

October 22, 2014

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

DEPARTMENT OF  
TRANSPORTATION  
DOCKET OPERATIONS

2014 OCT 22 P 4:30

Re: Exemption Request Under Section 333 of the FAA Reform Act and Part 11 of the Federal Aviation Regulations

Dear Sir or Madam:

Pursuant to Section 333 of the FAA Modernization and Reform Act of 2012 (the "Reform Act") and 14 C.F.R. Part 11, Draganfly Innovations Inc. ("Draganfly"), the developer and operator of the Draganflyer X4P, Draganflyer X4ES, Draganflyer X6 and Draganflyer Guardian (collectively, Draganflyer Systems) small Unmanned UAS Systems ("sUAS") seeks an exemption from the Federal Aviation Regulations ("FARs") listed below and discussed in Appendix A. Details of Draganfly and the Draganflyer X4P, Draganflyer X4ES, Draganflyer X6 and Draganflyer Guardian sUAS are described in Appendix B. Attached as Appendix C is a summary of this request.

The requested exemption would permit Draganfly commercial operation of Draganfly's Draganflyer X4P, Draganflyer X4ES, Draganflyer X6 and Draganflyer Guardian (see details in Appendix B), each which weigh less 5.5 lbs with imaging payloads, to perform market research, aerial surveys, mapping, and inspections that consist of still photographs, video, and other data taken by onboard sensors. The Draganflyer Systems produce high quality imagery and data that can be used independently or in the case of surveying and modelling, can be combined to produce precision digital point clouds, triangle models, and contour maps of the surveyed area. Applications for these sUASs include assistance to law enforcement agencies for criminal investigation, traffic accident reconstruction and tactical support, emergency services emergency site management in cases of natural and manmade disasters as well as search and rescue, environmental monitoring, wildlife monitoring and enforcement, in inspection of sensitive infrastructure including oil and gas pipelines, flare stacks, power lines, communications towers, wind turbines, and surveying tasks such as precision agriculture, mining, transportation, and forestry. Use of Draganflyer Systems for these emergency services, inspection and surveying applications reduces the need to operate conventional aircraft, providing data more safely, quickly, accurately, economically, and with reduced environmental impact.

Operations under the exemption will be subject to strict operating requirements and conditions to ensure at least an equivalent level of safety to currently authorized operations using manned UAS and under conditions as may be modified by the FAA as required by Section 333.

Draganfly anticipates that while it is filing this exemption request on its own behalf, its customers, in the future, will file exemption applications to allow them to operate the Draganflyer X4P, Draganflyer X4ES, Draganflyer X6 and Draganflyer Guardian in commercial operations at their own locations, that require aerial data for law enforcement and emergency services or to support, inspections and surveys. Wherever possible, those filings will be substantially similar to this exemption application.

As described more fully below, the requested exemption would authorize Draganfly to perform market research and commercial operations of aerial inspections and surveys using the Draganfly Systems, all which are small in size less than 5.5 lbs and powered electrically by battery. Draganflyer Systems will be operated under controlled conditions at low altitude in airspace that is limited in scope, as described more fully herein; with automated control features, as described below. Draganflyer Systems are designed to be operated by one person but flight operations generally involve two people: an operator and an observer. The operator is responsible for flying the sUAS, monitoring its status and flight dynamics while maintaining visual line of sight, and keeping the flight within the specified factory limits (in terms of wind, flight range, battery life, etc) to ensure safe operation of the sUAS itself. The observer is responsible for monitoring the airspace for other UAS and hazards and instructing the operator before and during flight as necessary to ensure safe separation to avoid any interference with these UAS and hazards. The operator also will be an individual who has passed an FAA approved or equivalent ground training exam and authorized Draganfly training program for the Draganflyer X4P, Draganflyer X4ES, Draganflyer X6 and Draganflyer Guardian. Finally, the airspace in which the Draganflyer Systems will operate will be disclosed to and approved, as needed, by the FAA in advance.

Draganfly respectfully submits that because Draganfly systems will be used at very low altitudes, in lieu of having the same comparatively hazardous operations conducted by conventional fixed wing and rotary conventional aircraft, the FAA can have confidence that the operations will achieve at least an equivalent level or greater level of safety. Approval of this exemption would thereby enhance safety and fulfill the Secretary of Transportation's (the FAA Administrator's) responsibilities under Section 333(c) of the Reform Act to "establish requirements for the safe operation of such UAS systems in the national airspace system."

The regulations from which the exemption is requested are as follows:

- 14 C.F.R. Part 21;
- 14 C.F.R. 45.23(b);
- 14 C.F.R. 61.113(a) & (b);
- 14 C.F.R. 61.133(a);
- 14 C.F.R. 91.7(a);
- 14 C.F.R. 91.9(b)(2) & (c);
- 14 C.F.R. 91.103;
- 14 C.F.R. 91.109(a);
- 14 C.F.R. 91.119;
- 14 C.F.R. 91.151(a);
- 14 C.F.R. 91.203(a) & (b);
- 14 C.F.R. 91.405(a);
- 14 C.F.R. 91.407(a)(1);
- 14 C.F.R. 91.409(a)(2);
- 14 C.F.R. 91.417(a).

Appendix A discusses each rule listed above and explains why exemptions pursuant to the proposal set forth in this letter are appropriate, provide an equivalent level of safety, and are in the public interest.

## THE APPLICABLE LEGAL STANDARD UNDER SECTION 333

Draganfly submits that granting of this exemption application for use of Draganflyer Systems in market research, surveying, mapping and inspection operations will advance the Congressional mandate in Section 333 of the Reform Act to accelerate the introduction of sUASs into the national airspace system ("NAS") if it can be accomplished safely. This law directs the Secretary of Transportation to consider whether certain sUASs may operate safely in the NAS before completion of the rulemaking required under Section 332 of the Reform Act. In making this determination, the Secretary is required to determine which types of sUASs do not create a hazard to users of the NAS or the public or pose a threat to national security in light of the following:

- The sUAS's size, weight, speed, and operational capability;
- Operation of the sUAS in close proximity to airports and populated areas; and
- Operation of the sUAS within visual line of sight of the operator.

