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

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

July 20, 2015

Exemption No. 12080
Regulatory Docket No. FAA–2015–0180

Mr. Jeffrey J. Antonelli
Attorney for iCam Copters, LLC
Antonelli Law
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Dear Mr. Antonelli:

This letter is to inform you that we have granted your request for exemption. It transmits our decision, explains its basis, and gives you the conditions and limitations of the exemption, including the date it ends.

The Basis for Our Decision

By letter dated January 23, 2015, you petitioned the Federal Aviation Administration (FAA) on behalf of iCam Copters, LLC (hereinafter petitioner or operator) for an exemption. The exemption would allow the petitioner to operate an unmanned aircraft system (UAS) to film movies and commercials in rural natural areas.

See Appendix A for the petition submitted to the FAA describing the proposed operations and the regulations that the petitioner seeks an exemption.

The FAA has determined that good cause exists for not publishing a summary of the petition in the Federal Register because the requested exemption would not set a precedent, and any delay in acting on this petition would be detrimental to the petitioner. The FAA received one individual comment in opposition to the petition. In granting this exemption, the FAA has determined that the proposed operations can safely be conducted under the conditions and limitations of this exemption. As with exemptions issued to Aeryon Lab, Astraeus Aerial,

Clayco, Inc., and VDOS Global, LLC, failure to comply with the document's conditions and limitations is grounds for immediate suspension or rescission of the exemption.

Airworthiness Certification

The UAS proposed by the petitioner are the GT80X and DJI Inspire 1.

The petitioner requested relief from 14 CFR part 21, *Certification procedures for products and parts, Subpart H—Airworthiness Certificates*. In accordance with the statutory criteria provided in Section 333 of Public Law 112−95 in reference to 49 U.S.C. § 44704, and in consideration of the size, weight, speed, and limited operating area associated with the aircraft and its operation, the Secretary of Transportation has determined that this aircraft meets the conditions of Section 333. Therefore, the FAA finds that the requested relief from 14 CFR part 21, *Certification procedures for products and parts, Subpart H—Airworthiness Certificates*, and any associated noise certification and testing requirements of part 36, is not necessary.

The Basis for Our Decision

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

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

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

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

Our Decision

In consideration of the foregoing, I find that a grant of exemption is in the public interest. Therefore, pursuant to the authority contained in 49 U.S.C. 106(f), 40113, and 44701, delegated to me by the Administrator, iCam Copters, LLC is granted an exemption from 14 CFR §§ 61.23(a) and (c), 61.101(e)(4) and (5), 61.113(a), 61.315(a), 91.7(a), 91.119(c), 91.121, 91.151(a)(1), 91.405(a), 91.407(a)(1), 91.409(a)(1) and (2), and 91.417(a) and (b), to the extent necessary to allow the petitioner to operate a UAS to perform aerial data collection and closed set motion picture and filming. This exemption is subject to the conditions and limitations listed below.

Conditions and Limitations

In this grant of exemption, iCam Copters, LLC is hereafter referred to as the operator.

Failure to comply with any of the conditions and limitations of this grant of exemption will be grounds for the immediate suspension or rescission of this exemption.

1. Operations authorized by this grant of exemption are limited to the GT80X and DJI Inspire 1 when weighing less than 55 pounds including payload. Proposed operations of any other aircraft will require a new petition or a petition to amend this exemption.

2. Operations for the purpose of closed-set motion picture and television filming are permitted.

3. The UA may not be operated at a speed exceeding 87 knots (100 miles per hour). The exemption holder may use either groundspeed or calibrated airspeed to determine compliance with the 87 knot speed restriction. In no case will the UA be operated at airspeeds greater than the maximum UA operating airspeed recommended by the aircraft manufacturer.

4. The UA must be operated at an altitude of no more than 400 feet above ground level (AGL). Altitude must be reported in feet AGL.

5. The UA must be operated within visual line of sight (VLOS) of the PIC at all times. This requires the PIC to be able to use human vision unaided by any device other than corrective lenses, as specified on the PIC's FAA-issued airman medical certificate or U.S. driver's license.

6. All operations must utilize a visual observer (VO). The UA must be operated within the visual line of sight (VLOS) of the PIC and VO at all times. The VO may be used to satisfy the VLOS requirement as long as the PIC always maintains VLOS capability. The VO and PIC must be able to communicate verbally at all times; electronic messaging or texting is not permitted during flight operations. The PIC must

be designated before the flight and cannot transfer his or her designation for the duration of the flight. The PIC must ensure that the VO can perform the duties required of the VO.

7. This exemption and all documents needed to operate the UAS and conduct its operations in accordance with the conditions and limitations stated in this grant of exemption, are hereinafter referred to as the operating documents. The operating documents must be accessible during UAS operations and made available to the Administrator upon request. If a discrepancy exists between the conditions and limitations in this exemption and the procedures outlined in the operating documents, the conditions and limitations herein take precedence and must be followed. Otherwise, the operator must follow the procedures as outlined in its operating documents. The operator may update or revise its operating documents. It is the operator's responsibility to track such revisions and present updated and revised documents to the Administrator or any law enforcement official upon request. The operator must also present updated and revised documents if it petitions for extension or amendment to this grant of exemption. If the operator determines that any update or revision would affect the basis upon which the FAA granted this exemption, then the operator must petition for an amendment to its grant of exemption. The FAA's UAS Integration Office (AFS−80) may be contacted if questions arise regarding updates or revisions to the operating documents.

8. Any UAS that has undergone maintenance or alterations that affect the UAS operation or flight characteristics, e.g. replacement of a flight critical component, must undergo a functional test flight prior to conducting further operations under this exemption. Functional test flights may only be conducted by a PIC with a VO and must remain at least 500 feet from other people. The functional test flight must be conducted in such a manner so as to not pose an undue hazard to persons and property.

9. The operator is responsible for maintaining and inspecting the UAS to ensure that it is in a condition for safe operation.

10. Prior to each flight, the PIC must conduct a pre-flight inspection and determine the UAS is in a condition for safe flight. The pre-flight inspection must account for all potential discrepancies, e.g. inoperable components, items, or equipment. If the inspection reveals a condition that affects the safe operation of the UAS, the aircraft is prohibited from operating until the necessary maintenance has been performed and the UAS is found to be in a condition for safe flight.

11. The operator must follow the UAS manufacturer's maintenance, overhaul, replacement, inspection, and life limit requirements for the aircraft and aircraft components.

12. Each UAS operated under this exemption must comply with all manufacturer safety bulletins.

13. Under this grant of exemption, a PIC must hold either an airline transport, commercial, private, recreational, or sport pilot certificate. The PIC must also hold a current FAA airman medical certificate or a valid U.S. driver's license issued by a state, the District of Columbia, Puerto Rico, a territory, a possession, or the Federal government. The PIC must also meet the flight review requirements specified in 14 CFR § 61.56 in an aircraft in which the PIC is rated on his or her pilot certificate.

14. The operator may not permit any PIC to operate unless the PIC demonstrates the ability to safely operate the UAS in a manner consistent with how the UAS will be operated under this exemption, including evasive and emergency maneuvers and maintaining appropriate distances from persons, vessels, vehicles and structures. PIC qualification flight hours and currency must be logged in a manner consistent with 14 CFR § 61.51(b). Flights for the purposes of training the operator's PICs and VOs (training, proficiency, and experience-building) and determining the PIC's ability to safely operate the UAS in a manner consistent with how the UAS will be operated under this exemption are permitted under the terms of this exemption. However, training operations may only be conducted during dedicated training sessions. During training, proficiency, and experience-building flights, all persons not essential for flight operations are considered nonparticipants, and the PIC must operate the UA with appropriate distance from nonparticipants in accordance with 14 CFR § 91.119.

15. UAS operations may not be conducted during night, as defined in 14 CFR § 1.1. All operations must be conducted under visual meteorological conditions (VMC). Flights under special visual flight rules (SVFR) are not authorized.

