



6 December 2014

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

**RE: Exemption request under Section 333 of the FAA Modernization and Reform Act of 2012 and 14 C.F.R. Part 11**

Dear Sir or Madam:

Pursuant to Section 333 of the FAA Modernization and Reform Act of 2012 (FMRA) and 14 C.F.R. Part 11, TradeCraft LLC requests exemptions from several provisions of the Federal Aviation Regulations (FAR), specifically portions of 14 C.F.R. Parts 45, 61, and 91 to allow among other things, commercial operations of its DJI Inspire 1 small Unmanned Aircraft System (sUAS) in the Continental United States (CONUS) by individuals who have FAA Commercial Rotorcraft Instrument certificates and have completed TradeCraft's training program for commercial operation of sUAS.

The Inspire is an electric powered rotary wing sUAS that is capable of transmitting live airborne video images and location information to a Ground Control Station (GCS). The Inspire stores the photographs and data on board and makes them available for download after completion of the flight. The Inspire is 22 in x 22 in x 8 in and weighs 6.4 pounds, well under the 55 lbs mandated in the FMRA. The Inspire can conduct hovering flight and has a maximum cruising speed of 42 knots. It is battery powered, has a flight endurance of 22 minutes and can operate in temperatures ranging from 0° to 40° C. The Inspire's omni-directional antenna has a range of 2.1 km and operates in the 2.420 – 2.483 GHz frequency range.

DJI is a leader in the sUAS rotorcraft market. There are thousands of DJI products being used in the recreational and hobby industry. The Inspire can operate safely in the National Airspace System (NAS), without posing a threat to national security, by operating in accordance with the requirements discussed herein. Additionally, TradeCraft will utilize commercial rated pilots with extensive sUAS experience that will set them apart from most 333 applicants.

The Inspire's capabilities, along with TradeCraft personnel's prior experience conducting sUAS training, maintenance, and operations within the Department of Defense make it ideally suited to conduct commercial operations such as agriculture,

aerial surveying, and aerial photography within Visual Line of Sight (VLOS). Use of the Inspire reduces the need to operate manned aircraft, decreasing the risk to the pilot, crew, and those on the ground as the Inspire is carried to the area of operations and not flown there.

As a result of the Inspire's size, weight, maximum speed, operational capability, and safety record the Inspire does not create a hazard to users of the NAS or the public. Neither does it pose a threat to national security. The petitioner states that, given the clear direction in Section 333, the strong equivalent level of safety surrounding the proposed operations, and the significant public benefit, including enhanced safety, reduction in environmental impacts, including reduced emissions associated with allowing UAS. Therefore, the FAA should grant TradeCraft the requested exemptions. Alternatively, if the FAA finds that modification of TradeCraft application is required for safe operation of the Inspire in the NAS, TradeCraft requests that the FAA delineate the required modifications and either process TradeCraft application as if the modifications were already made or allow TradeCraft to amend its application to incorporate the FAA's findings.

The name and email address of the applicant are:

TradeCraft LLC  
email: [tradecraftuas@gmail.com](mailto:tradecraftuas@gmail.com)

Regulations from which the exemption is requested:

14 C.F.R Part 21  
14 C.F.R. 45.23 (b)  
14 C.F.R. 91.7 (a)  
14 C.F.R. 91.9 (b) (2)  
14 C.F.R. 91.103  
14 C.F.R. 91.109  
14 C.F.R. 91.119  
14 C.F.R. 91.121  
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. 407 (a) (1)  
14 C.F.R. 409 (a) (2)  
14 C.F.R. 417 (a) & (b)

This exemption application is expressly submitted to fulfill Congress goal in passing Section 333 (a) through (c) of the Reform Act. This law directs the Secretary of Transportation to consider whether certain unmanned aircraft systems 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 UAS 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 UAS size, weight, speed, and operational capability;
- Operation of the UAS in close proximity to airports and populated areas; and
- Operation of the UAS within visual line of sight of the operator.

Reform Act § 333 (a). Lastly, if the Secretary determines that such vehicles “may operate in the national airspace system, the Secretary shall establish requirements for the safe operation of such aircraft in the national airspace system.” Id. §333(c) (emphasis added)<sup>1</sup>

The FRMA expressly grants the FAA the authority to issue exemptions. This statutory authority by its terms includes exempting civil aircraft, as the term is defined under §40101 of the Act that includes sUAS, from the requirement that all civil aircraft must have a current airworthiness certificate.