Reform Act § 333(a)(1). If the Secretary determines that such vehicles "may operate safely in the national airspace system, the Secretary shall establish requirements for the safe operation of such UAS in the national airspace system." *Id.* §333(c) (emphasis added).<sup>1</sup>

The Federal Aviation Act expressly grants the FAA the authority to issue exemptions. This statutory authority, by its terms, includes exempting civil UAS, as the term is defined under §40101 of the Act, from the requirement that all civil UAS must have a current airworthiness certificate and those regulations requiring commercial pilots to operate UAS in commercial service:

The Administrator may grant an exemption from a requirement of a regulation prescribed under subsection (a) or (b) of this section or any of sections 44702-44716 of this title if the Administrator finds the exemption is in the public interest.

49 U.S.C. §44701(f). See also 49 USC §44711(a); 49 USC §44704; 14 CFR §91.203(a)(1).

Granting of the requested exemption is in the public interest based on the clear direction in Section 333 of the Reform Act; the additional authority in the Federal Aviation Act, as amended; the strong equivalent level of safety surrounding the proposed operations; and the significant public benefit, including enhanced safety and cost savings associated with transitioning to sUASs for aerial surveying, mapping and inspection applications. Accordingly, the applicant respectfully requests that the FAA grant the requested exemption without delay.

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<sup>1</sup> Applicant submits that this provision places a duty on the Administrator to not only process applications for exemptions under Section 333, but for the Administrator, if he deems the conditions proposed herein require modification in order to allow approval, to supply conditions for the safe operation of the sUAS. Draganfly welcomes the opportunity to consult with FAA staff in order to address any issues or concerns that this proposal may raise that they believe may require modification.

## **Airworthiness of the Draganfly X4P, Draganflyer X4ES, Draganflyer X6 and Draganflyer Guardian**

The exemption application includes a critical element, evidence of the airworthiness of Draganfly's sUAS including the Draganflyer X4P, Draganflyer X4ES, Draganflyer X6 and Draganflyer Guardian. Draganfly believes that it has shown compliance through a history of granted flight operations and successful flights including many operations with public agencies. The list of granted applicants includes but is not limited to: Mesa County Sheriff's Office, Grand Forks Sheriff's Department, Mobile County Emergency Management Agency, Canyon County Sheriff, Illinois State Police, Orange County Sheriff's Office, University of North Dakota, North Western Michigan College, Texas A & M, Northern Plains UAS Test Site. In Canada, Draganfly has been operating the noted systems since 2008 under the authority of Special Flight Operations Certificates issued by Transport Canada in, the Prairie North, Ontario and Pacific Regions. In addition our Draganfly Systems are being operated under the authority of Transport Canada -Special Flight Operations Certificates issued to the Royal Canadian Mounted Police at 21 locations, the Ontario Provincial Police(4 locations), Saskatoon Police Service, Prince Albert Police Service as well as a number of universities and other civilian businesses across Canada, to perform demonstration, research and development, public and commercial operations. Draganfly Systems are also being operated in an addition 48 other countries for applications ranging from emergency services to industrial inspections. The criteria set forth in the Order specify the substantive showings of the device's safety and fitness for operation to ensure that the FAA has sufficient basis to evaluate the UAS's safety<sup>3</sup>. Draganfly Systems also have a significant set of automated features to ensure safe takeoff, flight and landing in many conditions, further details of operation can be found in Appendix B.

### **Mandatory Operating Conditions**

Grant of the exemption to Draganfly will be subject to the following mandatory conditions, which are based upon operating conditions set forth for operation of sUAS by public entities pursuant to Certificates of Authorization, with additional restrictions:

- All operations to occur in Class G airspace.
- Operations to avoid congested or populated areas, which are depicted in yellow on VFR charts.
- Operations to be conducted over private or controlled access property.
- Permission from land owner/controller required before commencing any flight.
- Operations to occur during Visual Flight Rules Meteorological Conditions (VMC).
- UAS to remain within Visual Line of Sight (VLOS).
- Operations to occur during daylight hours.
- Above Ground Level (AGL) altitude to be restricted to 400 feet.
- All operations conducted in vicinity of airport to remain more than 2.5 NM from centerline azimuth of runway centerline measured from runway thresholds.
- Operator will file a NOTAM for each flight.
- All required permissions and permits will be obtained from territorial, state, county or city jurisdictions, including local law enforcement, or other appropriate governmental agencies.
- All operations will include one pilot for flight control and one observer for VLOS enhancement of surrounding area near the UAS

## Operator Requirements

Draganfly respectfully proposes that operator requirements should take into account the characteristics of the particular sUAS being operated. Draganflyer Systems provide many built in functional and safety features to assist the operator in safe and reliable operation.<sup>2</sup>

The Draganflyer Systems provide two semi-autonomous flight modes using a two joystick configuration and video interface. The user directs the Draganflyer Systems in either a Manual/Altitude(Manual) hold mode or GPS Position Hold to the areas of interest maintaining visual sight of the UAS at all times. Instrumentation indicating heading, bearing, altitude, climb rate, horizontal speed, GPS position, battery level, data link, GPS accuracy are additional navigation aids available to the pilot in control. Draganflyer Systems can be set for maximum ceiling by the user when specified flight parameters are required. All flight operations are GPS capable making the system easy to navigate, and the flight control system also employs a variety of sensors including gyros, accelerometers, magnetometers, barometric pressure, temperature, to ensure the high stability and reliability. Draganflyer Systems have the ability to operate in both GPS mode and in GPS deprived environments and are easily switch between modes when required. Draganflyer Systems have battery level indicators allowing the pilot to monitor battery energy levels with built in warnings indicating low battery and critical battery levels where the helicopter will begin an auto descent at a defined safe rate. In addition Draganflyer Systems have a "Return Home" capability for a command to return to the point of take-off, Return Home at loss of Data Link or Communications and a default Auto-land at its present position. At all times during flight operations, the operator can take immediate control of the system. Additional automated safety functions and safety enhancing features of the Draganflyer Systems include:

- Automated pre-flight system calibration checks
- Automated condition or fault detection, warnings, and predefined responses to a number of flight and system conditions.
  - Low battery with control or flight system
  - High temperature or other system safety thresholds
  - Lost link communication
- Predefined responses include behavior such as return to home position and hover, return to home position and land, or land in current position
- In the case of lost GPS, a manual user flight mode is enabled which allows the operator to provide manual navigation inputs to assist in operating the UAS.