16. The UA may not operate within 5 nautical miles of an airport reference point (ARP) as denoted in the current FAA Airport/Facility Directory (AFD) or for airports not denoted with an ARP, the center of the airport symbol as denoted on the current FAA-published aeronautical chart, unless a letter of agreement with that airport's management is obtained or otherwise permitted by a COA issued to the exemption holder. The letter of agreement with the airport management must be made available to the Administrator or any law enforcement official upon request.

17. The UA may not be operated less than 500 feet below or less than 2,000 feet horizontally from a cloud or when visibility is less than 3 statute miles from the PIC.

18. If the UAS loses communications or loses its GPS signal, the UA must return to a pre-determined location within the private or controlled-access property.

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

20. The PIC is prohibited from beginning a flight unless (considering wind and forecast weather conditions) there is enough available power for the UA to conduct the intended operation and to operate after that for at least five minutes or with the reserve power recommended by the manufacturer if greater.

21. Air Traffic Organization (ATO) Certificate of Waiver or Authorization (COA). All operations shall be conducted in accordance with an ATO-issued COA. The exemption holder may apply for a new or amended COA if it intends to conduct operations that cannot be conducted under the terms of the attached COA.

22. All aircraft operated in accordance with this exemption must be identified by serial number, registered in accordance with 14 CFR part 47, and have identification (N−Number) markings in accordance with 14 CFR part 45, Subpart C. Markings must be as large as practicable.

23. Documents used by the operator to ensure the safe operation and flight of the UAS and any documents required under 14 CFR §§ 91.9 and 91.203 must be available to the PIC at the Ground Control Station of the UAS any time the aircraft is operating. These documents must be made available to the Administrator or any law enforcement official upon request.

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

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

26. All Flight operations must be conducted at least 500 feet from all nonparticipating persons, vessels, vehicles, and structures unless:
    a. Barriers or structures are present that sufficiently protect nonparticipating persons from the UA and/or debris in the event of an accident. The operator must ensure that nonparticipating persons remain under such protection. If a situation arises where nonparticipating persons leave such protection and are within 500 feet of the UA, flight operations must cease immediately in a manner ensuring the safety of nonparticipating persons; and
    b. The owner/controller of any vessels, vehicles or structures has granted permission for operating closer to those objects and the PIC has made a safety assessment of the risk of operating closer to those objects and determined that it does not present an undue hazard.

    The PIC, VO, operator trainees or essential persons are not considered nonparticipating persons under this exemption.

27. All operations shall be conducted over private or controlled-access property with permission from the property owner/controller or authorized representative.

Permission from property owner/controller or authorized representative will be obtained for each flight to be conducted.

28. Any incident, accident, or flight operation that transgresses the lateral or vertical boundaries of the operational area as defined by the applicable COA must be reported to the FAA's UAS Integration Office (AFS−80) within 24 hours. Accidents must be reported to the National Transportation Safety Board (NTSB) per instructions contained on the NTSB Web site: www.ntsb.gov.

If this exemption permits operations for the purpose of closed-set motion picture and television filming and production, the following additional conditions and limitations apply.

29. The operator must have a motion picture and television operations manual (MPTOM) as documented in this grant of exemption.

30. At least 3 days before aerial filming, the operator of the UAS affected by this exemption must submit a written Plan of Activities to the local Flight Standards District Office (FSDO) with jurisdiction over the area of proposed filming. The 3-day notification may be waived with the concurrence of the FSDO. The plan of activities must include at least the following:
    a. Dates and times for all flights;
    b. Name and phone number of the operator for the UAS aerial filming conducted under this grant of exemption;
    c. Name and phone number of the person responsible for the on-scene operation of the UAS;
    d. Make, model, and serial or N−Number of UAS to be used;
    e. Name and certificate number of UAS PICs involved in the aerial filming;
    f. A statement that the operator has obtained permission from property owners and/or local officials to conduct the filming production event; the list of those who gave permission must be made available to the inspector upon request;
    g. Signature of exemption holder or representative; and
    h. A description of the flight activity, including maps or diagrams of any area, city, town, county, and/or state over which filming will be conducted and the altitudes essential to accomplish the operation.

31. Flight operations may be conducted closer than 500 feet from participating persons consenting to be involved and necessary for the filming production, as specified in the exemption holder’s MPTOM.

Unless otherwise specified in this grant of exemption, the UAS, the UAS PIC, and the UAS operations must comply with all applicable parts of 14 CFR including, but not limited to, parts 45, 47, 61, and 91.

This exemption terminates on July 31, 2017, unless sooner superseded or rescinded.

Sincerely,

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

Enclosures

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U.S. Department of Transportation
Docket Management System
1200 New Jersey Ave S.E.
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January 23, 2015

Re: Request for Exemption under Section 333 of the FAA Modernization and Reform Act of 2012 and Part 11 of the Federal Aviation Regulations from 14 C.F.R 21(h); 14 C.F.R. 43.7; 14 C.F.R. 43.11; 14 C.F.R. 45.11; 14 C.F.R. 45.27; 14 C.F.R. 45.29; 14 C.F.R. 91.7(a); 14 C.F.R. 91.9(b)(2); 14 C.F.R. 91.9(c); 14 C.F.R. 91.103(b)(2); 14 C.F.R. 91.105; 14 C.F.R. 91.113(b); 14 C.F.R. 91.119(b)(c); 14 C.F.R. 91.121; 14 C.F.R. 151; 14 C.F.R. 91.203(a) and (b); 14 C.F.R. 215; 14 C.F.R. 91.403; 14 C.F.R. 91.405; 14 C.F.R. 91.407; 14 C.F.R. 409; and 14 C.F.R. 91.417.

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, Antonelli Law on behalf of iCam Copters, LLC ("iCam"), an operator of Small Unmanned Aircraft Systems ("sUAS") equipped to film movies and commercials, applies for an exemption from the listed Federal Aviation Regulations ("FARs") to allow commercial operation of its sUASs, so long as such operations are conducted within and under the conditions outlined herein or as may be established by the FAA as required by Section 333.

Approval of exemptions for iCam will allow commercial operations of sUASs to film movies and commercials in rural natural areas. The pilot in command (PIC) is a licensed airline transport pilot, possessing a first class medical certificate. The requested exemption should be granted because operation of the proposed small UASs conducted in the strict conditions outlined below, will provide an equivalent level of safety, as Congress intended, while still allowing commercial operations. The lightweight aircraft, the GT80X (a proprietary design), and the DJI Inspire 1, covered by the exemption are far safer than conventional operations conducted with helicopters and fixed-wing aircraft weighing several thousand pounds containing pilot and crew operating in close proximity to the ground and people below. The seven factors Congress directed the FAA to consider when approving Section 333 exemption petitions - size, weight, speed, operational capability, proximity to airports, proximity to populated areas, and operation within visual line of sight – each support the request. In particular, the sUASs are small, and will operate at slow speeds, close to the ground, far from airports and in a low risk, low population environment. In addition, the substantial experience of the PIC weighs heavily in favor of granting the exemption.

Pursuant to 14 C.F.R. 11.35, iCam requests confidential treatment for certain information provided with this request for exemption. Specifically, iCam requests that information contained in its user manual, which includes specifications of the proprietary design of the GT80X copter and iCam's operating procedures, not be made public due to the proprietary information that the application has not and will not share with others. Additionally, iCam Copters LLC requests that personal information related to the PIC, including a copy of his airline transport pilot license, not be made public due to privacy concerns. These documents are not available to the public and are protected from release under the Freedom of Information Act 5 U.S.C. 552 *et seq*.

For your ease in reviewing this petition, please refer to the table of contents which begins on page three. If we can provide any additional information to assist your understanding or review of this document, please do not hesitate to contact us at 312-201-8310 or via email at Jeffrey@Antonelli-Law.com.

Thank you,

Jeffrey J. Antonelli
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Table of Contents

Exhibit List

GT80X Documents

DJI Documents

Additional documents have been submitted to the FAA confidentially and are not available to the public.

