - Frequency Band: 802.11n 4.9-5.9GHz
    - Certifications: FCC Part 15.247, IC RS210, CE

***Range varies with environment**

11 Onboard Sensors

- 3 Solid State MEMS (Micro-Electro-Mechanical Systems) Gyros
- 3 Solid State MEMS (Micro-Electro-Mechanical Systems) Accelerometers
- 3 Magnetometers (Magnetoresistive Sensors)
- 1 Barometric Pressure Sensor
- 1 GPS Receiver

GPS

- GPS Used For: Position Hold, Location & Velocity Data
- Maximum Satellites Tracked Simultaneously: 16
- Position Update Rate: 4 Hz
- GPS Antenna: Ceramic Patch

Flight Characteristics:

- Unassisted visual reference required
- Max Climb Rate: 2m/s (6.5ft/s)
- Max Descent Rate: 2m/s (6.5ft/s)
- Max Turn Rate: 90°/second
- Approx Maximum Speed: 50km/h (30mph)
- Minimum Speed: 0km/h (0mph)
- Launch Type: VTOL (Vertical Take Off and Landing)
- Maximum Altitude ASL: 2,438m (8,000ft)

- Maximum Flight Time: Approx. 20 min
- Approx Sound at 1m (3.28ft): 72dB
- Approx Sound at 3m (9.84ft): 62dB

Operating Requirements

- Recommended Pre-Use Temperature: 10° to 35°C (50° to 95°F)
- Maximum Environmental Operating Temperature: -25° to 38°C (-13° to 100°F)
- Relative Humidity: 0% to 90% Non condensing
- Maximum Wind speed: 50 km/h (30mph)

Rotor Blades

- Two Clockwise, Two Counter-clockwise rotors (Four Rotors Total)
- Rotor Blade Material: Molded Carbon Fiber
- Rotor Diameter: 39.4 cm (16in)

Electric Motors

- Brushless Motors: 4
- Configuration: Direct Drive (One Motor per Rotor)
- Safety Features: Stall Protection
- Ball Bearing
- Voltage: 14.8V

Position Navigation Lights

- Type: 1 Watt LED Variable Brightness Emitters
- Luminous Flux at Full Brightness: 40lm
- Purpose: Helicopter Orientation Confirmation
- Visible Condition Range: Full Darkness to Direct Sunlight
- LED Light Positions
    - Red: Left Front
    - Green: Right Front
    - White: Both sides Tail/Rear

Rechargeable Helicopter Battery

- Cell Chemistry: Lithium Polymer
- Voltage: 14.8V
- Capacity: 5400mAh
- Length: 9.8cm (3.9in)
- Width: 6.7cm (2.6in)
- Height: 3.4cm (1.3in)
- Connectors: Integrated Balance and Power
- Recharge Time: Approx. 60 minutes (after typical flight)

Landing Gear

- Installed Height: 16.5cm (6.5in)
- Stance Width: 64.7cm (25.5 in)
- Landing gear : 4 individual nylon feet
- Landing Gear Material: Molded Carbon Fiber, nylon

Materials

- Carbon Fiber
- Glass Filled Injected Nylon
- Aluminum & Stainless Steel Fasteners
- RoHS Compliant