Given these safety features, Draganfly proposes that operators of Draganflyer Systems should not be required to hold a commercial or private pilot certification. Instead, operators should be required to:

- have successfully completed, at a minimum, FAA private pilot ground instruction and passed the FAA Private Pilot written examination or FAA recognized equivalents including commercial or private license and ground school issued from an ICAO recognized country;
- have completed Draganfly authorized training program for operation and maintenance of the sUAS.

<sup>2</sup> Submitted under confidentiality the following documents in support of this exemption application for the Draganfly X4P, Draganflyer X4ES, Draganflyer X6 and Draganflyer Guardian Training Overview (Exhibit 1) and User Guides (Exhibit 2) which includes Safety and PreFlight Checklists. It is estimated that since Oct 2008, Draganfly staff will have log in excess of 4,000 flight hours and in addition over 300 customers world-wide will have performed thousands more of flights and logging over thousands of hours of flight time with the Draganflyer systems with both development and release versions. A significant amount of flight time collected to understand and refine Draganfly's UAS products.

Draganfly notes that the FAA has found that safety factors permitted operation of sUASs by operators with these qualifications in the case of operations pursuant to public COAs when the mandatory operating conditions specified above were present. See Federal Aviation Administration, Notice N8900.227, Unmanned UAS Systems (UAS) Operational Approval, at 2021(July 30, 2013). The FAA has the statutory authority to grant exemptions to the requirements for and privileges associated with the grant of airmen's certificates. 49 USC §44701 (f).

In summary, applicant seeks an exemption from the FARs set forth above and in Appendix C to allow market research and commercial operations of a small unmanned vehicle in surveying, mapping and inspection operations.

Approval of the exemption allowing commercial operations of Draganflyer Systems for emergency services, law enforcement requirements, surveying, mapping and inspection operations will enhance safety by reducing risk. Conventional aerial survey and inspection operations using manned UAS involve very heavy aerial vehicles carrying significant quantities of combustible fuels, and a multi-person crew in piloting and observation roles. These operations require transit to and from the location of the activity, and often take place in congested environments including proximity to physical obstacles and/or presence of the general public. By contrast, Draganflyer systems all weigh less than 5.5 lbs including payloads and use a battery for power, is carried to/from the area of activity, removes the need for airborne pilots/observers, and poses less risk to people and infrastructure on the ground.

Additionally, no national security issue is raised by the grant of the requested exemptions. Given the size, load carrying capacity, speed at which it operates, and the fact that it carries no explosives or other dangerous materials, Draganflyer systems pose no threat to national security.

Operation of Draganflyer systems for market research, emergency services, law enforcement requirements surveying, mapping and inspection operations in accordance with the strict conditions outlined above, will provide an equivalent level of safety supporting the grant of the exemptions requested herein, including exempting Draganfly from the requirements of Part 21.

The name and address of the applicant are:

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The primary contact for this application is:

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Draganfly Innovation Inc. believes satisfaction of the criteria set forth in Section 333 of the Reform Act— given Draganflyer Systems size, weight, speed, operating capabilities, lack of operational proximity to airports and populated areas, operation within visual line of sight, and lack of threat to national security as well as showing of an equivalent level of safety as it may relate to the requirement for a pilot's license, provide more than adequate justification for the granting of the requested exemptions thus allowing Draganfly commercial operation of Draganflyer Systems in market research, surveying, mapping and inspection operations in the United States of America.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Zenon Dragan". The signature is fluid and cursive, with the first name "Zenon" being more prominent than the last name "Dragan".

Zenon Dragan  
Draganfly Innovations Inc.

## **APPENDIX A**

### **EXEMPTION REQUEST AND EQUIVALENT LEVEL OF SAFETY SHOWINGS UNDER APPLICABLE RULES SUBJECT TO EXEMPTION**

Draganfly requests an exemption from the following regulations as well as any additional regulations that may technically apply to the operation of the Draganfly X4P, Draganflyer X4ES, Draganflyer X6 and Draganflyer Guardian:

#### **14 C.F.R. Part 21, Subpart H: Airworthiness Certificates 14 CFR § 91.203(a)(1)**

Section 91.203(a)(1) requires all civil UAS to have a certificate of airworthiness. Part 21, Subpart H, entitled Airworthiness Certificates, establishes the procedural requirements for the issuance of airworthiness certificates as required by FAR § 91.203(a)(1). Given the size of the UAS (5.5 lbs.) and the limited operating area associated with its utilization, it is unnecessary to go through the certificate of airworthiness process under Part 21 Subpart H to achieve or exceed current safety levels.

Such an exemption meets the requirements of an equivalent level of safety under Part 11 and Section 333 of the Reform Act. The Federal Aviation Act and Section 333 of the Reform Act both authorize the FAA to exempt aircraft from the requirement for an airworthiness certificate, upon consideration of the size, weight, speed, operational capability, and proximity to airports and populated areas of the sUAS involved.

In this case, an analysis of these criteria demonstrates that the Draganflyer systems operated without an airworthiness certificate, under the conditions proposed herein, will be at least as safe, or safer, than a conventional UAS (fixed wing or rotorcraft) with an airworthiness certificate. Draganflyer Systems weigh less than 5.5 lbs. fully loaded. It will not carry a pilot or passenger, will not carry flammable fuel, and will operate exclusively within an area pre-disclosed and in compliance with conditions set forth herein. Operations under this exemption will be tightly controlled and monitored by both the operator, pursuant to the conditions set forth above, and by local public safety requirements. The FAA will have advance notice of all operations through the filing of NOTAMs. Receipt of the prior permission of the land owner, the size of the UAS, the lack of flammable fuel, and the fact that the UAS is carried to the location and not flown there all establish the equivalent level of safety. Draganflyer Systems provide at least an equivalent, level of safety<sup>3</sup> to that of such operations being conducted with conventional aircraft that would be orders of magnitude larger and would be carrying passengers, cargo, and flammable fuel. The automated safety features including redundant sensor systems as described in Appendix B and throughout this document highlight the design intentions towards safety and reliability of Draganflyer Systems.