I. Publishable Summary

Pursuant to 14 C.F.R. Part 11, the following summary is provided for publication in the Federal Register, should it be determined that publication is needed:

Applicant seeks an exemption from the following rules:

14 C.F.R 21(h); 14 C.F.R. 43.7; 14 C.F.R. 43.11; 14 C.F.R. 45.11; 14 C.F.R. 45.27; 14 C.F.R. 45.29; 14 C.F.R. 91.7(a); 14 C.F.R. 91.9(b)(2); 14 C.F.R. 91.9(c); 14 C.F.R. 91.103(b)(2); 14 C.F.R. 91.105; 14 C.F.R. 91.113(b); 14 C.F.R. 91.119(b)(c); 14 C.F.R. 91.121; 14 C.F.R. 151; 14 C.F.R. 91.203(a) and (b); 14 C.F.R. 215; 14 C.F.R. 91.403; 14 C.F.R. 91.405; 14 C.F.R. 91.407; 14 C.F.R. 409; and 14 C.F.R. 91.417 to operate commercially a small unmanned aircraft system (sUAS) (55lbs or less).

Approval of exemptions for iCam Copters LLC will allow commercial operations of sUASs for the purpose of filming movies and commercials in rural natural areas. iCam is managed by a licensed Airline Transport Pilot with a first class medical certificate who is type rated in: Gulfstream 5 (G-V); Global Express (BBD-700); Challenger 601 (CL600); Citation Jet 525s (CE525s); Falcon 900 EX (DA-50); Falcon 900 DX. (DA50-EASY). iCam treats its sUASs with the same standard a pilot of a manned helicopter would treat aircraft.

Approval of exemptions for iCam will allow commercial operations of sUASs to film movies and commercials in rural natural areas. The pilot in command (PIC) is a licensed airline transport pilot, possessing a first class medical certificate. The requested exemption should be granted because operation of the proposed small UASs conducted in the strict conditions outlined below, will provide an equivalent level of safety, as Congress intended, while still allowing commercial operations. The lightweight aircraft, the GT80X (a proprietary design), and the DJI Inspire 1, covered by the exemption are far safer than conventional operations conducted with helicopters and fixed-wing aircraft weighing several thousand pounds containing pilot and crew operating in close proximity to the ground and people below. The seven factors Congress directed the FAA to consider when approving Section 333 exemption petitions - size, weight, speed, operational capability, proximity to airports, proximity to populated areas, and operation within visual line of sight – each support the request. In particular, the sUASs are small, and will operate at slow speeds, close to the ground, far from airports and in a low risk, low population environment. In addition, the substantial experience of the PIC weighs heavily in favor of granting the exemption.

II. Petitioner's Contact Information

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III. iCam Copters LLC's Operations

A. The sUASs

The requested exemption will permit the operation of two small, unmanned multirotor aircraft, the GT80X and the DJI Inspire 1.

1. The GT80X

The GT80X is designed and manufactured by iCam Copters LLC ("iCam"). It weighs up to 55 pounds (inclusive of fuel, batteries and technical payload). This rotorcraft operates at a speed of no more than 50 knots (57 mph) and has the capability to hover and move in the vertical and horizontal planes simultaneously.

The designer and manufacturer of the sUAS, is a licensed Airline Transport Pilot with a first class medical certificate, who holds the following type ratings:

- Gulfstream 5 (G-V)
- Global Express (BBD-700)
- Challenger 601 (CL600)
- Citation Jet 525s (CE525s)
- Falcon 900 EX (DA-50)
- Falcon 900 DX (DA50-EASY)

The GT80X will use the DX9 Spektrum Transmitter, which displays telemetry data to the PIC and can give voice alerts. Exhibit 3.

The GT80X's flight controller is the DJI Ace One Autopilot system, which includes the main controller (MC), internal measurement unit (IMU) with built-in J-axis accelerometer, 3-axis gyroscope, and a barometer, and a GPS/compass. The radio receiver (Rx) connects to the MC. For more information regarding the Ace One, please refer to Exhibits 4-7.

In order to protect the design of the sUAS, information about it, including the CAD drawings and user manual, will be submitted confidentially, for proprietary reasons.

2. The DJI Inspire 1

The DJI Inspire 1 is a small, unmanned multirotor aircraft, weighing 6.5 lbs., inclusive of batteries and technical payload. The rotorcraft can operate at a speed up to 43 knots (50 mph). The FAA has previously granted Exemption No. 11138, allowing commercial flight of a DJI product. Exhibit 2.

The sUAS will have the following specifications:

Airframe: DJI Inspire 1
Dimensions: 438x451x301mm / 17.24 x 17.75 x 11.85 in.
Flight Control System: Internal to the DJI Inspire 1. This includes the main controller (MC), which receives the battery voltage, capacity, and current, the internal measurement unit (IMU), which receives telemetry data (visible at the ground station), compass, GPS, and radio receiver (Rx).
Transmitter (Tx): DJI Inspire Remote Control
Receiver (Rx): Internal to DJI Inspire 1
Motor: DJI 3510
Propeller: DJI 1345, 13-inch diameter
Data and Video Combined Link: HD Lightbridge Video Downlink
Gimbal: Zenmuse X3
Camera: X3 FC350
Batteries: LiPo 6S High voltage battery with 4500 mAh capacity

Please refer to Exhibits 8-15 for further information about the DJI Inspire 1.

B. Flight Conditions

The sUAS will be flown in airspace under 400 feet above ground level ("AGL") and under controlled conditions in a closed set in rural areas. iCam will only operate its sUASs in VMC, visual meteorological conditions: no less than 500 feet below and no less than 2,000 feet horizontally from a cloud or when visibility is at least 3 statute miles from the PIC. The flight crew will always make a safety assessment of the risk of every operation, and will only operate when it is determined that no undue hazards are present.

The flight crew, consisting of one Pilot in Command (PIC), two Visual Observers (VOs) and one safety technician, will act as fence posts on the outside of the intended flight area, watching for intrusions into the area from individuals or other aircraft.

The flight crew will have each individual involved in the filming sign a waiver and obtain their consent prior to shooting. Additionally, during operations, the two visual observers ("VOs") will be on the lookout for any trespassers, so that the operation can be quickly aborted if someone unauthorized walks into the closed set. However, when flying closer than 500 feet to nonparticipating individuals or structures, there will be barriers between the flight area and the nonparticipants.

The sUAS will be used to film natural areas for films, television shows, and commercials. The sUAS will be flown over both land and water. iCam will avoid congested areas when planning operations, and will work with the local FSDO. iCam's flight crew will make a safety assessment of the filming location prior to operations, and will only operate when it determines there is no undue risk.

C. Flight Operations

The purpose of each sUAS flight will be to film natural areas for the motion picture and television industries safely and efficiently.

iCam's flight crew will always use at least four individuals for each flight: the Pilot in Command (PIC), a safety technician, and two visual observers (VOs). The flight crew will be set up in a triangle, with the safety technician and the PIC in one corner, and the VOs in the each of the other corners, 200-300 yards apart. Each member of the flight crew, as well as any producers who will be present, will wear a Peltor-brand headset, so they can communicate orally for the duration of the flight.

Prior to the day of filming, the flight crew will visit the site where filming will be held and observe the area to determine if it is safe for shooting. The flight crew will determine that a location is not safe if it is too close to objects, such as trees, or if wind conditions would make the planned flight unsafe. The flight crew will conduct a "dry run" without the sUAS, to prepare for the real flight.

On the day of filming, the flight crew will set out a landing pad that has a diameter of 50-100 feet marked as the "home" area. This landing pad area will be marked off with cones and flags. The flight crew will also program two safety zones into the DJI Autopilots in the event that a bailout is necessary, and set the bailout height 150 feet higher than the highest spot in the area, but limit the height to 400 feet AGL. Should a bailout be necessary, and the "home" area be unsafe for a landing, the PIC will direct the sUAS to one of the "safety zones." The sUAS will rise to the bailout height, travel horizontally to the indicated spot, and then descend. In the event that the PIC becomes incapacitated, the safety technician will hit the red "return" button on the transmitter, or turn off the transmitter. Either event will cause the sUAS to rise to the set height, travel horizontally until it is over the "home" location, then land.

Both the GT80X and the DJI Inspire 1 will have the "return to home" function in their flight controller. Exhibit 4; Exhibit 8.

Once the home and safety zones are set, the flight crew will go through an extensive pre-flight safety inspection, which is based on pre-flight safety inspections for manned helicopters. (Submitted under seal for proprietary reasons under 14 C.F.R. 11.32(b) within the iCam Operations Manual).

