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**BY HAND**

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Washington, D.C. 20590

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WASHINGTON, D.C. 20590

**Re: Petition of Oceaneering International, Inc. for Exemption**

Pursuant to 14 C.F.R. Part 11, Oceaneering International, Inc. ("OI" or "Petitioner") hereby applies for an exemption in order to conduct commercial use operations with the Wookong DJI S800 and Aeronavics X4 Titanium unmanned aerial systems ("UAS"). In accordance with the requirements of the Federal Aviation Administration ("FAA"), Petitioner's UAS operations have been designed to achieve a level of safety equivalent to that provided by the FAA regulations from which an exemption is requested. In support of its exemption request, OI provides the following information.

**Petitioner**

Established over 50 years ago, OI has a long history of deep-sea safety and inspection operations using remotely-piloted vehicles. These operations have largely been conducted in support of the offshore oil and gas industry, with a focus on deepwater applications. OI's operations have included drilling platform inspections, construction of deep-sea hardware and distribution systems, the installation of sub-sea blow-out prevention devices, Navy submarine rescue and recompression systems, and full service ship repair for the U.S. Government including submarines. Through these activities, OI has accumulated substantial expertise in the safe and reliable operation of underwater remotely-piloted vehicles for commercial applications. OI is now proposing to expand its operation of remotely-piloted devices to include the commercial use of small UAS aircraft for various aerial inspection and surveying purposes.

**Proposed Commercial Uses**

OI proposes to use the Wookong DJI S800 and Aeronavics X4 Titanium small UAS aircraft for multiple commercial applications, including safety inspections and aerial surveying of the following remote or difficult-to-access facilities:

- Oil and Gas platforms
- Flare booms/stacks- both onshore and offshore
- Refineries and processing stations
- Pipelines
- Power lines
- Bridges and infrastructure including rail bridges
- Wind turbines
- Solar farms.

OI also envisions UAS operations in support of emergency response activities on behalf of the National Transportation Safety Board, the Department of the Interior's Bureau of Safety and Environmental Enforcement, the U.S. Coast Guard, and any other federal or state government agency which may require its services and personnel.

All of OI's proposed UAS operations are intended to facilitate safety inspections and aerial surveying in areas where the performance of those functions using current methods involves considerable expense and/or a substantial risk of injury. Many of these functions must be performed in hazardous environments. Others may be performed much more efficiently by an unmanned aircraft with the ability to hover and capture images at close range. The commercial UAS applications which OI proposes will therefore result in a significant enhancement of safety, by reducing the risks associated with current inspection methods and enhancing current inspection techniques.

#### **Proposed UAS Aircraft**

OI plans to conduct commercial UAS operations with the Wookong DJI S800 aircraft and Aeronavics X4 Titanium. The DJI S800 is a small UAS with a maximum takeoff weight of 15.4 lbs. The X4 Titanium is a small UAS with a maximum takeoff weight of 28.6 lbs. At all times while conducting commercial operations, OI will operate the DJI S800 and Aeronavics X4 Titanium under line-of-sight conditions with a hands-on control system, i.e., dual gimbals, in response to commands from an OI employee with specialized flight training; neither aircraft will perform commercial operations autonomously or in accordance with a pre-programmed flight plan. The DJI S800 has six battery-powered motors and the Aeronavics X4 has eight. If one of the motors on either aircraft experiences a power failure, the DJI S800 and the Aeronavics X4 will hover in place, orbiting around the motor that has failed.

In the event that the signal between the control system and the DJI S800 or the Aeronavics X4 Titanium is lost or disrupted, both aircraft are designed to hover for approximately 5 seconds attempting to regain the data link. If the UAS is equipped with a GPS communication system and is unable to re-establish contact with the control station, it will rely on an auto-pilot feature that returns the UAS aircraft to the home point via the original flight path from the launch point. This will eliminate "fly-away" incidents and other flight deviations that are known to occur with other types of UAS aircraft.

Both the S800 and the X4 have been used extensively in Europe and the United Kingdom for commercial cinematography and survey work due to both platforms being stable and simple to operate. During the past Winter Olympics, the X4 was the primary system used for filming most of the events

from the air. Both systems have substantial commercial operating experience outside the U.S. and are known for being rugged with a history of reliability in flight.