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<sup>3</sup> Transport Canada has issued a report referencing sUAS that states "This class of RPA is defined by the maximum kinetic energy they possess and the maximum energy per unit area that they can impose on a human being. These RPA were defined as "Low Energy RPA". This conclusion was based on a variety of information sources such as range safety guides and design guidelines for non-lethal weapons. It also noted that such aircraft, by their very design, have relatively short range and endurance. This coupled with their low mass, makes them extremely unlikely to pose a threat to manned aviation."



#### **14 C.F.R. § 45.23 & 91.9(c): Marking of the Aircraft**

Regulation 45.23 provides:

- (a) Each operator of an aircraft must display on that aircraft marks consisting of the Roman capital letter "N" (denoting United States registration) followed by the registration number of the aircraft. Each suffix letter used in the marks displayed must also be a Roman capital letter.
- (b) When marks include only the Roman capital letter "N" and the registration number is displayed on limited, restricted or light sport category aircraft or experimental or provisionally certificated aircraft, the operator must also display on that aircraft near each entrance to the cabin, cockpit, or pilot station, in letters not less than 2 inches no more than 6 inches high, the words "limited," "restricted," "light sport," "experimental," or "provisional," as applicable.

Regulation 91.9(c) provides:

No person may operate a U.S. registered civil aircraft unless that aircraft is identified in accordance with part 45 of this chapter.

Draganflyer Systems have no entrance to the cabin, cockpit, or pilot station on which the markings can be placed. Given the size of the sUAS, two inch lettering will be impossible. Official marking systems for small UAS have not yet been established for operations inside the NAS. Draganflyer systems are currently marked with a fixed label measuring 1.8" x 0.4" containing Draganfly's logo as well as a Draganfly serial number located on the airframe deck plate next to the flight battery insertion point. Draganfly is prepared to mark the inspection system with the name of the organization and location or origin and fulfill any other request by the FAA to this topic in accordance to § 45.29(f) where the pilot, observer, and others working with the sUAS will see the identification of the sUAS.

The FAA has issued the following exemptions to this regulation, see Exemption Nos. 8738, 10167, 10167A and 10700.

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

Section 61.113(a) & (b) limit private pilots to non-commercial operations. Unlike a conventional aircraft that carries a pilot, passengers, and cargo, Draganflyer systems in this case are remotely controlled with no passengers or property of others on board. Section 61.133(a) requires an individual with a commercial pilot's license to be pilot in command of an aircraft for compensation or hire.

Draganfly respectfully proposes that operator requirements should take into account the characteristics of the particular sUAS. Due to Draganflyer Systems small size, endurance, range and payload capabilities, no passengers and no cargo would ever be carried. Commercial operations would be strictly limited to acquiring imaging data.

Draganflyer systems have an all-digital software platform with advanced features previously restricted to full size unmanned UAS. Automated features and advanced controls enable safe, reliable operation.

Draganfly Innovations considers flight safety a priority, no matter the operating environment or project. When flown within the designed limitations, Draganflyer Systems offer superior safety over manned UAS by removing the need for people to be onboard in potentially dangerous situations. With multiple built-in safety features, the Draganfly platform is designed with safety in mind.

- Draganflyer Systems automatically detects potential issues with configurable automated response behavior such as a return home and land routine
- Draganflyer Systems system self-calibrate all of its sensors and performs self-tests prior to takeoff to check for errors
- Draganflyer Systems Altitude limits. The Pilot in Command has the ability to set up maximum altitude limits to prevent climbing to altitudes where normal manned aviation takes place in Class G airspace
- Draganflyer Systems display battery voltage and flight time at all times
- Low battery on the Draganfly systems triggers a warning alarm to return home, land and replace the battery
- Critical battery on the Draganfly system initiates an automatic controlled descent and landing.
- If the Draganfly detects a lost link to the control system the vehicle will perform its predefined Return to Home and Land or Auto land at the location it is currently at .
- Auto detection of lost GPS warning the pilot to switch back to manual mode.

Given these safety features, Draganfly proposes that operators of Draganflyer Systems should not be required to hold a commercial or private pilot certification. Instead, operators should be required to:

- have successfully completed, at a minimum, FAA private pilot ground instruction and passed the FAA Private Pilot written examination or FAA recognized equivalents including ICAO issued commercial, private license and ground school;
- have completed Draganfly's training program for operation of the sUAS.

Draganfly notes that the FAA has found that safety factors permitted operation of sUASs by operators with these qualifications in the case of operations pursuant to public COAs where the mandatory operating conditions specified above are present. See Federal Aviation Administration, Notice N8900.227, Unmanned UAS Systems (UAS) Operational Approval, at 2021 (July 30, 2013). The FAA has the statutory authority, granted at 49 U.S.C. §44701(f) to waive the pilot requirements for commercial operations.

Given these conditions and restrictions, an equivalent level of safety will be provided by allowing operation of Draganflyer Systems without a private pilot's certificate or a commercial pilot's certificate, under the conditions set forth herein.

The risks associated with the operation of the Draganflyer systems (given their size, speed, operational capabilities, and lack of combustible fuel) are so diminished from the level of risk associated with private pilot operations or commercial operations contemplated by Part 61 with conventional UAS (fixed wing or rotorcraft), that allowing operations of the sUAS as set forth above meets or exceeds the present level of safety provided under 14 C.F.R. § 61.113(a) & (b) and does not rise to the level of requiring a commercial pilot to operate the UAS under § 61.133(a).

#### **14 C.F.R. § 91.7(a): Civil aircraft airworthiness.**

This regulation requires that no person may operate a civil aircraft unless it is in airworthy condition.

Currently no standard exists for airworthiness of a sUAS such as Draganflyer Systems. Given the size of the UAS and the previous COAs issued for Draganfly's Draganflyer X6, Draganflyer X4ES, an equivalent level of safety will be achieved by ensuring compliance with the Draganfly manuals prior to each flight.