At the ground station, the PIC and safety technician will set up a laptop which shows the telemetry information about the flight, including the engine temperature for the GT80X, distance away, altitude, and heading.

After the flight crew goes through the startup procedure specific to each sUAS, the PIC will then take the sUAS up and through the path as specified by the shot list. The producer will be able to view what the camera views and can ask the PIC to move the sUAS to get a different shot.

For flights over water, the sUAS's feet will be fitted with flotation devices in the event of an emergency water landing.

The PIC has an Airline Transit Pilot's license with a first-class medical certification. Each additional member of the flight crew has experience flying radio-controlled aircraft.

1. GT80X Flight Procedure

The flight crew will go through the GT80X's pre-flight inspection, which is included in iCam's Operations Manual, submitted confidentially for proprietary reasons. After the pre-flight safety inspection has been passed, and each crew member is in place, the safety technician will start the GT80X engine, and the PIC will start the timer on the transmitter. The gas GT80X engine takes approximately two minutes to warm up to 180°F in order to fly.

When flying the GT80X, each flight will be terminated when the fuel or usable battery power reaches the 50% mark, or at 30 minutes, whichever comes first. The flight crew can land the sUAS, refuel it, and have it back in the air within three minutes, in order to continue to film, if necessary. The flight crew will have up to four cans of fuel, each of which hold 2.5 gallons. The flight crew will also have fire extinguishers, which can have a range of six feet and are kept a safe distance from the extra fuel.

Telemetry information will also be accessible on the GT80X's transmitter, the Spektrum DX9. The Spektrum DX9 has an additional safety feature, which gives voice alerts for telemetry, warnings, and other conditions. For more information regarding the Spektrum DX9, please refer to Exhibit 3.

The PIC will manually control each flight in VLOS, using a GPS hold, or assist. The PIC's 40 years of experience flying RC aircraft, as well as career as a manned aircraft pilot, coupled with the stabilization of the GPS, will ensure that operation of this sUAS will be at least as safe as a manned aircraft. The automated features of the Ace One GPS will keep the sUAS in a fixed location in the wind. It will also allow the PIC to release the controls and have the sUAS remain in that fixed location. The PIC can then move one of the control sticks, and the sUAS will move in that direction and no others.

After the operation, the PIC and flight crew will go through the post-flight inspection, the procedure for which is submitted under seal for proprietary reasons.

2. DJI Inspire 1 Flight Procedure

To start the DJI Inspire 1, iCam will follow the procedures set out by the manufacturer beginning on page 8 of the Quick Start Guide, Exhibit 10 to this petition. Additionally, iCam will conduct a communications check to make sure the transmitter is connected to the DJI Inspire 1. After the pre-flight inspection has been completed and the flight crew is in place, the PIC will begin the flight.

When flying the DJI Inspire 1, the low battery failsafe is triggered when the DJI Intelligent Flight Battery is depleted to a point that may affect the safe return of the aircraft. This threshold is automatically determined based on the current aircraft altitude and its distance from the home spot. For more information regarding this safety procedure, please refer to Exhibit 8. Other than this automated emergency procedure, the PIC will manually control each flight in VLOS.

IV. Privacy

There is little concern that the proposed flights will cause invasions of privacy because all

flights will occur in a closed set situation, with written and/or oral permission of the property owner. Should any trespasser enter into the filming area, the flight will be aborted safely. Every individual present during filming will have signed a waiver.

V. Aircraft and Equivalent Level of Safety

iCam proposes that the exemption requested herein apply to civil aircraft that have the characteristics and that operate with the limitations listed herein. These limitations provide for at least an equivalent or higher level of safety to operate under the current regulatory structure.

These limitations and conditions to which iCam agrees to be bound when conducting commercial operations under an FAA issued exemption include:

1. The sUAS will weigh no more than 55 lbs.

2. Flights will be operated within line of sight of a pilot and multiple observers.

3. Maximum total flight time for each operational flight of the GT80X will be 30 minutes. Flights will be terminated at 50% fuel reserve should that occur prior to the 30 minute limit.

4. When flying the DJI Inspire 1, the low battery failsafe is triggered when the DJI Intelligent Flight Battery is depleted to a point that may affect the safe return of the aircraft. This threshold is automatically determined based on the current aircraft altitude and its distance from the home spot. For more information regarding this safety procedure, please refer to Exhibit 8.

5. The sUAS will remain clear and yield the right of way to all other manned operations and activities at all times.

6. Flights will be operated at an altitude of no more than 400 feet AGL.

7. Minimum crew for each operation will consist of the sUAS PIC, a safety technician, and two VOs.

8. A briefing will be conducted in regard to the planned sUAS operations prior to each day's activities. It will be mandatory that all personnel who will be performing duties in connection with the operations be present for this briefing.

9. Prior to each day's activity, the flight crew will visit the location for filming to determine if it is safe for filming. The flight crew will also brief their clients on the limitations of the sUAS and their own internal safety limitations.

10. The operator will obtain a FAA UAS Civil COA prior to conducting any operations under this grant of exemption.

11. The operator will request a Notice to Airman (NOTAM) not more than 72 hours in advance, but not less than 48 hours prior to the operation.

12. At least three days before scheduled filming, the operator of the sUAS will submit a written Plan of Activities to the local FSDO with jurisdiction over the area of proposed filming.

13. The PIC has an airline transport pilot (ATP) license and a first class medical certificate. Copies of the ATP license and medical certificate have been attached under seal as Exhibit 7 in order to protect the PIC's identity. The PIC is type rated in: Gulfstream 5 (G-V); Global Express (BBD-700); Challenger 601 (CL600); Citation Jet 525s (CE525s); Falcon 900 EX (DA-50); Falcon 900 DX (DA50-EASY).

14. The flight crew has gone through 200 flight cycles with the GT80X, which comprises 100 hours of flight time. The flight crew will also spend a minimum of 25 hours training with the DJI Inspire 1 prior to operations.

15. The PIC, safety technician, and VOs will at all times be able to communicate by voice through headsets.

16. Written and/or oral permission from the landowners/authorized agents of the land over which flights will occur.

17. All required permissions and permits will be obtained from territorial, state, county or city jurisdictions, including local law enforcement, fire, or other appropriate governmental agencies.

18. Both the GT80X and DJI Inspire 1 will have the capability to abort a flight in case of unexpected obstacles or emergencies. Prior to each flight, two separate safety zones will be programmed into the sUAS autopilot, in the event that the home area is unsafe for an emergency landing.

19. For both the GT80X and the DJI Inspire 1, if the sUAS and its radio controller disconnects during flight, the system's failsafe protection will come to the rescue and the multirotor will return to home and land automatically, rather than flying off uncontrollably or landing at an unknown location.

20. Approval of commercial flights as outlined in this petition presents no national security issue. The PIC is a licensed airline transport pilot, so he has already been subject to security screening by the Department of Homeland Security.

Satisfaction of the criteria provided in Section 333 of the Reform Act of 2012--size, weight, speed, operating capabilities, proximity to airports and populated areas and operation within visual line of sight and national security – provide more than adequate justification for the grant of the requested exemptions allowing commercial operation of applicant's sUAS in the film industry pursuant to iCam's rules of operation, submitted under seal for proprietary reasons.

VI. Public Interest and Safety

Use of the sUAS will increase ground safety by eliminating the need to have multiple individuals in a helicopter while filming. Manned helicopters pose a risk to the pilots and onboard crew. Comparatively, when flying a sUAS, the pilot and crew are safely on the ground, rather than several hundred feet in the air, as the FAA has previously determined. Exhibit 1 at 11.

The limited weight of the GT80X and DJI Inspire 1 significantly reduces the potential for harm to participating and nonparticipating individuals or property in the event of an incident or accident. Additionally, both sUASs can fly at lower altitudes than manned aircraft and requires less room for takeoff and landing, allowing for flights to take place over smaller areas.