### Operating Conditions

OI will conduct commercial operations with the DJI S800 and Aeronavics X4 Titanium only in accordance with a highly-detailed set of safeguards governing all phases of flight operations. OI employees responsible for UAS operations will always place a priority upon minimizing risk to personnel, equipment, assets and the environment. To ensure the highest level of safety, UAS flight operations will only be conducted after an extensive safety briefing (including OI and customer personnel) and a risk analysis have been conducted.

All UAS flights operated by OI will be conducted by a minimum of three operational personnel, including a system supervisor. No flights may be initiated unless a preflight checklist has been completed and signed by all those OI employees performing the checks. The checklist procedure includes a detailed inspection of the DJI S800 and Aeronavics X4 Titanium prior to the initiation of any operations. Attached as Exhibit A to this exemption petition is a copy of OI's pre- and post-flight checklist.<sup>1</sup> Any UAS operations to be conducted at an altitude of less than ten feet require the prior approval of OI supervisory personnel. Most importantly from a safety perspective, operations directly overhead OI and customer personnel are not permitted as the UAS aircraft must be operated at all times at no more than a 30 degree oblique to any personnel.

There are several additional mandates that OI employees must observe in connection with all commercial operations with the DJI S800 and Aeronavics X4 Titanium, including the following:

- No flights through an established Air Defense Identification Zone (ADIZ)
- UAS flights shall not exceed 400 feet above ground or above the sea level per FAA Advisory Circular 91-57
- All flights will be conducted in Class G airspace
- All flights will be conducted within line-of-sight of UAS operator
- All flights will be conducted in accordance with Class G airspace visibility requirements
- Wind speed shall not exceed 25 knots
- UAS operations will be conducted during daylight hours
- A Notice to Airmen (NOTAM) will be filed with the FAA prior to each UAS operation
- All OI crews will have an air-air radio system for communication with low flying air traffic in the area surrounding UAS operations (programmed with 123.025 common Air-Air Frequency, and the local frequency for the area of operation)
- All OI crews will have an up to date Helicopter Safety Advisory Conference Air Frequency card

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<sup>1</sup> All exhibits to this exemption petition are submitted to the FAA with a request for confidential treatment as they constitute commercially-sensitive proprietary data.

At no point in time will OI's UAS aircraft be allowed to share airspace with commercial aircraft. Prior to conducting operations within three miles from any airport runway, OI will notify the airport operator or the airport tower, as the case may be, in compliance with FAA Advisory Circular 91-57. OI employees are instructed to terminate any UAS operations when an approaching commercial aircraft is within five nautical miles.

As Exhibit B to this exemption petition, OI is submitting a copy of its *General Procedure for the Operation of RAV Systems*.

### Operator Requirements

OI's commercial UAS operations will build on its years of experience as an underwater operator of remotely-piloted vehicles. Only OI employees who have undergone and successfully completed a rigorous competency assessment evaluation will be selected to operate the DJI S800 and Aeronavics X4 Titanium.<sup>2</sup> Operators must demonstrate not only a superior knowledge of the technical issues associated with UAS systems, including the full range of the capabilities and limitations of the DJI S800 and Aeronavics X4 aircraft, but also must show sound piloting techniques and the ability to navigate around structures. In order to retain their status, OI employees conducting UAS commercial operations must enforce compliance with the company's policy of "working under the more stringent rule."

Some of the OI employees selected to be operators of the DJI S800 and Aeronavics X4 have previous significant experience as the operators of undersea remotely-piloted vehicles. In addition to their other qualifications, OI employees who operate the DJI S800 and Aeronavics X4 will undergo an extensive program of simulator training as well as hands on flight training in a simulated inspection environment. Simulator training will allow these employees to gain experience with the specific flight characteristics of the DJI S800 and Aeronavics X4 prior to any actual commercial operations.

The following requirements will apply to any commercial UAS operations conducted by OI:

- A pilot-in-command (PIC) will be designated at all times for each flight
- The PIC will be directly responsible for, and have final authority over the operation of the UAS
- The PIC will not perform concurrent duties as the visual observer
- The PIC will be qualified on the DJI S800 aircraft and Aeronavics X4 Titanium
- The PIC will exercise control over the UAS as it will not maneuver autonomously.