#### **14 C.F.R. § 91.9(b)(2): Civil Aircraft Flight Manual in the Aircraft.**

The regulation provides:

No person may operate a U.S.registered civil aircraft ...

(2) For which an Airplane or Rotorcraft Flight Manual is not required by §21.5 of this chapter, unless there is available in the aircraft a current approved airplane or Rotorcraft Flight Manual, approved manual material, markings, and placards, or any combination thereof.

Given the size and configuration of Draganflyer systems there is no ability or place to carry such a flight manual on the UAS, not only because there is no pilot on board, but because there is no room or capacity to carry such an item on the UAS.

The equivalent level of safety will be achieved by keeping the flight manual (see, e.g., User Guide, Exhibit 1) at the ground control point where the pilot flying the sUAS will have immediate access to it. The FAA has issued to others the following exemptions to this regulation: Exemption Nos. 8607, 8737, 8738, 9299, 9299A, 9565, 9565B, 10167, 10167A, 10602, 32827, and 10700.

#### **14 C.F.R. § 91.103: Preflight action**

This regulation requires;

Each pilot in command shall, before beginning a flight, become familiar with all available information concerning that flight. This information must include—

a) For a flight under IFR or a flight not in the vicinity of an airport, weather reports and forecasts, fuel requirements, alternatives available if the planned flight cannot be completed, and any known traffic delays of which the pilot in command has been advised by ATC;

(b) For any flight, runway lengths at airports of intended use, and the following takeoff and landing distance information:

(1) For civil aircraft for which an approved Airplane or Rotorcraft Flight Manual containing takeoff and landing distance data is required, the takeoff and landing distance data contained therein; and

(2) For civil aircraft other than those specified in paragraph (b)(1) of this section, other reliable information appropriate to the aircraft, relating to aircraft performance under expected values of airport elevation and runway slope, aircraft gross weight, and wind and temperature.

As operations will not take place under IFR nor will they take place at airports and as FAA approved rotorcraft flight manuals will not be provided for the aircraft an exemption will be needed. An equivalent level of safety will be provided as set forth in the Draganflyer Systems User Manuals (exhibit 1) under the 'Helicopter preflight' section. The pilot in command will take all actions including reviewing weather, potential hazards in and near landing and take-off areas as well as in the general flight area, Dragnflyer systems flight communications check and UAS performance data before initiation of flight.

#### **14 C.F.R. § 91.109(a) & 91.319(a)(1): Flight Instruction**

These regulations provide that no person may operate a civil aircraft (except a manned free balloon) that is being used for flight instruction unless that aircraft has fully functioning dual controls.

The Draganflyer systems are remotely piloted UAS and by design, do not have fully functional dual controls<sup>4</sup>. Flight control is accomplished through the use of a control station that communicates with the UAS via radio communications. The flight plan is controlled manually in either manual mode or using GPS Positions Hold capabilities. If instruction is accomplished through a training program, as set forth in Exhibit 1, an equivalent level of safety will be assured. The FAA has approved exemptions for flight training without fully functional dual controls for a number of UAS and for flight instruction in experimental UAS. See Exemption Nos. 5778K & 9862A. The equivalent level of safety will be achieved by the manufacturer providing the training as outlined, and through the use of experienced and qualified pilots familiar with the Draganfly X4P, Draganflyer X4ES, Draganflyer X6 and Draganflyer Guardian.

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<sup>4</sup> Dragnflyer Flight Controls can be paired for training or payload operator purpose as a Primary and Secondary Control system with the Primary Operator required to maintain pressure on a training button to allow flight controls.

#### **14 CFR § 91.119: Minimum Safe Altitudes**

Section 91.119 establishes safe altitudes for operation of civil UAS. Specifically, 91.119(c) limits UAS flying over areas other than congested areas to an altitude of 500 feet above the surface, except over open water or sparsely populated areas. In those cases, the UAS may not be operated closer than 500 feet to any person, vessel, vehicle, or structure.

As set forth herein, Draganflyer Systems will never operate at higher than 400 feet AGL and be operated in a manner to avoid congested or populated areas.

Because aerial survey, mapping and inspection work must be accomplished at relatively low altitudes and at altitudes less than 500 feet AGL, an exemption from Section 91.119(c) is needed.

The equivalent level of safety will be achieved given the size, weight, speed, and material with which Draganflyer Systems are built. Also, no flight will be taken without the permission of the land owner or those who control the land. Because of the advance notice to the landowner, all affected individuals will be aware of the flights. Compared to aerial survey operations conducted with traditional manned aircraft weighing far more than 5.5 lbs. and carrying flammable fuel, any risk associated with these operations will be far less than those currently allowed with conventional aircraft operating at or below 500 feet AGL. Indeed, the low altitude operations of the sUAS will maintain separation between these sUAS operations and the operations of conventional aircraft that must comply with Section 91.119.

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

This regulation prohibits an individual from beginning “a flight in an airplane under VFR conditions unless (considering wind and forecast weather conditions) there is enough fuel to fly to the first point of intended landing and, assuming normal cruising speed – (1) During the day, to fly after that for at least 30 minutes; or (2) At night, to fly after that for at least 45 minutes.”

The Draganflyer Systems batteries provide approximately 10 - 20 minutes of powered flight dependent on the model. Without an exemption from § 14 CFR 91.151, the sUAS's flights would not be possible. Given the limitations on its proposed operations and the location of those proposed operations, a shorter time frame for flight in daylight VFR conditions is reasonable.

Draganfly believes that an exemption from 14 CFR § 91.151(a) is safe and within the scope of a prior exemption. See Exemption 10673 (allowing Lockheed Martin Corporation to operate without compliance with 91.151(a)). Operating the sUAS, without 30 minutes of reserve fuel does not engender the type of risks that Section 91.151(a) was meant to prevent given the size and speed at which the sUAS operates. The fact that it carries no pilot, passenger, or cargo also enhances its safety. In the unlikely event that the Draganflyer should run out of fuel, it would simply land (an auto-land function is initiated upon critical battery warning). Given its weight and construction material, the risks are less than contemplated by the current regulation.