Any concerns regarding fuel spillage or combustion are unfounded. The GT80X uses no more than one gallon of fuel at a time. Additionally, the designer and manufacturer of the GT80X has designed tests of the fuel tanks to make them rupture (under the close watch of a safety technician with a fire extinguisher), and could not make them burst. Additionally, each tank has a one way vent that will not leak, even if turned upside down.

Using the GT80X or the DJI Inspire 1 for the purpose of filming natural areas, therefore, is significantly safer than use of a manned helicopter for the same purpose.

VII. Regulations from Which Exemption is Requested

A. 14 C.F.R. 21(h): Airworthiness Certificates

iCam Copters LLC requests an exemption from 14 C.F.R. 21(h), which "prescribes procedural requirements for the issue of airworthiness certificates." 14 C.F.R. 21.171. The GT80X will meet an equivalent level of safety as a manned aircraft, and has gone through testing similar to that a manned aircraft would go through. Significantly, iCam has conducted testing designed to make the fuel tanks of the GT80X rupture, but was unable to achieve combustion. Additionally, the fuel tanks contain a vent that will prevent leakage.

Both the GT80X and the DJI Inspire 1's small size, weight, speed, and limited operating area associated with the aircraft and their operation meet the statutory considerations of Section 333.

Equivalent level of safety: iCam's proposed exemption meets the requirements for an equivalent level of safety of this section, pursuant to Section 333, based upon the following factors:

- Small size:
  - GT80X: the GT80X's external dimensions are set out on page one of the iCam Operations Manual, Exhibit 6.
  - DJI Inspire 1: 438x451x301mm / 17.24 x 17.75 x 11.85 in.
- Light weight:
  - GT80X: no more than 55 lbs. inclusive of fuel, battery and technical payload.
  - DJI Inspire 1: 6.5 lbs. inclusive of battery and technical payload.
- Relatively slow speed:
  - GT80X: while the GT80X is capable of operating at speeds up to 65 mph (56 knots), flights will be limited to the slower speed of 20 mph (17 knots).
  - DJI Inspire 1: the DJI Inspire 1 can operate at speeds up to 43 knots (50 mph).
- Operational capacity:
  - GT80X: flights are limited to 50% of fuel capacity.
  - DJI Inspire 1: the low battery level failsafe is triggered when the DJI

Intelligent Flight Battery is depleted to a point that may affect the safe return of the aircraft. The warning threshold is automatically determined based on the current aircraft altitude and its distance from the home point.

- Proximity to airports: iCam will only operate in Class G airspace, and will notify ATC and the local FSDO prior to operations, as described above.
- Proximity to populated areas: iCam will only operate in Class G airspace in rural, natural areas and work with the local Flight Standards District Offices to determine which areas to avoid during flights. Local FSDO may carve out areas indicated as yellow in the sectional chart and allow iCam to fly in these specifically designated carve-out areas.
- Operation within visual line of sight: the PIC will always fly the sUAS within his line of sight.
- Location: iCam will operate in rural remote areas in Class G airspace.
- Altitude: no more than 400 feet AGL.
- Restricted area in which the sUAS will be operated: as described previously in this petition, the flight crew will act as fence posts to the flight area. The sUAS will not exit that area, and the flight crew will watch for individuals and other aircraft entering the space. Flights will be aborted if an intruder enters the area.
- Substantial experience of the PIC: the PIC has an ATP license and is type rated in: Gulfstream 5 (G-V); Global Express (BBD-700); Challenger 601 (CL600); Citation Jet 525s (CE525s); Falcon 900 EX (DA-50); Falcon 900 DX (DA50-EASY).

B. 14 C.F.R. Part 27: Airworthiness Standards: Normal Category Rotorcraft

iCam requests an exemption from 14 C.F.R. part 27, which "prescribes airworthiness standards for the issue of type certificates for normal category rotorcraft with maximum weights of 7,000 pounds or less and nine or less passenger seats." 14 C.F.R. 27.1. This part prescribes standards for helicopters weighing over one hundred times more than the sUAS that iCam will use. Because the GT80X is significantly smaller, this section is inapplicable; or in the alternative, iCam should be exempted from this Part.

Equivalent level of safety: The requested exemption will meet the requirements for an equivalent level of safety because the GT80X was built and is maintained to the extent possible under the same standards as manned aircraft. Please refer to Exhibit 6, under seal, for further details.

C. 14 C.F.R. 43.7: Persons authorized to approve aircraft, airframes, aircraft engines, propellers, appliances, or component parts for return to service after maintenance, preventive maintenance, rebuilding, or alteration.

iCam requests an exemption from 14 C.F.R. 43.7. This part provides, inter alia, that the holder of a mechanic certificate or a repair station certificate may approve an aircraft, airframe, aircraft engine, propeller, appliance, or component part for return to service.

Equivalent level of safety: The requested exemption will provide an equivalent level of safety because iCam designed and manufactured the GT80X. As a result, the individual with the greatest possible knowledge about this copter will be participating in and directing maintenance

and repairs. Moreover, the designer and manufacturer of the GT80X copters has proven experience manufacturing and repairing manned aircraft. Documentation related to the modified Pitts Special S-2B with N-Number N140M that converted into an experimental aircraft is submitted with the other confidential documents. He has also been building and designing sUASs for recreational purposes for over a decade.

As for the DJI Inspire 1, the requested exemption will provide an equivalent level of safety because iCam will repair and maintain the sUAS in accordance with the manufacturer's directions and recommendations.

D. 14 C.F.R. 43.11: Content, form, and disposition of records for inspections conducted under parts 91 and 125 and §§135.411(a)(1) and 135.419 of this chapter.

iCam requests an exemption from 14 C.F.R. 43.11(b). This part provides, inter alia, for the listing of discrepancies and placards by inspectors. The sUAS, due to its small size, does not have room for placards to be placed in or on it and no inspections for sUAS have been certified by FAA at the present time.

Equivalent level of safety: To achieve an equivalent level of safety, iCam will keep log books of all maintenance and repairs. These log books will include the information meant for the placards. This meets an equivalent level of safety to 14 C.F.R. 43.11(b) because, as envisioned in the August 8, 2014 Memorandum, "Interpretation regarding whether certain required documents may be kept at an unmanned aircraft's control station," the log books will be kept at the ground station were the PIC and flight crew will have immediate access to them. Exhibit 3. iCam has confidentially provided examples of the maintenance books it keeps for the aircraft and engine of the GT80X.

E. 14 C.F.R. 45.11: Marking of products.

iCam requests an exemption from 14 C.F.R. 45.11. This part provides, inter alia, that the manufacturers of aircraft, engines, propellers, mark such aircraft, engines, or propellers with an approved fireproof identification plate. The sUAS, due to its small size, does not have room for fireproof placards to be placed in it. Any required placards could become hazardous, due to the additional weight and strain placed on the sUAS. Any additional weight or placards on the sUASs could create a risk, due to the small size and nature of the GT80X and the DJI Inspire 1.

Equivalent level of safety: To achieve an equivalent level of safety, iCam will keep information related to the GT80X and DJI Inspire 1, including their user manuals and log books at the ground station, and affix their N-Numbers, once obtained from the FAA Registration Office, as large as practicably possible. The requested exemption provides an equivalent level of safety to 14 C.F.R. 45.11 because the relevant documentation containing the serial numbers will be at the ground station with the PIC, where it will be useable in the event of an emergency.

F. 14 C.F.R. 45.27: Location of marks; nonfixed-wing aircraft

iCam requests an exemption from 14 C.F.R. 45.27. This part provides, inter alia, that each operator of a rotorcraft must display on that rotorcraft horizontally on both surfaces of the cabin, fuselage, boom, or tail the marks required by §45.23. The DJI Inspire 1, due to its small size, does not have a cabin, fuselage, boom or tail to display the marks required by §45.23.

Equivalent level of safety: Once iCam receives its N-Numbers for the DJI Inspire 1, it will display these marks on the "arms" or fuselage of the aircraft as large as practicably possible. This exemption provides an equivalent level of safety to 14 C.F.R. 45.27 because the sUAS will be registered with the FAA Aircraft Registration Branch. In the event of incident, the sUAS will be traceable to iCam.