Flight Data Recorder

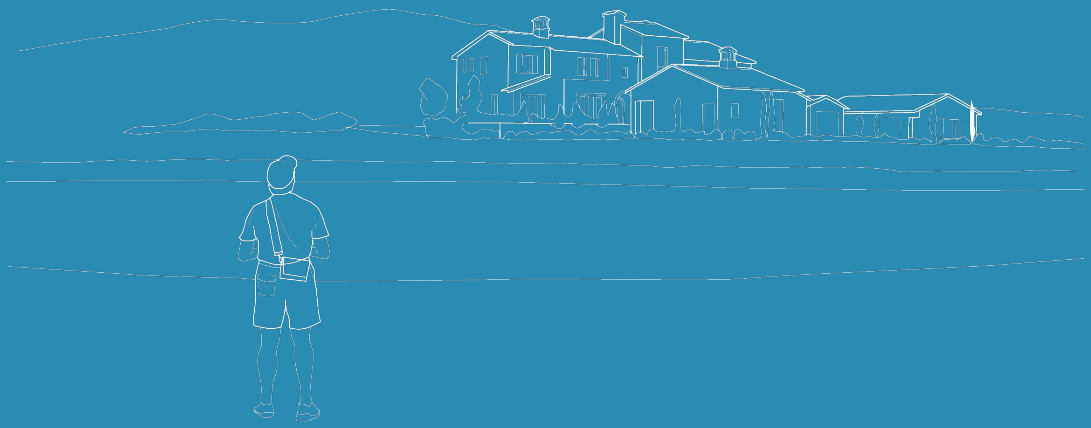
- Flight Data Recording: On-Board
- Stored To: Micro SD card or GCS hard drive exportable to external storage
- Data Recorded: Onboard Sensor Flight Data (Link quality, Orientation, Altitude, Speed, Direction)

Camera Attachments

Standard camera for the Draganflyer X4ES System is the Digital Still camera

- 20.2MP (Mega-Pixel)/1080P HD video- Digital Still Camera with Remote Controlled Tilt, Zoom and shutter with a 2 axis stabilized mounting system.
- Thermal FLIR (Forward Looking Infra-Red) Camera with Remote Controlled Tilt & onboard digital video recorder
- Low Light Video Camera with Remote Controlled Tilt & onboard digital video recorder
- **Note:** The Digital Still camera and the FLIR Camera (Quark 320 model) can be ordered to allow for a dual mounting system to provide live video switching on demand remotely between regular video and IR video.

Maintenance



Maintenance

The Draganflyer series aircraft feature a direct drive system requiring minimal maintenance as compared to a tradition style helicopter with servo linkages, gears, drive shafts, clutch, rotor head, swash plate, tail rotor and pitch change mechanisms.

However, as the pilot in command, in addition to the health of your batteries, you are responsible for the mechanical integrity of the aircraft, so it's a good idea to inspect the aircraft on a regular basis for any wear or damage. Should any component on the helicopter or support equipment show signs of fatigue or damage, immediately discontinue use until the component has been properly repaired or replaced.

To help ensure safe operation and keep your Draganflyer running at its best we recommend that you inspect or service the aircraft at the following intervals listed below.

Every Flying Session:

- Inspect folding mechanisms and all joints for damage or wear
- Inspect motors for rough motion
- Inspect all props and prop quick release clips for damage
- Inspect batteries for damage or puffing
- Inspect payload quick release attach points and spring loaded connections
- Check to ensure the handheld controller is recording a log file
- Clean all components with a soft damp cloth or compressed air

Every 3 months:

- Check for software or configuration updates
- Check mounting bolts on rotor mounts to ensure they are tight
- Perform a motor test and inspect for rough sounding motors
- Cycle flight batteries

- Inspect canopy mounting latch and slot for tears or cracks

Every Year or 300 flight hours:

Please contact Draganfly Innovations Customer Service Department for assistance with the following service requirements.

- Inspect and clean all electrical connections
- Inspect all crimps and solder connections on movable components
- Inspect all moveable components for wear
- Recalibration of magnetometer and main circuit board
- Inspect motor assemblies and replace all that are worn
- Inspect all fasteners, linkages and joints
- Inspect all rubber mounting brackets
- Cycle and test flight batteries
- Cycle and test hand held controller or GCS battery
- Cycle and test base station battery
- Check for software or configuration updates

Every 600 flight hours:

Congratulations for hitting the 600 hour mark. Please contact Draganfly Innovations Customer Service Department for assistance to overhaul or replace all motor assemblies.

Firmware updates

Firmware is the software running onboard the helicopter autopilot system or the software running on the handheld controller. At Draganfly we're always working to improve the flight characteristics of our systems or when possible, to bring new systems functionality to our customers. These improvements are accomplished sometimes by new hardware or most often, changes or improvements to the system software.

Just like your computer at home, you should never perform a "software update" unless you have a good idea of "what's new" or what will change as a result of the software update.