Given their experience with remotely-piloted vehicles, the amount of required simulator training, and the operational procedures applicable to OI employees operating the DJI S800 and Aeronavics X4 Titanium for commercial purposes, OI PICs should not be required to hold an FAA pilot

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<sup>2</sup> A copy of OI's Competency Assessment Scheme is attached as Exhibit C to this exemption petition.

certificate. The commercial UAS operations by OI will resemble the circumstances under which the FAA will issue a Certificate of Waiver or Authorization to UAS operators without requiring pilot certification. All operations will be in Class G airspace, conducted during daylight hours under visual line-of-sight flight procedures no more than one-half nautical mile laterally from the OI PIC. All OI PICs also will hold, at a minimum, a valid FAA second-class medical certificate. In accordance with the qualifications established by the FAA for the pilots of UAS aircraft operating pursuant to a COA under similar flight conditions, OI's PICs should therefore be deemed qualified once they have successfully completed an FAA private pilot ground instruction course and passed the FAA Private Pilot examination or an FAA-recognized equivalent.<sup>3</sup>

The manager for OI's commercial UAS operations is Bryan Foster, a recognized UAS industry expert. Mr. Foster has over thirty years of experience building, flying and maintaining remotely-piloted systems, including 12 years as an instructor and 5 years of utilizing remotely piloted systems while in the U.S. Army Military Intelligence Corps. He has over 20,000 hours of experience operating remotely-piloted vehicles, and conducts between 500-750 UAS flights per year. This knowledge and experience has been incorporated into the training, flight procedures and maintenance recordkeeping developed for OI's commercial UAS operations.

### **Exemption Request**

OI is requesting an exemption from FAA regulations in order to conduct commercial UAS operations with a DJI S800 and Aeronavics X4 aircraft. Attached is a list of each FAA regulation from which OI is requesting an exemption and the justification for each such exemption. In accordance with FAA requirements, in the case of each requested exemption, OI is suggesting alternate methods of compliance that will provide a level of safety equivalent to that provided by the regulation from which an exemption is sought.

OI's request is consistent with the FAA's policies for the granting of exemptions. It also is in accordance with the direction provided by Congress in Section 333 of the FAA Modernization and Reform Act of 2012 ("FAA Modernization Act"), instructing the Secretary of Transportation to determine which UAS aircraft operating "within visual line of sight" may be integrated into the National Airspace System ("NAS") before the development of regulations governing the commercial use of other types of UAS aircraft.<sup>4</sup> Because of the relatively small size, light weight, speed and operational capabilities of the DJI S800 and Aeronavics X4, as well as the strict visual line of sight protocols under which these UAS will be operated by OI, the DJI S800 and Aeronavics X4 aircraft may be safely operated without creating a hazard to other users of the NAS or a threat to national security. The DJI S800 and Aeronavics X4, operated as proposed herein, is therefore the type of UAS that ought to be the subject of operational

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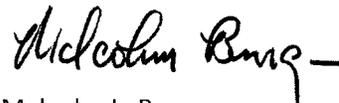
<sup>3</sup> See FAA Notice 8900.227 Unmanned Aircraft Systems Operational Approval, pp. 20-21.

<sup>4</sup> See, Pub. Law 112-95, 126 Stat. 11, § 333.

approval by the Department of Transportation prior to the issuance of regulations governing the operation of small unmanned aircraft systems generally.

The UAS operations to be conducted by OI pursuant to the requested exemption offer significant safety enhancements over current methods of providing the same commercial services. OI's DJI S800 and Aeronavics X4 aircraft have the ability to fly into difficult-to-access areas that present substantial hazards to other methods of data collection, including those involving close-up inspections by human beings. In evaluating OI's request for an exemption, the FAA should consider not just the ability of OI to achieve a level of safety equivalent to that afforded by the regulations from which an exemption is sought, but also the safety benefits to be derived from using UAS aircraft for services now performed by other means at substantially greater risk to human life. As demonstrated below, the FAA can allow these benefits to be realized without compromising its obligation to promote the highest level of aviation safety.

Respectfully submitted,



Malcolm L. Bengé

Counsel for  
Oceaneering International, Inc.

**OCEANEERING INTERNATIONAL, INC. – EXEMPTION REQUEST**

Oceaneering International, Inc. requests an exemption from the following regulations of the Federal Aviation Administration:

**1. 14 C.F.R. § 45.23(b) – Display of marks; general**

This regulation requires the display of an “N” registration mark on any U.S.-registered aircraft. Additional markings are required for limited or restricted category aircraft, experimental aircraft or provisionally-certificated aircraft on the entrance to the cabin, cockpit or pilot station.