G. 14 C.F.R. 45.29: Size of marks

iCam requests an exemption from 14 C.F.R. 45.27. This part provides, inter alia, at subpart (3) that the registration marks for rotorcraft must be at least 12 inches high. Such a display will be impracticable, due to the small size of the sUAS.

Equivalent level of safety: iCam will affix its registration number as large as practicably possible on the "arms" or fuselage of the DJI Inspire 1, and as large as practicably possible on the surface of the GT80X, once it obtains the N-Numbers. This exemption provides an equivalent level of safety to 14 C.F.R. 45.29 because the sUAS will be registered with the FAA Aircraft Registration Branch. In the event of incident, the sUAS will be traceable to iCam.

H. 14 C.F.R. 91.7(a): Civil aircraft airworthiness.

The FAA has previously stated that no exemption is required for this section in the MPAA Exemptions. Exhibit 1 at 19. iCam requests the same determination be made for this petition.

Alternatively, iCam requests an exemption from 14 C.F.R. 91.7(a). The regulation requires that no person may operate a civil aircraft unless it is in airworthy condition. As there will be no airworthiness certificate issued for the aircraft should this exemption be granted, no standard will exist for determining airworthiness.

Equivalent level of safety: iCam will keep the GT80X's and the DJI Inspire 1's maintenance and safety information at the ground station, where it will be readily accessible to the PIC and the VO before, during, and after operations. Additionally, the PIC designed and manufactured the GT80X, which makes him the most qualified individual to confirm that the copter is in an airworthy mechanical and electrical condition. Thus, this exemption provides an equivalent level of safety to 14 C.F.R. 91.7(a) because the PIC, based on his knowledge of the aircraft and the documents available, will be able to make the determination as to the airworthy condition, in accordance with 14 C.F.R. 91.7(b).

I. 14 C.F.R. 91.9(b)(2): Civil aircraft flight manual, marking, and placard requirements.

The FAA previously stated that no exemption is required for this section. Exhibit 2 at 17. iCam requests the same determination to be made for this Petition.

Alternatively, iCam requests an exemption from 14 C.F.R. 91.9(b)(2). This part provides:

"(b) 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."

First, there does not currently exist a method of approving manuals for sUAS. Second, given the size and configuration of the sUAS, there is no space to carry such a flight manual on the aircraft. In addition, carrying the manual on the aircraft would be pointless, since there is no pilot or other person on board who could read or use it. The equivalent – and in fact a greater - level of safety will be maintained by keeping the flight manual at the ground control point where the pilot flying the sUAS will have immediate access to it.

On August 8, 2014, the FAA issued a memorandum entitled "Interpretation regarding whether certain required documents may be kept at an unmanned aircraft's control station." This document stated, in part "maintaining these documents at the pilot's control station would meet the intent of the rule as the pilot would be able to produce the documents for his or her own information or to an FAA inspector." Exhibit 1.

Equivalent level of safety: iCam will keep its flight manual at the ground station, where both the PIC and VO can access it. An equivalent level of safety to 14 C.F.R. 91.9(b)(2) is provided because the intent of this rule – the pilot having access to this material during flight – is met.

J. 14 C.F.R. 91.9(c): Civil aircraft flight manual, marking, and placard requirements.

iCam requests an exemption from 14 C.F.R. 91.9(c). This part provides: "(c) No person may operate a U.S.-registered civil aircraft unless that aircraft is identified in accordance with part 45 of this chapter."

As stated above, iCam will submit AC Form 8050-1 to the FAA Registration Office in order to obtain its N-Numbers, which will be placed on the "arms" or fuselage of the aircraft in lettering as large as practicably possible. The sUAS, due to its small size, does not have room to contain fireproof placard or to display aircraft marks in a conventional size. However, iCam Copters LLC will place its N-Numbers on the "arms" or fuselage of the aircraft in lettering as large as practicably possible, once obtained from the FAA.

Equivalent level of safety: iCam will obtain its N-Numbers from the FAA Registration Office and affix it to the "arms" or fuselage of the aircraft as large as practicably possible. An equivalent level of safety to 14 C.F.R. 91.9(c) is met because the sUASs will be registered with the FAA and identifiable in the event of an incident.

K. 14 C.F.R. 91.103(b)(2): Preflight action.

iCam requests an exemption from 14 C.F.R. 91.103(b)(2). This part provides:

"Each pilot in command shall, before beginning a flight, become familiar with all available information concerning that flight. This information must include—... (b) For any flight, runway lengths at airports of intended use, and the following takeoff and landing distance information: … (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."

Because flights of the sUAS will not be at airports, Part 91.103(b)(2) does not apply.

Equivalent level of safety: The iCam PIC will, before beginning a flight, become familiar with all available and relevant information concerning the craft and that flight, including wind and temperature. However, as the flights of the sUAS will not begin or end at airports, the airport-related information required in Part 91.103(b)(2) does not apply. As a condition to the approval of exemption, iCam shall perform the preflight operations set forth in its operations manual.

L. 14 C.F.R. 91.105: Flight crewmembers at stations.

iCam requests an exemption from 14 C.F.R. 91.105 since this part is not applicable due to the sUAS carrying no flight crewmembers.

Equivalent level of safety: The requested exemption will achieve an equivalent level of safety because iCam will not operate the aircraft unless someone is at the controls at all times. Each flight will be manual, with the exception of the Ace One's and DJI Inspire 1's emergency return-to-home and stabilization features. This will achieve an equivalent level of safety to 14 C.F.R. 91.105 because the flight crew will be at their stations at all times during the flight. The stations will not be on the aircraft, but on the ground.

M. 14 C.F.R. 91.113(b): Right-of-way rules: Except water operations.

iCam requests an exemption from 14 C.F.R. 113(b) to the extent that it applies to overhead aircraft operating at or above 500 feet AGL as the sUAS will be operating no higher than 400 feet AGL. This part provides:

"(b): General. When weather conditions permit, regardless of whether an operation is conducted under instrument flight rules or visual flight rules, vigilance shall be maintained by each person operating an aircraft so as to see and avoid other aircraft. When a rule of this section gives another aircraft the right-of-way, the pilot shall give way to that aircraft and may not pass over, under, or ahead of it unless well clear."

For example, if another aircraft is operating overhead at 10,000 feet AGL there is no danger posed to that other aircraft if the sUAS is operating under it or ahead of it at or beneath 400 feet AGL.

Equivalent Level of Safety: iCam will operate its sUAS to see and avoid and give way to other aircraft that should enter airspace at or below 400 feet AGL, and will give right-of-way to manned aircraft. This will provide an equivalent level of safety to 14 C.F.R. 91.113(b) because the sUAS has significantly greater mobility than a much larger, manned aircraft. As a result, the PIC will be able to react and respond much more quickly than the other pilot.

N. 14 C.F.R. 91.119(b) and (c): Minimum safe altitudes: General.

iCam requests an exemption from 14 C.F.R. 91.119 subparts (b) and (c). This regulation provides:

> "Except when necessary for takeoff or landing, no person may operate an aircraft below the following altitudes:...
>
> (b) Over congested areas. Over any congested area of a city, town, or settlement, or over any open air assembly of persons, an altitude of 1,000 feet above the highest obstacle within a horizontal radius of 2,000 feet of the aircraft.
>
> (c) Over other than congested areas. 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."

iCam requests an exemption to allow it to conduct flight operations closer than 500 feet to vessels, vehicles and structures when the owner/controller of any such vessels, vehicles or structures grants permission for the operation and the PIC makes a safety assessment of the risk of operating closer to those objects and determines that it does not present an undue hazard. iCam also requests an exemption allowing it to fly closer than 500 feet to participating individuals.

Equivalent level of safety: iCam will not operate the sUAS any higher than 400 feet AGL, and the majority of flights will be closer to 100 feet AGL. Furthermore, while iCam will not be operating over any congested areas, the sUAS will necessarily be flown closer than 500 feet to the natural areas and structures it will be filming (as well as closer than 500 feet to the ground). When planning operations, iCam will work with local FSDO to determine the proper location for filming. Additionally, prior to each operation, iCam's flight crew will conduct a safety assessment and will not operate its sUASs without determining that there are no undue safety hazards.

iCam will also have a buffer zone to prevent unauthorized individuals from entering into the flight area. iCam's VOs will serve as fence posts on the outer edges of the flight operational area in order to actively monitor the space for unauthorized and nonparticipating individuals. Should one appear, iCam will safely land the sUAS in a manner meant to avoid the unauthorized/nonparticipating individual. This will provide an equivalent level of safety to 14 C.F.R. 91.119(b) and (c) because the PIC and flight crew will make a safety assessment of the risk of operating, and determine that it does not present an undue hazard.