At Draganfly, before releasing a new firmware update to our customers the software is tested first on simulator systems, then tested extensively in the field under different environmental conditions by several "beta testers" before making it available to our customers.

The following details the firmware update process for the:

- Standard Handheld Controller (HHC)
- Handheld Ground Control System (GCS)
- Draganflyer X4
- Draganflyer X6
- Draganflyer X4-P and ES systems

Before any upgrade:

To get started you'll need to get the new Draganfly Firmware and that can be accomplished any number of ways. The software might be sent to you on a memory stick, it might be something you get in an e-mail or you might download it from the Draganfly Support Base WEBsite. To accomplish the upgrade you'll need one or more of the items detailed below:

- Computer with Internet connection
- Formatted 1Gb micro SD memory card
- Freshly charged batteries for either the controller or helicopter

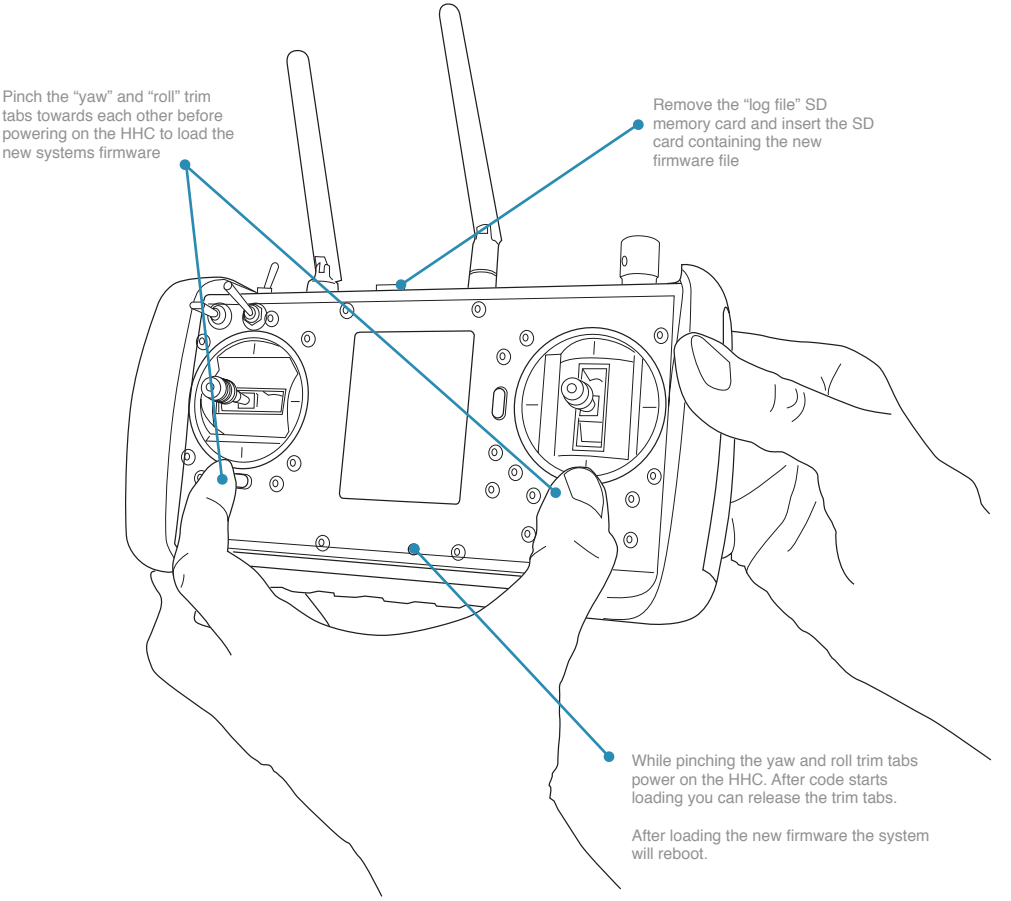
Upgrading the standard handheld controller (HHC):

To get started either delete existing files or reformat the 1Gb micro SD memory card. With a clean memory card, download or copy the new upgrade firmware software to the 1Gb Micro SD memory card. Double check to make sure the new update file is on the card and then properly eject it from your computer.