Equivalent level of safety analysis: The FAA has yet to indicate whether UAS aircraft will be subject to its aircraft registration requirements. The FAA’s *Integration of Civil Unmanned Aircraft Systems in the National Airspace System (NAS) Roadmap* published in November 2013 is silent on this point. As UAS aircraft are not currently required to be registered with the FAA, it is not necessary for OI’s UAS aircraft to be marked with an “N” registration number.

The surface area of the DJI S800 and Aeronavics X4 is not large enough to contain any of the markings required by the FAA for limited or restricted category aircraft, experimental aircraft or provisionally-certificated aircraft. One of the purposes served by these markings is to caution passengers onboard such an aircraft (including any pilot) that it does not meet all of the FAA’s requirements for a standard category certificate of airworthiness. As the DJI S800 and Aeronavics X4 will not carry any passengers, and otherwise will operate in accordance with strictly-controlled flight parameters, the absence of such a warning on the DJI S800 and Aeronavics X4 will not result in any reduction in the overall safety of the operation.

OI is willing to include any markings that may be required by the FAA in connection with its commercial UAS operations, with the understanding that the surface area of the DJI S800 and Aeronavics X4 will not permit lettering that is larger than  $\frac{3}{4}$  - one inch in height. In addition, if requested by the FAA, OI can place markings on each of the control stations used to operate OI’s UAS aircraft.

**2. 14 C.F.R. Part 21, Subpart H: Airworthiness Certificates  
14 C.F.R. § 91.203: Civil Aircraft: Certifications Required**

Under 14 C.F.R. § 91.203, all U.S.-registered aircraft are required to have a certificate of airworthiness issued by the FAA. Part 21, Subpart H of the FAA’s regulations establishes the procedural requirements for the issuance of airworthiness certificates by the FAA.

Equivalent level of safety analysis: The strict operational limitations under which OI will conduct flights for commercial UAS applications (e.g., daylight operations, use of Class G airspace, all flights within line-of-sight of the operator) are at least as restrictive as the limitations that apply to the operation of limited or restricted category, experimental or provisionally-certificated aircraft. The DJI S800 and

Aeronavics X4 do not carry a pilot or any other passengers and their small size and electric motor reduce the danger that any collisions with the ground or structures will involve anything more than the loss of the DJI S800 and Aeronavics X4. Automatic descent of the DJI S800 and Aeronavics X4 upon loss of the data link with its control station eliminates the potential for “fly away” incidents. The concerns behind the need for the certification of an aircraft’s airworthiness are mitigated by the DJI S800’s and Aeronavics X4’s limited operational range, small dimensions and the use of lightweight materials in their construction, all of which reduce the risk of damage to surrounding structures.

3. **14 C.F.R. § 61.133(a): Commercial Pilot Privileges and Limitations**

FAA regulations generally require that an aircraft may engage in operations for compensation or hire only if it is flown by a person holding a commercial pilot certificate. 14 C.F.R. § 61.133(a). OI submits that hands-on experience with the flight characteristics of the DJI S800 and the Aeronavics X4 and UAS aircraft generally are a far more effective guarantee of flight safety than a commercial pilot certificate would be in connection with OI’s proposed commercial UAS services.

Equivalent level of safety analysis. A joy stick-operated UAS, such as the DJI S800 and Aeronavics X4, has flight characteristics substantially different from manned aircraft. The propulsion system and control surfaces on the DJI S800 and Aeronavics X4 respond to inputs that are transmitted remotely from the joy stick located on the control station. A commercially-licensed pilot would need to “unlearn” almost all the principles of flying a manned aircraft in order to successfully operate the DJI S800 and Aeronavics X4. On the other hand, an operator who had done all his or her “flying” on the DJI S800 and Aeronavics X4, with no previous flight experience with manned aircraft, would know no other type of airborne system but would be intimately familiar with maneuvering the DJI S800 and Aeronavics X4.