O. 14 C.F.R. 91.121: Altimeter Settings

iCam requests an exemption from 14 C.F.R. 91.121. This Part provides guidelines for altimeter use in maintaining the cruising altitude or flight level of the aircraft. iCam is not requesting a general exemption from the requirement that its sUAS have an Altimeter. The DJI Ace One and DJI Inspire 1's flight controller both have an internal measurement unit ("IMU"). The IMU has a built-in internal sensor and a barometric altimeter that measures both attitude and altitude. Exhibit 4, Exhibit 8. Rather, iCam requests an exemption from the requirement to set its

altimeter to a station along the route, or out of an airport, because the GT80X and DJI Inspire 1 will not be traveling point-to-point and is limited in the distance it can travel from the PIC. Additionally, iCam will not be flying into or out of an airport.

Equivalent Level of Safety: iCam's operation of the sUAS will not exceed 400 feet AGL and will be operated in a fashion that is not a sustained cruising flight such as a manned aircraft will typically fly. The operator will be able to observe and control the maximum height of the sUAS through the telemetry features of the transmitter and on the laptop at the ground station. The telemetry features of both the GT80X and DJI Inspire 1 provide altitude information from the onboard flight controller. Additionally, the sUAS will be operated within the line of sight. Therefore, the equivalent level of safety provided by Section 91.121 will be met. The FAA has previously granted this exemption. Exhibit 2.

P. 14 C.F.R. 91.151: Fuel requirements for flight in VFR conditions.

The DJI Inspire 1 is powered by electricity, using lithium polymer batteries that currently have a flight limit of approximately no more than 18 minutes, with optional batteries of 5700 mAh and flight times up to 22 minutes. Exhibit 8. Therefore, due to the limitations of the batteries, it is currently impossible to comply with Part 91.151. However, the sUAS will be operated in a manner with at least the equivalent level of safety as that of a manned aircraft complying with Part 91.151.

Both the fuel-powered and electric GT80X will use 50% of the total useable fuel or battery, which leaves 30 minutes to return to home.

Operation of a sUAS with less than 30 minutes of reserve fuel does not engender the type of risks that Section 91.151(a) was intended to alleviate. During the entire flight, the PIC will always have a visual line of sight of the sUAS and the VO will be monitoring the battery life via the telemetry display on the laptop at the ground station. The sUAS will always have enough power to land safely, given the minimum level of reserve capacity of the batteries.

When flying the DJI Inspire 1, the low battery failsafe is triggered when the DJI Intelligent Flight Battery is depleted to a point that may affect the safe return of the aircraft. This threshold is automatically determined based on the current aircraft altitude and its distance from the home spot. For more information regarding this safety procedure, please refer to Exhibit 8.

Applicant believes that an exemption from 14 CFR §91.151(a) is entirely consistent with the scope of similar exemptions already granted to other operations, including the MPAA Exemptions. Exhibit 9.

Equivalent level of safety: iCam will land the DJI Inspire 1 when the low battery level failsafe is triggered. The proposed exemption meets an equivalent level of safety to 14 C.F.R. 91.151 because, given the limitations on iCam's proposed operations and the location of those operations, a reduced minimum power reserve for flight in daylight VFR conditions is reasonable.

Q. 14 C.F.R. 91.203(a) and (b): Civil aircraft: Certifications required.

iCam requests an exemption from 14 C.F.R. 91.203(a) and (b). This section provides in

part:

> "(a) Except as provided in § 91.715, no person may operate a civil aircraft unless it has within it the following:
>
> (1) An appropriate and current airworthiness certificate…
>
> (2) An effective U.S. registration certificate issued to its owner…
> (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."

First, there are currently no procedures by which the FAA can approve airworthiness certificates for sUAS. However, iCam Copters LLC will submit AC Form 8050-1 to the FAA Registration Office in order to obtain its N-Number, which will be placed on the legs of the aircraft as large as practicably possible, and the PIC will have the operator's manual and log book at the ground station, which have of the relevant testing and data information for each sUAS.

Second, iCam has put the GT80X through the same testing that a manned aircraft would go through, including testing designed to make the fuel tanks combust (while being monitored by a safety technician holding a fire extinguisher), which iCam was unable to do.

Additionally, the autopilot systems for both the GT80X and DJI Inspire 1 provides a number of safety features, including the failsafe automatic return to home if the radio control link is broken. Because of the use of GPS with the sUAS, the operator will set the initial location of flight takeoff ("home position"), and two alternative "safety zones" the sUAS can be directed to, should the home position become unsafe. If the radio control link is broken, the Autopilot system will recognize this broken control link and cause the sUAS to automatically return to the home position as recorded by the GPS instrumentation. Because the sUAS team will mark off an area with traffic cones that has a 50-100 foot diameter that will be used as the "home position" for the sUAS to return, no one will be standing in the way of the path. More information about the Ace One Autopilot system, including its user manual, is included in Exhibits 4-7. More information about the DJI Inspire 1's flight control system can be found on page 12 of its user manual, submitted as Exhibit 8.

In the restricted environment and under the conditions proposed, operation of the sUAS will be at least as safe as a conventional aircraft (fixed wing or rotorcraft) operating with an airworthiness certificate. iCam will not accept assignments from clients who are within 5 miles of controlled airspace without first gaining written and/or oral permission from air traffic control.

Equivalent level of safety: The GT80X is no more than 55 pounds inclusive of fuel and technical payload, and carries neither a pilot nor passengers. The DJI Inspire 1 is no more than 6.5 pounds. The sUAS will be tightly controlled and monitored by the operator and the observer and in compliance with the requirements of the FAA's grant of this petition and all local public safety requirements. This will ensure safety and security for the area of operation. The FAA will have advance notice of all operations because iCam will notify both ATC and the local FSDO prior to operating, as outlined above. These safety enhancements provide a greater degree of

safety to the public and property owners than conventional operations conducted with airworthiness certificates issued under Subpart H. Lastly, application of these same criteria demonstrates that there is no credible threat to national security posed by the UAS, due to its size, speed of operation, location of operation, and inability to carry a substantial payload. Granting the proposed exemption will achieve an equivalent level of safety to 14 C.F.R. 91.203(a) and (b) because of the small size of the sUAS and the operational limits set out above.

R. 14 C.F.R. 91.215: ATC Transponder and Altitude Reporting Equipment and Use

This section requires that installed Air Traffic Control (ATC) transponder equipment must meet specific performance and environmental requirements, and aircraft must be equipped with an operable coded radar beacon transponder.

The GT80X and DJI Inspire 1 are not equipped with ATC transponder equipment. It is designed to fly in limited airspace under the control of a ground station. Because the sUASs used by iCam will not be flying into or near airports, and will fly no higher than 400 feet AGL, they will not share airspace with manned aircraft and there is very low risk of collision. In addition, because there will be no need to have contemporaneous communication with ATC Control, due to the short distances, short flight times, and restricted altitude the sUASs will operate within, iCam requests an exemption from this section. Additionally, the sUAS is too small to contain ATC transponder equipment in any form factor that is known to be available commercially at a reasonable cost.

Equivalent level of safety: An equivalent level of safety to 14 C.F.R. 91.125 will be met because iCam will not fly its sUAS into or near airports. All operations will be below 400 feet AGL, so there is very low risk of collision with any manned aircraft. Moreover, the GT80X and DJI Inspire 1 will always be flown within the line of sight of the PIC, and iCam will utilize two VOs on opposite, outer edges of the flight area, whose only job is to watch for objects and individuals entering into the flight area. iCam will contact local ATC before operations to issue a NOTAM, and the local FSDO with its flight plan. iCam will also give right of way to manned aircraft as they do appear.