The HHC update file is typically called: TXboot.fx6

The system update file contains an “auto-loader” program that will be executed when the system is powered up but... we need to force the HHC to read the file. And to do this please:

- remove the flight log file SD memory card from the HHC
- insert the SD memory card with the firmware update file in the HHC
- as illustrated on the next page, press and hold the “yaw trim” and “roll trim” switches to the “center” of the HHC. It’s more like a pinch and hold grip on them
- as you’re holding the trim tabs, power-on the HHC
- hold the trim tabs until you see the code start loading on the display and then release
- after loading the new updated firmware the HHC will reboot
- you can check the new firmware version number on the HHC config screen
- power-off the HHC and reinstall the “log file” SD memory card



HHC Firmware Upgrade Diagram

Upgrading the handheld Ground Control System (GCS):

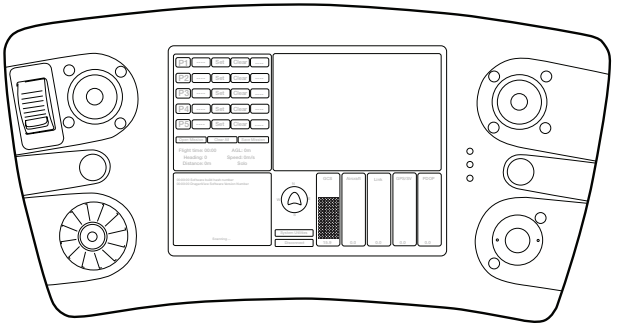
Because the handheld Ground Control System (GCS) is a full blown computer the process is considerably different and in many cases much more straight forward. The GCS is actually comprised of two computers operating side-by-side to “present” the information and to “control” the aircraft.

Periodically the GCS will get new “software” updates for the presentation computer and new “firmware” updates for the flight controller. As a user of the system, this is all accomplished through a single “system upgrade”.

To upgrade a GCS all that’s required is an Internet connection either via a wired, or wireless ethernet.

To get started power-on the GCS and connect to either a wired ethernet connection or the wireless access to the Internet.

Keep in mind that if you select a new wireless network, after the upgrade process you’ll need to reconnect back to the Draganfly video network before you will receive video again.



Handheld Ground Control System (GCS)

Once powered on and connected to the Internet navigate to the System Utility Screens and select the “controller” screen. From there please run through these steps to check for updates and load:

- select “upgrade”
- in the upper right screen select “check”

- at this point the GCS will connect through the Internet to the Draganfly Servers and “check” for the latest software updates for the GCS. If a new update is found, it will be listed
- select the upgrade file and “update” the GCS
- update status will be indicated as the GCS copies and loads the new software. Once completed the GCS will reboot itself
- check the new software version by returning to the system utility, controller screen and hovering your GCS mouse over the “controller identity” located in the upper left window. Hovering over identity will pop-up the status in the upper right window.
- upgrade is complete
- if you used a wireless network to upgrade your GCS, you will need to reconnect with the Draganfly network the next time the helicopter is powered up to restore the video down-link network so you can do that now, or remember it needs to be done the next time you fly.

Helicopter firmware upgrades:

The process to update firmware on the various aircraft is exactly the same, no matter what the aircraft. The only difference between them is the physical location of the SD memory card socket and the switches. The following is a general description of the process and to see the exact location of the switches and SD memory card locations refer to the aircraft diagrams that follow.

To get started either delete existing files or reformat a 1Gb micro SD memory card. With a clean memory card, download or copy the new aircraft upgrade firmware to the 1Gb Micro SD memory card. Double check to make sure the new update file is on the card and then properly eject it from your computer.