OI therefore emphasizes UAS training and flight experience for those employees who will operate the DJI S800 and Aeronavics X4 for commercial services. An OI employee will not be able to act as an operator of DJI S800 and Aeronavics X4 commercial services until successfully completing a minimum of 25 hours of UAS training flights (150 ten-minute flights). Successive levels of responsibility for UAS operations require additional hours of flight experience, as follows:

<u>Position</u>	<u>Minimum Required Flight Experience</u>
Technician	25 hours of operations (150 ten-minute flights)
Pilot	75 hours of operations (450 ten-minute flights)
Senior Pilot	150 hours of operations (900 ten-minute flights)
Supervisor	250 hours of operations (1500 ten-minute flights)
Superintendent	400 hours of operations (2400 ten-minute flights)

The above-listed hours will be recorded in ASA-SP-30 pilot logbooks subject to inspection by FAA personnel at any time. Attached as Exhibit D is a summary of OI’s training program for UAS operators.

By requiring extensive flight experience with the DJI S800 and Aeronavics X4 prior to conducting commercial operations, OI employees will have a better grasp of the handling of that aircraft and the available options in the event of an emergency than they would by holding a commercial pilot certificate for an entirely different type of airborne system.

OI also conducts extensive simulator training and flight training for each of its DJI S800 and Aeronavics X4 operators. Simulator training is in addition to the hands-on training experience required of each OI employee prior to conducting commercial operations with the DJI S800 and Aeronavics X4 aircraft. The amount of training – under simulator conditions and hands-on – that OI employees must complete before conducting commercial UAS services provides a level of experience specific to UAS flight operations that cannot be duplicated merely by holding a commercial pilot certificate. The OI operators of the DJI S800 and Aeronavics X4 will thus be better prepared to conduct UAS flights than a commercially-licensed pilot who has never operated a UAS aircraft and is unfamiliar with its flight characteristics.

In addition to UAS operational experience and simulator flight training, OI also will require that before becoming a UAS operator an employee must complete an FAA-approved private pilot ground instruction course and have successfully passed the FAA Private Pilot written examination or an FAA-recognized equivalent. Operators of OI UAS aircraft will therefore receive instruction in aeronautical navigation, meteorology and aviation regulations prior to conducting commercial UAS operations.

**4. 14 C.F.R. § 91.7(a): Civil Aircraft Airworthiness.**

This regulation prohibits the operation of an aircraft unless it is in an airworthy condition. The DJI S800 and Aeronavics X4 will not be the subject of an airworthiness certification process prior to their use by OI for commercial UAS services.

Equivalent level of safety analysis. The strict operational limitations under which OI will conduct flights for commercial UAS applications (e.g., daylight operations, use of Class G airspace, all flights within line-of-sight of the operator) are at least as restrictive as the limitations that apply to the operation of limited or restricted category, experimental or provisionally-certificated aircraft. The DJI S800 and Aeronavics X4 do not carry a pilot or any other passengers and their small size and electric motor reduce the danger that any collisions with the ground or structures will involve anything more than the loss of the DJI S800 and Aeronavics X4. Automatic descent of the DJI S800 and Aeronavics X4 upon loss of the data link with its control station eliminates the potential for “fly away” incidents. The concerns behind the need for the certification of an aircraft’s airworthiness are mitigated by the DJI S800’s and Aeronavics X4’s limited operational range, small dimensions and the use of lightweight materials in their construction, all of which reduce the risk of damage to surrounding structures.

**5. 14 C.F.R. § 91.9(b)(2): Civil Aircraft Flight Manual, Marking and Placard Requirements.**

This regulation requires that an approved flight manual, manual material, markings, placards or some combination thereof be placed onboard the aircraft. Neither DJI S800 nor the Aeronavics X4 has a configuration suitable for compliance with this requirement.

Equivalent level of safety analysis. The DJI S800 and Aeronavics X4 are linked to a computer that serves as the control station. The instruction manual for the DJI S800 and Aeronavics X4 can be downloaded to the computer and accessed by the operator, in much the same way that pilots of commercial airliners are able to access flight manuals on tablet devices that serve as “electronic flight bags.” All manual material, markings and placards relevant to the operation of the DJI S800 and Aeronavics X4 can be displayed on the screen of the computer that serves as the control station, as required. The instruction manual for the DJI S800 and Aeronavics X4 will therefore be just as accessible as a flight manual carried onboard a commercial jet.