The Administrator may grant an exemption from a requirement of a regulation prescribed under subsection (a) or (b) of this section or any sections 44702-44716 of this title if the Administrator finds the exemption in the public interest. 49 U.S.C. §44701(f) See also 49U.S.C. §44711(a); 49 U.S.C. 44704; 14 C.F.R. §91.203 (a) (1).

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<sup>1</sup> Applicant interprets this provision to place the duty on the Administrator to not only process applications for exemptions under section 333, but for the Administrator to craft conditions for the operation of the UAS, if it should be determined that the conditions set fourth herein do not fulfill the statutory requirements for approval.

TradeCraft LLC sUAS are rotorcraft, weighing 55 lbs. or less, including payload. They operate under normal conditions at a speed of no more than 50 knots and have the capability to hover and, move in the vertical and horizontal plane simultaneously. They will operate within line of sight and will only operate under strict risk mitigation guidelines as outlined in the TradeCraft LLC Commercial sUAS Flight Operations Procedures (hereinafter “the Manual”)<sup>2</sup>. Such operations will insure that the sUAS will “not create a hazard to users of the national airspace system or the public”<sup>3</sup>

Given the small size of the sUAS involved and the restricted environment within which they will operate, the applicant falls squarely within the zone of safety (an equivalent level of safety) in which Congress envisioned that the FAA must, by exemption, allow commercial operations of UAS to commence immediately. Also, due to the size of the UAS and the areas in which the relevant sUAS will operate, approval of the application presents no national security issue. Given the clear direction in Section 333 of the Reform Act, the authority contained 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, reduction in environmental impacts, including reduced emissions associated with allowing sUAS for commercial operations, the grant requested exemptions is in the public interest. Accordingly, the applicant respectfully requests that FAA grant the requested exemption without delay.

### **Airworthiness**

The Inspire is safe and fit for operation in the NAS under the conditions listed herein. In support of this application, TradeCraft LLC provides the following documents, the Inspire Flight and Maintenance Manual and the TradeCraft LLC Commercial sUAS Flight Operations Procedures.

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<sup>2</sup> Applicant provides this manual as a Confidential document under 14 C.F.R. 11.35 (b) as the entire manual contains proprietary information that the applicant has not and will not share with others. The manual contains operating conditions and procedures that are not available to the public and are protected from release under the Freedom of Information Act 5 USC 552 et.seq.

<sup>3</sup> Reform Act Section 333 (b)

## Mandatory Operating Conditions

TradeCraft LLC proposes that the grant of the exemption be subject to the following mandatory conditions which are based upon operating conditions set forth for operation of sUAS for commercial use pursuant to Certificates of Waiver or Authorization, with additional restrictions.

- Class III Flight Physical
- Aircraft will not exceed 42 knots
- Aircraft 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
- Pilot in Command will file a NOTAM for each flight

## Pilot Qualifications

Tradecraft proposes the following sUAS pilots:

Pilot in Command	Qualifications	Hours
Pilot 1 FAA Certificate: 3233322	FAA Commercial Instrument Rotary Wing Army sUAS master trainer graduate	Manned: 2683 Unmanned: 123 203 fixed wing launch/recovery 112 rotary wing launch/ recovery
Pilot 2 FAA Certificate: 3116078	FAA Commercial Instrument Rotary Wing	Manned: 363

## Aircraft Information and Emergency Procedures

The Inspire is an inherently stable, lightweight aircraft that weighs 6.4 lbs. Moreover, although the aircraft can be configured to give the pilot full control of the aircraft and payload during flight, the Inspire has an advanced autopilot that flies the aircraft, managing altitude and flight path within the intended flight envelope at all times when the that flight mode is engaged. The autopilot limits maneuvering to simple airspeed, altitude, and turn rate changes. These limits are hard coded into the autopilot and define the aircraft's normal flight operating envelope. The autopilot manages, pitch, roll, yaw and collective throttle to maintain target airspeed, target turn rate, and target altitude. All flight modes utilize GPS and in the event of unintended input the aircraft can be put into an operator controlled flight mode that allows for the aircraft to come to an immediate hover. Turn rates and airspeeds are limited by the autopilot and do not allow commands that are outside of the normal operating envelope.