The aircraft update file is typically called: boot.fx6

Just like the HHC, the aircraft update file contains an “auto-loader” program that will be executed when the helicopter is powered up but... we need to force the helicopter to read the file on power-up. To get all this going please:

- if you have an SD memory card in the aircraft, remove it
- install the SD memory card containing the new firmware in the aircraft
- install and plug in the helicopter flight battery
- locate and press/hold the S1 switch on the helicopter
- with S1 depressed, power-on the aircraft
- S1 forces the helicopter to read the SD memory card and begin loading the new firmware. As the firmware is being loaded the navigation LEDs will blink in an erratic fashion. Hold the S1 switch until the new firmware is loaded, indicated by a normal navigation LED blink pattern. When you see a normal blink pattern it's okay to release the S1 switch.
- connect to the aircraft with your HHC or GCS to read and confirm the new helicopter firmware version number
- power-down the system
- unplug the helicopter battery
- remove the update SD memory card
- reinstall the original helicopter SD memory card that's normally in the aircraft to record system flight data and error logs

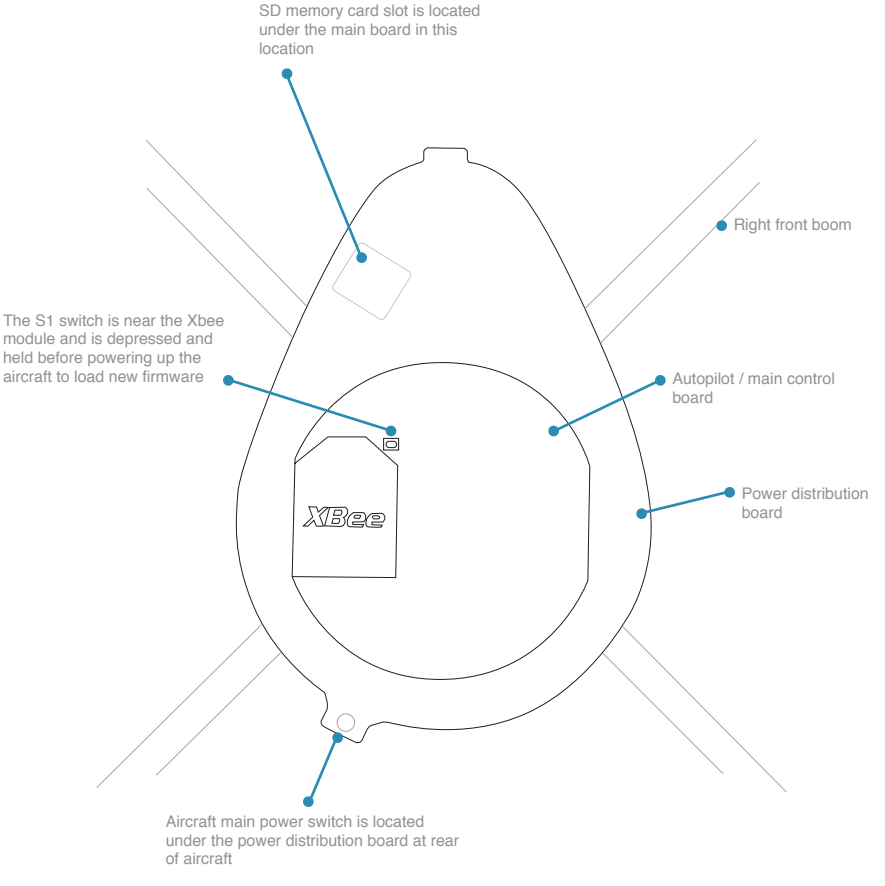
SD memory card and switch locations for the different aircraft:

Draganflyer X4

Remove the canopy and you'll see two different PC boards. The power distribution board is located on the bottom and the autopilot/main control board is located above it. As illustrated the SD memory card socket is located on the bottom side of the power distribution board near the left, front, boom.

The S1 switch is located on the top autopilot board right next to the Xbee module and as you know, the power on/off switch is located under the main board at the rear of the aircraft.

It takes two hands to do this, but in some respects it's easier than the other helicopters. The diagram on the next page explains where everything is located.