**6. 14 C.F.R. § 91.109(a) and 14 C.F.R. § 91.109(c): Flight Instruction: Simulated Instrument Flight and Certain Flight Tests.**

Under this regulation, aircraft used for training purposes must have dual flight controls, subject to certain exceptions. FAA regulations also require that whenever training is provided in a simulator, the simulator must have a second control seat occupied by a safety pilot who possesses at least a private pilot certificate with category and class ratings appropriate to the aircraft being flown. Neither OI’s UAS aircraft nor the simulator used by OI for flight training purposes complies with these FAA requirements.

Equivalent level of safety analysis. OI has developed an extensive flight instruction training program for its employees who will conduct commercial UAS operations. Flight instruction is provided through OI and consists of ground instruction and flight training. Further training will be conducted with a computer flight simulator with a review of operator skills on a monthly basis. Pilots will be required to perform frequent training flights and refresher flights, at either an FAA-approved field or on OI property with suitable objects for pilots to navigate to and around in a simulated commercial environment.

As all operations of the DJI S800 and Aeronavics X4 are conducted with a joystick, a duly-qualified OI employee with UAS flight experience at the Supervisor level will be able to observe all operator training by standing or sitting next to the computer that is used as the control station. Similarly, as flight simulations of the DJI S800 and Aeronavics X4 also are displayed on a computer screen, an OI employee with high-level UAS flight experience is able to sit next to the operator and directly observe all phases of simulator training. In this manner, OI will be able to satisfy the FAA’s interest in having simulator training observed by a highly-experienced operator.

The requirement for dual flight controls on an aircraft used for training purposes is mitigated by the DJI S800’s and Aeronavics X4’s limited operational range, small dimensions and the use of lightweight materials in their construction, all of which reduce the risk of damage to surrounding structures in the event of an operator error that results in the loss of the aircraft.

**7. 14 C.F.R. 91.119: Minimum Safe Altitudes: General**

This regulation specifies the minimum altitude in various flight environments below which aircraft are not allowed to operate. OI will conduct the commercial services it proposes to operate below the FAA-specified minimum of 500 feet above the surface and closer to vessels and structures than the minimum separation of 500 feet mandated by the FAA.

Equivalent level of safety analysis. The operation of the DJI S800 and Aeronavics X4 aircraft exclusively in Class G airspace (i.e., below 500 feet) is intended as a safety measure to provide a level of separation between OI's commercial UAS operations and the operation of manned aircraft at altitudes above 500 feet. In this case, limiting the DJI S800 and Aeronavics X4 to flights below the 500 foot minimum will enhance safety rather than compromise it. OI will need to operate the DJI S800 and Aeronavics X4 closer than 500 feet to structures in order to conduct the inspections that will comprise a major part of OI's commercial UAS services. However, OI's flight procedures include the company's own requirements regarding the minimum level of separation between the DJI S800 and Aeronavics X4 and any nearby structures or facilities. In addition, the risk of damage to any nearby structures or facilities is reduced by OI's S800's and Aeronavics X4's limited operational range, small dimensions and the use of lightweight materials in their construction.

**8. 14 C.F.R. § 91.121: Altimeter Settings**

Pursuant to this regulation, an aircraft that is operating below 18,000 feet above Mean Sea Level must contain an altimeter that is set to one of several designated altimeter settings prior to departure. Neither the DJI S800 nor the Aeronavics X4 includes an altimeter.

Equivalent level of safety analysis: The operation of the DJI S800 and Aeronavics X4 aircraft exclusively in Class G airspace (i.e., below 500 feet) away from commercial traffic and ATC-controlled airspace reduces the need for an altimeter onboard OI's UAS aircraft. The altitude of OI's UAS aircraft above Mean Sea Level and its GPS coordinates will be displayed on the screen of the remote control station used by the OI operator to perform any commercial services. The OI operator will have continuous situational awareness of the UAS altitude and position as flight operations will be conducted under line-of-sight flight procedures.

**9. 14 C.F.R. § 91.151(a): Fuel Requirements for Flight in VFR Conditions.**

FAA regulations require that a rotorcraft operating under VFR conditions have sufficient fuel to fly to the first point of intended landing and, assuming normal cruising speed, to fly for at least an additional 20 minutes. OI's DJI S800s and Aeronavics X4 have a maximum operating time of 20 minutes.