Equally significant, the Inspire is comprised of composite materials, has energy absorbing landing gear that reduce damage in the event of a hard landing and is composed of carbon fiber and plastic components.

The DJI Inspire has additional safety features to facilitate safe integration into the NAS. The Inspire GCS software incorporates “Flight Restriction” areas around all B, C, and D airports. These flight restriction areas have different levels of notification, from warnings on the Ground Control Station, to altitude restrictions and finally not allowing the start of the motors.

Another feature that is pilot defined, allows for altitude and distance limits to be set on the GCS. TradeCraft believes this is a key safety attribute that will allow seamless integration into the NAS and compliance with all FAA regulations.

The Inspire has three failsafe emergency procedures:

**Loss of Communication:** In the event the communication link with the operators ground control station is lost, the Inspire enters return to home mode after three seconds of transmission loss. The aircraft climbs to a Pilot defined altitude based on obstacle height. It then returns to the home waypoint, hovers for 15 seconds while trying to establish connection. The aircraft conducts a controlled landing then shuts off the motors if connection is not reestablished.

**Low Battery:** The low battery emergency procedure is triggered when the DJI smart battery is depleted to a point that may affect the safe return of the aircraft; the Pilot in Command will Land as Soon as Possible. The thresholds for these warnings are automatically determined based on the current aircraft altitude and its distance from the Home point.

**Loss of GPS:** A loss of GPS while in guidance mode will cause the aircraft to hover using the onboard altimeter. This will allow the Pilot in Command to land the aircraft as soon as possible. Additionally, the aircraft utilizes an “optical flow” sensor that uses ultrasonic and image data to help the aircraft identify its position. This allows for the aircraft to hover when GPS is lost.

## **Specific Exemption Requests and Equivalent Level of Safety Showings**

### **14 C.F.R. § 45.23(b) – Display of marks; general**

The regulation requires:

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 nor more than 6 inches high, the words "limited," "restricted," "light-sport," "experimental," or "provisional," as applicable.

Even though the UAS will have no airworthiness certificate, an exemption may be needed as the UAS will have no entrance to the cabin, cockpit or pilot station on which the word "Restricted" can be placed as required by this provision. Two-inch lettering also is not possible given the overall size of the Inspire. TradeCraft LLC, therefore, requests an exemption to display, with one-inch lettering the word "Restricted" on the fuselage in compliance with §45.299(f).

The equivalent level of safety will be achieved by having the Inspire marked with one inch lettering on its fuselage because the pilot, observer, and others working with the sUAS will have the identification of the aircraft as "Restricted". The FAA has issued similar exemptions to this regulation, including to Pioneer Hi-Bred International, Inc., Exemption No. 10810; Raytheon Missile Systems/Advanced Programs, Exemption Nos. 10167 and 8738; and Trimble Navigation Limited, Exemptions No. 10700 and 11042.

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

Sections 91.7 (a) and (b) prohibit operation of a civil aircraft unless it is in airworthy condition. TradeCraft LLC requests an exemption from this regulation because the Inspire would not operate with an airworthiness certificate under the proposal set forth in this filing. Given the size of the aircraft and requirements contained in the Manual for maintenance and use of safety check lists prior to each flight, as set forth in the operators manual, an equivalent level of safety will be provided.

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

Section 91.109 (a) provides 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 Inspire is a remotely piloted aircraft, and, by design, it does not have fully functional dual controls. Flight control is accomplished through the use of a control box that communicates with the aircraft via radio communications. Completing instruction through the TradeCraft training program will ensure an equivalent level of safety.

The FAA has approved exemptions for flight training without fully functional dual controls for a number of aircraft and for flight instruction in experimental aircraft. See *Exemption Nos. 5778K and 9862A*.

## **14 C.F.R § 91.119 Minimum Safe Altitudes**

Section 91.119 establishes safe altitudes for operation of civil aircraft. Specifically, Section 91.119 (c) limits aircraft 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 aircraft may not be operated closer than 500 feet to any person vessel, vehicle, or structure.