Draganfly believes that an equivalent level of safety can be achieved by maintaining 5 minutes of reserve fuel, which, would be more than adequate to return the sUAS to its planned landing zone from anywhere in its operating area given that the systems are designed to be flown within direct unaided visual sight of the operator. For most operators this will be within 300 yards of the operator.

The FAA has granted similar exemptions to others, including Exemptions 2689F, 5745, 10673 and 10808.

#### **14 C.F.R. § 91.203 (a) & (b): Carrying Civil Aircraft Certification and Registration**

This regulation provides as follows:

- (a) ... no person may operate a civil aircraft unless it has ... an appropriate and current airworthiness certificate.
- (b) No person may operate a civil aircraft unless the airworthiness certificate required by paragraph (a) of this section or a special flight authorization issued under §91.715 is displayed at the cabin or cockpit entrance so that it is legible to passengers or crew.

Draganflyer Systems fully loaded weighs approximately 5.5 lbs or less. 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 UAS.

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. 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.

#### **14 C.F.R. § 91.405(a); 407(a)(1); 409(a)(2); 417(a): Maintenance Inspections**

Section 91.405(a) requires that an aircraft operator or owner "shall have that aircraft inspected as prescribed in subpart E of this part and shall between required inspections, except as provided in paragraph (c) of this section, have discrepancies repaired as prescribed in part 43 of this chapter ..." Section 91.407 similarly makes reference to requirements in Part 43; Section 91.409(a)(2) requires an annual inspection for the issuance of an air worthiness certificate. Section 91.417(a) requires the owner or operator to keep records showing certain maintenance work that has been accomplished by certificated mechanics, under Part 43, or licensed pilots and records of approval of the aircraft for return to service.

The Draganflyer systems are nearly maintenance free with the only moving parts on the flight airframe during operations are 2 ceramic bearings per motors. The motors are direct drive brushless motors. Checks done of the system will be performed by a qualified person prior to each flight and at predefined intervals as part of the Maintenance Schedule in the User Manual (see Exhibit 2).

Preflight checklist includes:

- 1. Visual inspection of the airframe
- 2. Visual inspections of rotor integrity
- 3. Check charge of all batteries (aerial vehicle, command station, radio repeater station)

An equivalent level of safety will be achieved because the sUAS is small in size, will carry only a light weight camera system payload, will operate only in restricted predetermined areas and is not a complex mechanical devise. As provided in the attached User Guide (System Maintenance section), the operator of the Draganflyer System will ensure that the sUAS is in working order prior to initiating flight, perform required maintenance, and keep a log of any

maintenance that is performed. Moreover, the operator is the person most familiar with the UAS and is best suited to maintain the UAS in an airworthy condition and to ensure an equivalent level of safety.

The Draganflyer Systems' Maintenance guidelines ensure an equivalent level of safety to the maintenance requirements in Part 91.

## APPENDIX B

### SMALL UNMANNED AERIAL SYSTEM DESCRIPTION

**Draganfly Corporate Overview:** Draganfly Innovations Inc. is a Canadian company located in Saskatoon Saskatchewan, Canada. Draganfly is focused on providing micro unmanned aerial systems and is globally recognized as one of the market and technology leaders in this space. Key customers range from organizations such as Mesa County Sheriff's Office, Grand Forks Sheriff's Department, Mobile County Emergency Management Agency, Canyon County Sheriff, Illinois State Police, Orange County Sheriff's Office, University of North Dakota, North Western Michigan College, Texas A & M, Northern Plains UAS Test Site. In Canada, Draganfly Innovations has been operating the noted systems since 2008 under the authority of Special Flight Operations Certificates issued by Transport Canada in, the Prairie North, Ontario and Pacific Regions. In addition our Draganfly systems are being operated under the authority of Transport Canada -Special Flight Operations Certificates by the Royal Canadian Mounted Police at 17 locations, the Ontario Provincial Police (4 locations), Saskatoon Police Service, Prince Albert Police Service as well as a number of universities and other civilian businesses across Canada, Draganfly systems have accumulated thousands of hours in global flight operations.

Draganfly systems have been approved by the FAA for operational COAs and have a demonstrated safety track record. The Draganflys UAS platforms were the first to officially fly at the first operational the FAA's UAS Test Sites (Northern Plains UAS Test Site, North Dakota). Many customers from emergency services, to education to police and even commercial operations for industrial inspections have been given approval to fly in US, Canada, UK, Australia, Japan, and others airspaces.

#### **Draganfly Systems Overview:**

The Draganflyer X4P and Dragnflyer X4ES systems can carry payloads up to 1.8 lbs. The Draganflyer X6 can carry payloads up to 0.74 lbs. The Draganflyer Guardian can carry a payload of 0.9 lbs. The Draganfly systems fly with a maximum wind threshold of 30 M.P.H. for sustained winds and wind gusts up to 35 M.P.H. Draganflyers' system each have 11 sensors on board the UAS including 3 gyros, 3 magnetometers, 3 accelerometers, a barometric pressure sensor and GPS module automatically. This sensor package provides for default flight of level flight and does not allow the UAS to go beyond a 38 degree angle. This takes the difficult portion out of flying, the operator is only steering the UAS and adjusting its altitude. While in GPS mode the helicopter compensates for wind at the altitude the system is flying. The end result is a system capable of gathering high quality aerial data at much higher wind thresholds. A trait that is imperative for many aerial inspection operations. While GPS Position Hold is available the UAS does not rely on it for operations. When an operator finds themselves in a situation where GPS is either not available or has degraded, safe operations can still be carried out.

While the Draganfly Systems have an operational range of over ½ a miles, the systems are designed to be flown within direct visual sight of the operator at all times. Dependent on a person visual acuity most operation would take place within 300 yards of the operator.

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<sup>5</sup> Control transmission signal is rated for in excess of ½ mile, however battery flight endurance limits require the operator to restrict maximum distance to ensure safe return of the sUAS.



All flight operations take place as a result of direct input of the pilot in control. Flight adjustments are made based on a two joystick control system which allows for very precise movements and makes it extremely easy to navigate in either Manual or GPS Position Hold. When in Manual flight altitude is maintained based on barometric pressure and can be easily adjusted by the pilot in control using the left joystick. In GPS Position Hold mode, if the operator is not explicitly commanding the system to move, the system automatically holds its GPS position. Camera stability is further enhanced by a 2 axis brushless mount to ensure the most stability and least amount of vibration regardless of the wind.