Equivalent level of safety analysis. The FAA's regulations require sufficient reserves of additional fuel to enable a rotorcraft to find the nearest suitable landing zone if the intended landing facility is not available. The additional time that a rotorcraft is required to be able to operate is less than the time required to allow fixed-wing aircraft to find a suitable landing field (30 minutes during the day, 45 minutes at night), reflecting the relative scarcity of landing fields for aircraft versus landing zones suitable for rotorcraft. By similar logic, the additional fuel required for UAS aircraft should be

dramatically less than for rotorcraft, as UAS aircraft are small enough to land virtually anywhere. Because the DJI S800 and Aeronavics X4 initiates an automatic spiral descent upon any loss of power, there is no need to require additional flying time for the DJI S800 and Aeronavics X4 to find a suitable landing zone. The concerns behind the FAA's surplus fuel requirement for rotorcraft are mitigated by the DJI S800's and Aeronavics X4's limited operational range, small dimensions and the use of lightweight materials in their construction, all of which reduce the risk of damage to surrounding structures.

**10. 14 C.F.R. § 91.203(a) & (b): Civil Aircraft: Certifications Required.**

The FAA requires that all civil aircraft have an appropriate and current airworthiness certificate and that the airworthiness certificate or special flight authorization for an aircraft be displayed at the cabin or cockpit entrance so that it is visible to passengers or crew. The DJI S800 and Aeronavics X4 do not have a current airworthiness certificate nor do they have a surface area large enough to display a certificate of airworthiness or special flight authorization.

Equivalent level of safety analysis. The strict operational limitations under which OI will conduct flights for commercial UAS applications (e.g., daylight operations, use of Class G airspace, all flights within line-of-sight of the operator) are at least as restrictive as the limitations that apply to the operation of aircraft that have been issued limited or restricted category, experimental or provisional certificates of airworthiness. The concerns behind the need for the certification of an aircraft's airworthiness are mitigated by the DJI S800's and Aeronavics X4's limited operational range, small dimensions and the use of lightweight materials in their construction, all of which reduce the risk of damage to surrounding structures.

One of the purposes served by the requirement to display a certificate or airworthiness onboard an aircraft is to advise passengers (including any pilot) that the aircraft meets all of the FAA's requirements for a certificate of airworthiness. As the DJI S800 and Aeronavics X4 will not carry any passengers, and otherwise will operate in accordance with strictly-controlled flight parameters, the absence of such a warning on the DJI S800 and Aeronavics X4 will not result in any reduction in the overall safety of the operation.

OI is willing to include any markings that may be required by the FAA in connection with its commercial UAS operations, with the understanding that the surface area of the DJI S800 and Aeronavics X4 will not permit lettering that is larger than  $\frac{3}{4}$  - one inch in height.

**11. 14 C.F.R. § 91.405(a); 407(a)(1); 409(a)(2); 417(a): Aircraft Maintenance and Inspections; Maintenance Records.**

FAA regulations impose various requirements regarding the maintenance of civil aircraft, including periodic inspections, approval for return to service by a qualified mechanic following maintenance or repair, an airworthiness inspection and certain rules concerning maintenance recordkeeping. OI's maintenance of its DJI S800 and Aeronavics X4 aircraft will not satisfy these requirements.

Equivalent level of safety analysis. OI will maintain the DJI S800 and Aeronavics X4 in accordance with the manuals and operating handbook provided by the manufacturer. Because of the DJI S800's and Aeronavics X4's small size and lightweight construction, OI will be able to subject it to top-to-bottom examination after every flight. All pre- or post-flight maintenance, equipment failures, charge cycle logs, fault/repair logs, inspections and general maintenance records will be kept on file for a minimum of three years. OI has developed a lengthy pre/post-flight checklist; any aircraft which is unable to meet all the requirements for safe operation will be removed from service immediately and will not return to service until any defects have been remedied. Moreover, if mechanical issues arise, the DJI S800 and Aeronavics X4 can land immediately as they will be operating at an altitude no higher than 500 feet.

The manufacturers periodically update parts and software for these UAS aircraft. Each time a UAS is tested in the office, OI checks for the most recent stable software issued by the manufacturer (OI will not use Beta software). If any parts have been updated by the manufacturer, OI immediately places them on order to ensure its UAS aircraft have the most recent equipment and software.

The number of hours that a UAS is in operation are logged by OI to ensure proper life of components as well as the flight packs that provide power. Once a DJI S800 and Aeronavics X4 aircraft has been removed from service its unique ID and serial number will not be re-issued.