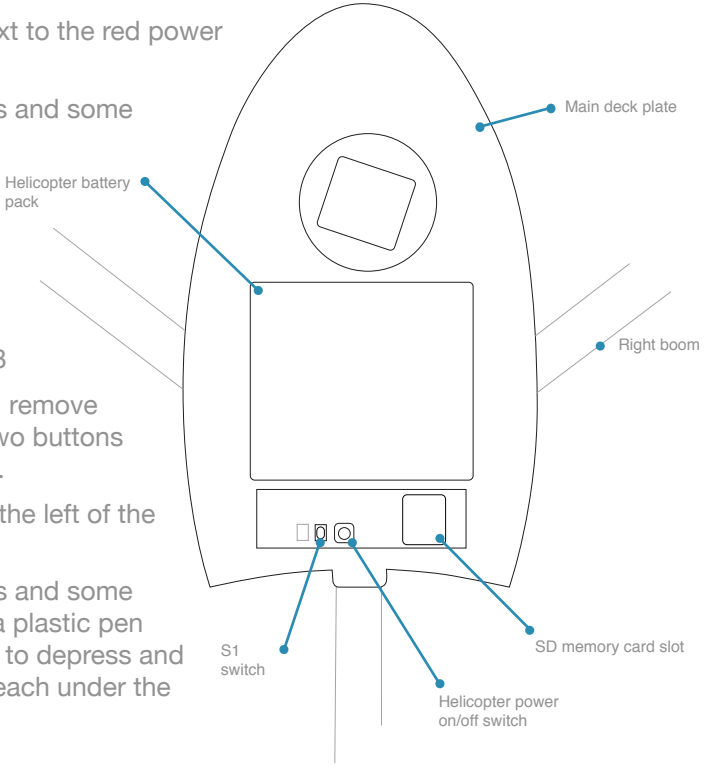
Draganflyer X4 Canopy removed Top View

Draganflyer X6

Remove the canopy and you'll see a printed circuit board along the back end of the helicopter deck plate. The PC board holds the power on/off switch, S1 switch and SD memory card holder.

The S1 switch is located next to the red power on/off switch.

It takes two hands to do this and some people find it easier to use a plastic pen tool or pointer of some kind to depress and hold the S1 button.