The Draganflyer Systems have the option to be operated in both semi and fully autonomous flight modes. Using Draganfly Preflight planning software, preplanned flight paths can be uploaded to the helicopter prior to take off and after a controlled take off the pilot can command the preprogramed flight path to be executed. At any time during the autonomous flight the pilot can immediately provide inputs to abort the autonomous flight and take over the flight system.

With the ability to fly in both Manual Mode and GPS Position Hold as well as in a GPS deprived environment makes the Draganflyer systems the safest choice for both urban and nonurban environments. Draganflyer systems detect a loss of GPS and warn the Pilot in Control of the status. Other faults that can be detected include: loss of communication and low battery levels. In addition, the operator can create maximum flight altitudes so the system cannot go above a pre-set maximum altitude.

The Draganflyer systems are operated entirely by visual based navigation with the operator maintaining direct sight of the SUAS at all times. This means the operator can fly in very technically challenging areas and does not rely on maps or GPS or an internet connection for operations.

**Draganfly X4P, Draganflyer X4ES, Dragnflyer X6 and Draganflyer Guardian Operating Manual** System user manuals available upon request.

## **Physical Characteristics**

### **Draganflyer X4P and Draganflyer X4ES**

#### **Dimensions:**

- Width: 87cm (34.25in)
- Length: 87cm (34.25in)
- Top Diameter: 107cm (42in)
- Height: 30cm (12in)

#### **Weight and payload:**

- Helicopter weight w/battery: 1,670g (3.7lbs)
- Payload capacity: 800g (1.8lbs)
- Max take-off weight: 2,470g (5.4lbs)

#### **Flight characteristics:**

- Max climb rate: 2m/s (6.5ft/s)
- Max descent rate: 2m/s (6.5ft/s)
- Max turn rate: 90 degrees/sec
- Approx max air speed: 50km/h (30mph)
- Minimum air speed: 0km/h (0mph)
- Launch type: VTOL

- Max altitude ASL 2,438m (8,000ft)
- Approx sound at 1 meter distance: 72db
- Approx sound at 3 meters distance: 62db

**Fuel** – 5400 mAh Lithium polymer battery. Charging is done in the included battery charger and can be charged via standard wall outlet, or via a 12 volt dc source.

## **Draganflyer X6**

### **Dimensions:**

- Width: 84cm (33in)
- Length: 90cm (35.5in)
- Top Diameter: 99cm (39in)
- Height: 26.5cm (10.5in)

### **Weight and payload:**

- Helicopter weight w/battery & WiFi: 1,310g (2.8lbs)
- Payload capacity: 335g (.74lbs)
- Max take-off weight: 1,645g (3.6lbs)

### **Flight characteristics:**

- Max climb rate: 2m/s (6.5ft/s)
- Max descent rate: 2m/s (6.5ft/s)
- Max turn rate: 90 degrees/sec
- Approx max air speed: 50km/h (30mph)
- Minimum air speed: 0km/h (0mph)
- Launch type: VTOL
- Max altitude ASL 2,438m (8,000ft)
- Approx sound at 1 meter distance: 72db
- Approx sound at 3 meters distance: 62db

**Fuel** – 2700 mAh Lithium polymer battery. Charging is done in the included battery charger and can be charged via standard wall outlet, or via a 12 volt dc source.

## **Draganflyer Guardian**

### **Dimensions:**

- Width: 59.5cm (23.5in)
- Length: 59.5cm (23.5in)
- Top Diameter: 72.5cm (28.5in)
- Height: 25.5cm (10in)

### **Weight and payload:**

- Helicopter weight w/battery: 1050g (2.3lbs)
- Payload capacity: 420g (.9lbs)
- Max take-off weight: 1,470g (3.2lbs)

### **Flight characteristics:**

- Max climb rate: 2m/s (6.5ft/s)
- Max descent rate: 2m/s (6.5ft/s)
- Max turn rate: 90 degrees/sec
- Approx max air speed: 50km/h (30mph)
- Minimum air speed: 0km/h (0mph)
- Launch type: VTOL

- Max altitude ASL 2,438m (8,000ft)
- Approx sound at 1 meter distance: 62db
- Approx sound at 3 meters distance: 50db

**Fuel** – 2700 mAh Lithium polymer battery. Charging is done in the included battery charger and can be charged via standard wall outlet, or via a 12 volt dc source.

**Landing style/type** – Autonomous vertical lift

### **Propulsion System**

- **Engines** – The Draganfly X4P, Draganflyer X4ES, Draganflyer Guardian are powered by 4 electric direct drive brushless DC motors. The Dragnflyer X6 is powered by 6 electric direct drive brushless DC motors.
- **Batteries** – Lithium polymer batteries. Charge level status from the battery on the helicopter is continually monitored and real time levels are displayed on the control system used by the Pilot in Control. Predefined voltage levels indicating; Low Battery Warning – (Low battery land immediately) warning alarm both visual and audible are provided to the Pilot.  
Critical Battery Warning – (Critical battery land immediately) warning alarm both visual and audible are provided to the Pilot, in addition the helicopter will begin an auto descent and land at a controlled rate. At any time during the battery warnings full control of the helicopter is maintained. Ignoring the critical battery warning and overriding the descent feature could result in a critical flight system failure. Charging is done with the included battery charger and can be charged via standard wall outlet, or via a 12 volt DC source.

**Maintenance** – The UAS are nearly maintenance free, the airframe has very few moving parts only 2 ceramic bearing per motor. Maintenance consists of inspections and verification of communications performed by a qualified person prior to each flight.

Preflight checklist includes but is not limited to:

- Visual inspection of the airframe including; side arms, landing gear, rotors, motors, canopy
- Visual inspections of rotor integrity
- All payload system connections and components
- Check charge of all batteries (aerial vehicle, control system, video repeater station)

**Reliability** – The system is designed for maximum reliability and to maintain performance over its life. The only components experience routine wear are rotors, batteries, motors, and legs. Battery and motor conditions are monitored by the system with deviations reported to the operator.