As set forth herein, the Inspire will never operate at higher than 400 feet AGL. Because agriculture, aerial survey work, and aerial imagery must be accomplished at relatively low altitudes, i.e. 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 the Inspire is built. Also, no flight will be taken without the permission of the land owner or the party controlling the land. With advance notice to the landowner, all affected individuals will be aware of agriculture, survey, and aerial imagery. Compared to similar operations conducted with conventional aircraft or rotorcraft, which weigh thousands of pounds and carry flammable fuel, any risk associated with these operations will be far less than those currently allowed with such conventional aircraft operating at or below 500 feet AGL.

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

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

The Inspire’s battery provides 22 minutes of powered flight. Without an exemption from 14 C.F.R. §91.151, the Inspire’s flights would only be allowed to fly for 2 minutes. Given the limitations on its proposed operations and the location of those proposed operations, a lesser reserve for flight in VFR conditions is reasonable.

TradeCraft LLC believes that an exemption from 14 C.F.R. § 91.151 (a) is safe and consistent with the scope of a prior exemption. See Exemption 10673 (allowing Lockheed Martin Corporation to operate without compliance with 91.151 (a)). Operating the Inspire sUAS without 20 minutes of reserve fuel does not engender the type of risks that Section 91.151 (a) was meant to prevent. Given its weight and construction material, the risks are less than contemplated by the current regulation.

TradeCraft LLC believes that an equivalent level of safety can be achieved by maintaining 3 minutes of reserve fuel, which, allowing 19 minutes of flight time, would be more than adequate to return the UAS to its planned landing zone from anywhere in its visual line of site operating area.

Similar exemptions have been granted to others, including Exemptions 2689F, 5745, 10673, and 10808.

**14 C.F.R § 91.405 (a); 91.407 (a) (1); 91.409 (a) (2); 91.417 (a): Maintenance inspections**

Section 91.405 (a) requires that an aircraft operator or owner “[s]hall have that aircraft inspect as prescribed in subpart E of this part and shall between required inspections, excepts 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 issuance of an air worthiness certificate. Section 91.417 (a) requires that an owner or operator keep records showing certain maintenance work that has been accomplished by certificated mechanics, under Part 43, or licensed pilots and records of approval of the aircraft for return to service.

Maintenance of the Inspire 1 will be accomplished by TradeCraft LLC pilots pursuant to the manuals provided by DJI. An equivalent level of safety will be achieved because the Inspire is small in size, will operate only in predetermined areas, and is not a complex mechanical device. With the combined use of the DJI Inspire1 operator’s and maintenance manual and TradeCraft LLC Commercial sUAS Flight Operations Procedures, the Pilot in Command of the Inspire will ensure that it is in safe working order prior to initiating flight, TradeCraft LLC pilots will perform required maintenance, and keep a log of any maintenance that is performed. Moreover, the Pilot in Command, prior to all flights will ensure the aircraft is safe for flight, which will provide an equivalent level of safety.

## Federal Register Summary

Pursuant to 14 C.F.R. § 11.81(f), the following summary is provided for publication in the Federal Register, should the FAA determine that publication is needed:

Docket No.: No. FAA-2014-  
Petitioner: TradeCraft LLC

Section of 14 CFR: 14 C.F.R. § 45.23(b), 14 C.F.R. § 61.113(a) and (b), 14 C.F.R. § 61.133(a), 14 C.F.R. § 91.7(a) and (b), 14 C.F.R. § 91.109(a), 14 C.F.R. § 91.119, 14 C.F.R. § 91.151(a), 14 C.F.R. § 91.405(a), 14 C.F.R. § 91.407(a)(1), 14 C.F.R. § 91.409(a)(2), 14 C.F.R. § 91.417(a).

Description of Relief Sought: TradeCraft LLC is seeking an exemption to conduct commercial agriculture, aerial survey, and imagery operations using a small Unmanned Aircraft System (55lbs or less) in areas of the continental United States.

Based upon the foregoing, TradeCraft LLC requests that the FAA grant it the necessary exemptions under Section 333 of the FAA Reform ACT and 49 U.S.C. §44701(f) of the Federal Aviation Act as requested herein to allow commercial operations of the Inspire within the continental United States and its territories.

Sincerely,

TradeCraft LLC