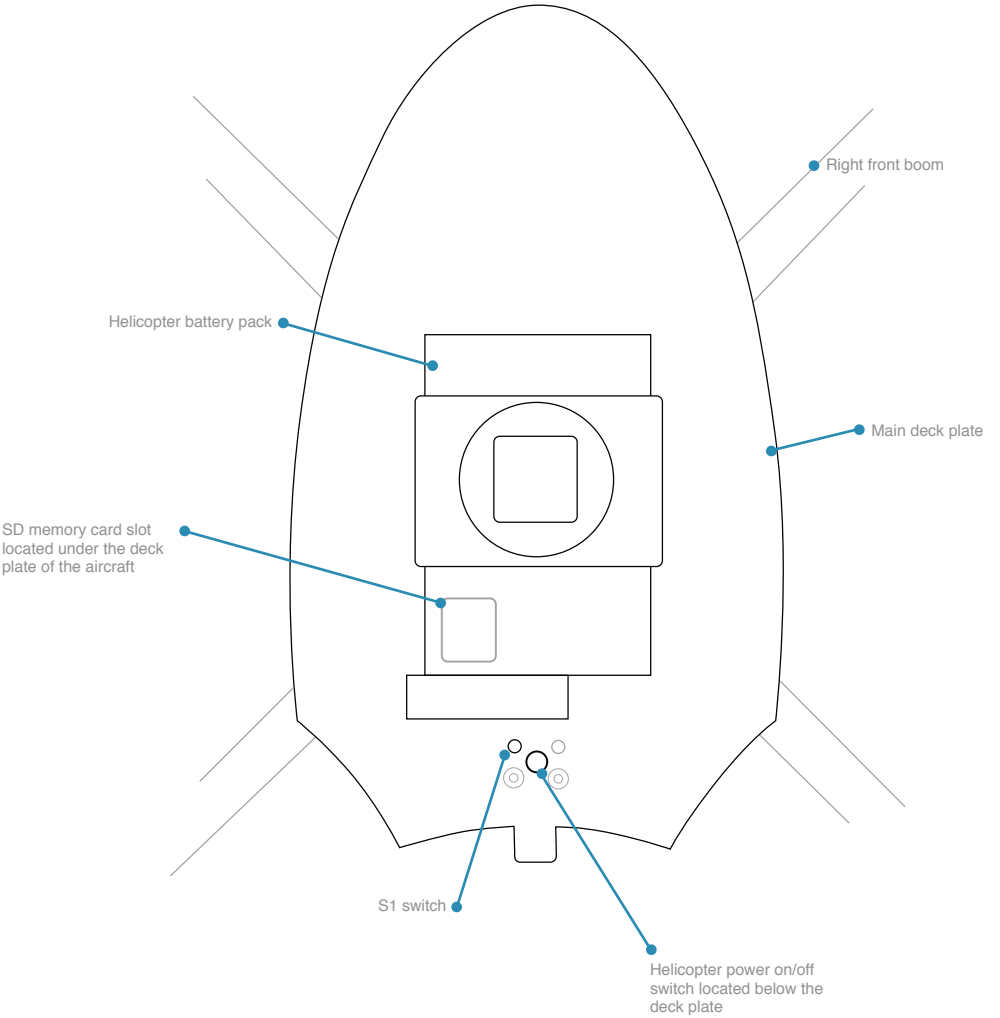
Draganflyer X6
Canopy removed Top View

Draganflyer X4-P, ES and X8

Illustrated on the next page, remove the canopy and you'll see two buttons at the rear of the deck plate.

The S1 switch is located to the left of the red power on/off switch.

It takes two hands to do this and some people find it easier to use a plastic pen tool or pointer of some kind to depress and hold the S1 button as you reach under the helicopter to power it on.



Draganflyer X4-P, X4-ES and X8
Canopy removed Top View

Helicopter configuration file upgrades:

The configuration file, contains the helicopter tuning parameters. Helicopter configuration files are different between all airframes and as you might expect, when improvements are made to the aircraft, new helicopter tuning “config files” will be made available.

Updating the helicopter configuration file is an easy and straight forward process that can be implemented in one of two ways. You can update using an SD memory card or if you prefer, use the USB wireless dongle and the DF X6 Control program.

SD memory card update process:

- Insert an SD memory card into the helicopter.
- Within 5 seconds of powering on the helicopter, depress the S1 switch.
- The helicopter will create a backup file called “BACKUP.DFD”.
- During the backup process, the aircraft navigation LEDs will blink fast. After they stop, power off the aircraft.
- Remove the SD memory card.
- Copy the new configuration file you either downloaded or received from Draganfly to the SD card.
- While the SD card is plugged into your computer, copy the BACKUP.DFD file you just created to a nice safe place on your computer system.
- Insert the SD memory card into the helicopter.
- Within 5 seconds of powering on the helicopter, depress the S1 switch.
- During the update process, the aircraft navigation LEDs will blink fast. After they stop, power off the aircraft and the the software update is complete.
- You are ready to fly

USB wireless dongle update process:

- keep in mind that before updating your current helicopter configuration it's always a good idea to create a backup of the current aircraft settings.
- you will receive new helicopter config files from Draganfly via e-mail or you'll download the files from the Draganfly Support Base WEBsite.
- to begin, setup your computer and connect the blue USB telemetry communications adapter.
- after powering on the computer and letting it boot, launch the DF X6 Control program and select the "configuration" tab.
- power on the aircraft.
- The DF X6 Control program, will automatically establish a wireless connection to the aircraft.
- from within DF X6 Control, download and save the current aircraft configuration file to a named folder. For example a folder called "DF Old Config". With this step completed continue to update the aircraft.
- Download the new config file to your computer and save it in a named folder. For example create a folder called "DF Config Updates".
- using the DF X6 Control program, selct the new configuration file to upload to the aircraft.
- select the "all wind conditions" and the "all payloads" radio buttons.
- Confirm that you have selected the correct file and that you have the radio buttons selected.
- select "upload" to update the aircraft. When completed the program will indicate "success".
- power-off the aircraft.