Contact with other objects during flight may cause other components, particularly rotors, and motor arms, to become damaged and may cause a flight system failure. Damaged components are likely to be detected during the full visual inspection of the airframe performed before each flight.

The UAV system detects numerous conditions which may make flying unsafe, such as reduced GPS accuracy, magnetic anomalies, low battery charge, battery cell imbalances, and temperature fluctuations. Degradation or loss of communications(Data Link) between the helicopter may initiate a failsafe action of Return to Home, where the helicopter would return to its point of take-off at its current altitude and then land or an Auto-land where the helicopter will descend at a controlled rate at its current position. For the failsafe action of Return Home the UAS must be in GPS Position hold, if not in GPS Position Hold the UAS will default to Auto-land. In the event during a Return to Home initiation the helicopter senses a low battery the helicopter will default to the Auto-land process.

### **Command and Control Systems**

The Draganflyer Control station allows the operator simultaneous control over UAS and payloads. The joysticks control allows for quick navigation while the display screen provides all essential flight data to the Pilot in Command. Telemetry data is transmitted to the command station at least once per second.

### **Displayed on GCS:**

- UAS Barometric Altitude
- UAS Bearing
- UAS Heading
- UAS Ground Speed
- UAS Climb Rate
- Flight Time
- Data Link
- UAS Position
- GPS Satellite number of Satellites
- GPS Satellite PDOP
- GPS Satellite Errors
- Control system battery level
- Helicopter battery level
- Helicopter attitude
- Flight Time
- Local Time
- UAS Failsafe Action
- UAS Status

**Onboard Flight Instruments** – The UAV is equipped with an Inertial Navigation System (3 axis gyroscope, 3 axis magnetometer, 3 axis accelerometers, GPS receiver, barometric pressure sensor and GPS module.

**On-board computer systems** – The UAS is equipped onboard computer systems to monitor (sensors, battery, etc.), control (speeds, altitude, position, etc.), and communicate (control, telemetry, etc.).

**Onboard guidance and navigation equipment** – The UAS can operate semi autonomously or autonomously; before autonomous flight is allowed to be executed the Pilot in Command must initiate and complete the takeoff sequence then place the helicopter in GPS Mode. In the event GPS satellite coverage is not sufficient or degrades, the Pilot in Command can immediately take control with Manual flight.

**Frequency Allocations** – 900 MHz, 2.4 GHz, 5.8 GHz

**Flight termination link** – to prevent a “fly away” or other potentially dangerous situation a flight termination link is available to the operator at the control system.

**Takeoff and Landing** – The Draganfly X4P, Draganflyer X4ES, Draganflyer X6 and Draganflyer Guardian has vertical lift autonomous launch. For launch procedures the UAS will takeoff and hover approximately 3-4 feet until further inputs are made by the Pilot in Command. Horizontal position of the UAS is controlled by the Pilot in Command using the Right joystick.

**Navigation System** – Operation of the helicopter for navigational purposes is done by the pilot keeping the helicopter in direct line of sight at all time. Autonomous flight (grid pattern and points of interest) is available if a flight route has been uploaded to the UAS prior to takeoff. Autonomous flight can only executed once the pilot is satisfied the helicopter is operating correctly and the autonomous flight route is safe to execute. Once the autonomous route is completed the pilot resumes control for continued flight or landing. At any time during the autonomous flight the pilot is able to abort the process and resume control of the UAS.

**Redundant Systems** – The UAS combines the input from a multitude of sensors. Even though the data from all sensors is required for optimal system performance, dependent on the sensor, a single sensor malfunction is likely to result in degraded performance rather than leading to a fatal response.

### **Emergency Procedures and System Failures**

**Sensor Failure** – Failure of onboard flight instruments/sensors will degrade the UAS performance and will result in either a fatal critical response or a non-fatal critical response, depending on the nature and severity. If the UAS becomes unstable due to sensor failure, this may result in loss of performance or features but still allow for stable Pilot in Command flight, an automated landing or in extreme cases a fatal response.

**Motor Failure** – This will cause a fatal response in the UAS flight performance if one or more motors fails.

**Airframe Failure** – Depending on the nature and severity, this may result in decreased flight performance or a fatal response.

**Navigation System Failure** – In a navigation system failure, degraded GPS will result in a response warning to the pilot where-by the system would be flown in manual mode. This will result in degraded GPS position performance, manual Pilot in Command flight will not be effected.

**Power Failure** – A complete battery failure which results in power loss to the UAS will result in a fatal response.

**Low Battery Condition** – Operator will be alerted of a low battery condition and will land the UAS as soon as able.

**Critical Battery Condition** – Operator will be alerted of a Critical low battery condition and will land the UAS as soon as able, the UAS will begin to descend at a controlled rate.

**Line of Sight Loss** – All flight operations will be conducted with the UAS within visual sight of the pilot. If the pilot's view becomes obstructed and line of sight is lost, the pilot may instruct the UAS to hover in place until line of sight is re-established, to return to the takeoff position, or to land at the current position.

### **Security**

The system and communication links are encrypted by the manufacturer's proprietary software.

## **APPENDIX C**

### **SUMMARY OF DRAGANFLYSECTION 333 EXEMPTION REQUEST**

Draganfly hereby provides pursuant to Part 11 a summary of its exemption application to allow commercial operation of the Draganfly X4P, Draganflyer X4ES, Draganflyer X6 and Draganflyer Guardian small unmanned systems in market research, precision aerial survey work, mapping and inspections. An exemption is requested from the following regulations:

14 C.F.R. Part 21;  
14 C.F.R. 45.23(b);  
14 C.F.R. 61.113(a) & (b);  
14 C.F.R. 61.133(a);  
14 C.F.R. 91.7(a);  
14 C.F.R. 91.9(b)(2) & (c);  
14 C.F.R. 91.103;  
14 C.F.R. 91.109(a);  
14 C.F.R. 91.119;  
14 C.F.R. 91.151(a);  
14 C.F.R. 91.203(a) & (b);  
14 C.F.R. 91.405(a);  
14 C.F.R. 91.407(a)(1);  
14 C.F.R. 91.409(a)(2);  
14 C.F.R. 91.417(a).

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