Motor testing:

To conduct a motor test it is very important to REMOVE THE PROPS from the aircraft. Only after removing the props should you consider executing a motor test because the computer will run up/down the motors to test their performance. If you do not remove the props there is a serious risk of both damage to the aircraft and personal injury.

To execute a motor test:

- remove all props from the helicopter.
- install a fully charged helicopter flight battery.
- power-on the helicopter.
- power-on your HHC or your GCS controller.
- power on your computer.
- connect the blue USB telemetry communications adapter to your computer.
- launch the DF X6 Control program.
- The DF X6 program will automatically connect to the aircraft.
- select the “diagnostics” tab.
- with the props removed, arm the aircraft with your HHC or the GCS.
- select the “start button” to begin the motor test.
- each motor can be run independently using the control sliders.
- slowly increase each slider to 25% and the reduce to zero.
- any motors that do not run, or run roughly should be replaced.
- after completing the test power-off the helicopter, power-off the HHC or GCS and shutdown your computer.

Motor replacement:

It is very important to understand the motors are set-up to run in the specific boom. For example, a motor that is in the right front boom can not be moved to any other boom without changing the “motor ID settings” DIP switch. And the same is true when installing a new motor; the motor DIP switch settings of the new motor must “match” the DIP switch settings of the motor being replaced. Failure to set-up the motor correctly will result in a crash.

To replace a motor please follow these instructions:

- disconnect and remove the aircraft battery.
- remove the prop.
- remove the motor by removing the small “set screw” type screws around the outside edge of the motor pod. Some aircraft will use 5 screws while others may use 3.
- with the screws removed, slowly and carefully remove the motor from the pod. Please avoid twisting the motor assembly. The motors are a snug fit but you must wiggle and pull straight up to remove them from the motor pod to avoid damaging motor wiring.
- be aware there is either a wired cable connector or flex cable attached so remove it very slowly and carefully. Please note, the flex cable is very fragile so take extra care if your motor is connected with this type of cable.
- the cable connectors in some aircraft are typically secured with a dab of adhesive. The adhesive can be either peeled away or carefully cut to remove the motor connector.
- with the motor removed you will see a four position DIP switch located on the motor speed controller. Motors from the X4-P, X4-ES and X8 are very easy to see. Motors from the X6 have the speed controller on the inside of the pod motor housing so it requires looking through one of the holes, to read the switch settings.

- match the switch settings of the new motor, to the old motor. Check this, and double check this, to make sure the switch settings are the same before reassembling the helicopter.
- after assembly, remove all props from the aircraft and execute a motor test as described above. Please note the direction the new motor is spinning as another safety check to insure the switches were set properly.

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SYSTEM FLIGHTS

Draganflyer Flight Logs

Version 1.0

draganFLY™
INNOVATIONS INC

Introduction:

It's important to plan and log each flight. Flight pre-planning helps define special conditions that will be encountered during the flight, aircraft configuration and any special resources required.

After each flight please complete a post flight log detailing what transpired, battery usage and anything unusual that happened. Well maintained log books are the sign of a well run and strong air program.

This log book is the property of:

_____

If found please
return to:

_____

_____

_____

Phone: _____

E-mail: _____

Local contact numbers

FAA/TC: _____

Local airport: _____

Local tower: _____

Fire & EMS: _____

Police: _____

Draganflyer Helicopter Serial Number _____ Flight Plan

Date	Location		Flight Plan Number
Estimated Takeoff Time	**Estimated Land Time**	**Maximum Altitude**	**Nature of Flight**
Pilot	**Spotter**	**Student**	**Payload Type**
Support Personnel			
Restrictions or Special Instructions			

Draganflyer Helicopter Serial Number _____ Flight Log

Date	Location	Pilot	Flight Plan Number		
			Flight Log Number		
			Agency Number		
Takeoff Time	**Land Time**	**Total Flight Time**	**Accumulated Flight Time**		
Wind Speed	**Temperature**	**Spotter**	**Maximum Altitude**		
Weather Conditions			**Payload Type**		
Purpose of Flight			**Battery**		
			Pack #	Start Voltage:	End Voltage:

Comments

Include damage sustained, repairs made or required