S. 14 C.F.R. 91.403: General

This section requires that the owner or operator of an aircraft is primarily responsible for maintaining that aircraft in an airworthy condition. iCam will adhere to this requirement. However, this Section also limits maintenance to that "prescribed in this subpart and other applicable regulations, including part 43 of this chapter." Because of this limitation, and because of the exemptions under Part 43 requested above, iCam requests an exemption from this Section.

Equivalent level of safety: This exemption meets the requirements for an equivalent level of safety pursuant to Section 333 because of its small size, light weight, relatively slow speed, and use in controlled rural environments, as described previously in this petition. iCam will conduct maintenance and repairs of the GT80X under the supervision and direction of the copter's manufacturer and designer.

T. 14 C.F.R. 91.405 (a) and (d): Maintenance Required

This section requires that aircraft be inspected as prescribed by Section E, 14 C.F.R.

§§91.401-91.421. As shown below, iCam is applying for an exemption for these sections, due to the fact that its operators will inspect the sUAS prior to each flight and keep a record of all maintenance that is done. Additionally, prior to each operation, iCam will conduct a pre-flight safety check of the GT80X. This safety check is listed in the operations manual, submitted confidentially. Because the Sections discussed below are concerned with manned aircraft, and as such have inspection requirements designed for the safety of passengers, they are inapplicable to iCam.

iCam is also applying for an exemption to subpart (d) of this section, which requires a placard to be installed and references §43.11. As noted previously, iCam requests an exemption to the placard requirement, because, due to the small size of the sUAS, there is no room to place the placard. As an alternative and to achieve an equivalent level of safety, iCam keeps logbooks detailing all repairs.

Despite the requested exemption from subparts (a) and (d) of this section, iCam will follow subparts (b) and (c) of this subpart.

Equivalent level of safety: The requested exemption will meet an equivalent level of safety to 14 C.F.R. 405 (a) and (d) because iCam will repair and maintain the GT80X under the supervision and at the direction of the copter's manufacturer. iCam will repair and maintain the DJI Inspire 1 by following the manufacturer's specifications.

U. 14 C.F.R. 91.407: Operation after maintenance, preventive maintenance, rebuilding, or alteration

This section prevents any aircraft from operation that "has undergone maintenance, preventative maintenance, rebuilding, or alteration unless (1) [i]t has been approved for return to service by a person authorized under § 43.7 of this chapter; and (2) [t]he maintenance record entry required by §43.9 or §43.11, as applicable, of this chapter has been made."

However, iCam has requested an exemption from §§ 43.7 and 43.11 as described previously. The capability of the operators to maintain and repair the sUAS meets the requirements for an equivalent level of safety pursuant to Section 333 for both sUASs, their intended use, and the rural operating environment. Additionally, due to the small size of the sUAS, there is no room to place inspection placards.

Therefore, because iCam has requested an exemption from 43.7 and 43.11, iCam respectfully requests an exemption from 91.407.

Equivalent level of safety: To achieve an equivalent level of safety, iCam will regularly inspect and maintain its sUASs in the manner required for manned aircraft, under the supervision of and at the direction of the manufacturer of the GT80X. iCam will repair and maintain the DJI Inspire 1 by following the manufacturer's specifications. iCam's inspection and maintenance procedures will be submitted under seal, for proprietary purposes.

V. 14 C.F.R. 91.409: Inspections

This section lays out the requirements for inspections of aircraft. iCam respectfully requests an exemption from these requirements because they are intended to maintain the safety

of manned aircraft significantly larger and capable of significantly longer flights than is sUAS. iCam's inspection and maintenance procedures have been submitted confidentially for proprietary purposes.

Equivalent level of safety: The requested exemption will meet or exceed the level of safety achieved by adherence to 14 C.F.R. 91.409 because iCam's inspection and maintenance procedures of the GT80X are as identical as possible to the inspection and maintenance procedures of manned aircraft. Additionally, iCam will repair and maintain the DJI Inspire 1 by following the manufacturer's specifications.

W. 14 C.F.R. 91.417: Maintenance records

iCam respectfully requests an exemption from this Section, as it is only applicable for aircraft with an airworthiness certificate. Because iCam will not have an airworthiness certificate, this Section is inapplicable.

Equivalent level of safety: The requested exemption will provide an equivalent level of safety to 14.C.F.R. 91.417 because iCam will keep detailed maintenance records on every part as it is replaced, including but not limited to propellers, batteries, and electrical components.

Federal Aviation Administration

Memorandum

Date: AUG -8 2014

To: John Duncan, Director, Flight Standards Service, AFS-1

From: Mark W. Bury, Assistant Chief Counsel for International Law, Legislation and Regulations, AGC-200

Prepared by: Dean E. Griffith, Attorney, AGC-220

Subject: Interpretation regarding whether certain required documents may be kept at an unmanned aircraft's control station.

This memorandum addresses whether the pilot of an unmanned aircraft may keep airworthiness certificates, aircraft manuals, and aircraft registration certificates at the unmanned aircraft's ground control station and satisfy the regulatory requirements of sections 91.9(b), 91.203(a) and (b), 47.3(b)(2), and 47.31(c) of Title 14, Code of Federal Regulations. This question has been brought to our attention because of the impracticality of placing these documents on a small aircraft with no pilot on board. As discussed below, we find that the intent of these regulations is met if the pilot of the unmanned aircraft has access to these documents at the control station from which he or she is operating the aircraft.

Section 91.9(b) prohibits operation of U.S.-registered civil aircraft unless "there is available in the aircraft" an Airplane or Rotorcraft Flight Manual or other material, markings and placards. The FAA stated that the purpose of this rule is to "insure that the information is readily available to the pilot" for use during operations. *See* 40 Fed. Reg. 24665 (June 9, 1975), 37 Fed. Reg. 20022 (Sept. 23, 1972). The text of the rule and preamble to subsequent revisions of the rule confirm the intent that the pilot is to have access to the material during flight. Accordingly, we find that the intent of the rule is met if the information is maintained at the pilot's control station such that it is available to the pilot.

Section 91.203(a) prohibits operation of a civil aircraft "unless it has within it" an appropriate and current airworthiness certificate and the aircraft's registration certification. Section 91.203(b) requires that the airworthiness certificate be "displayed at the cabin or cockpit entrance so that it is legible to passengers or crew." Similarly, sections 47.3(b)(2) and 47.31(c) allow an applicant for aircraft registration to carry "in the aircraft" the second copy of the registration application as temporary authority to operate without registration. These documents demonstrate that the aircraft is appropriately certificated and registered, or is in the process of being registered. Additionally, the FAA has previously addressed the requirement to display the

airworthiness certificate and found that the regulation permits displaying the certificate so that it is only legible to the flight crew even if not legible to passengers. *See* Legal Interpretation to Leonard A. Ceruzzi, from Donald P. Byrne, Acting Assistant Chief Counsel, Regulations and Enforcement Division (Aug. 7, 1990). Accordingly, we find that maintaining these documents at the pilot's control station would meet the intent of the rule as the pilot would be able to produce the documents for his or her own information or to an FAA inspector.

We note that this memorandum is to be narrowly construed to unmanned aircraft systems and is not intended to apply to operation of manned aircraft or optionally piloted aircraft with a pilot on board.

Exemption No. 11138

UNITED STATES OF AMERICA
DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
WASHINGTON, DC 20591

In the matter of the petition of

DOUGLAS TRUDEAU, REALTOR®

for an exemption from Part 21; and §§ 45.23(b); 61.113(a) & (b); 91.7(a); 91.9(b)(2); 91.103(b); 91.109; 91.119; 91.121, 91.151(a); 91.203(a) & (b); 91.405(a); 91.407(a)(1); 91.409(a)(2); and 91.417(a) & (b) of Title 14, Code of Federal Regulations

Regulatory Docket No. FAA-2014-0481

GRANT OF EXEMPTION

By letter dated July 12, 2014, Mr. Douglas Trudeau, Realtor®, of Tierra Antigua Realty (Trudeau), 1650 E River Road, Suite 202, Tucson, AZ 85718 petitioned the Federal Aviation Administration (FAA) for an exemption from part 21, subpart H; and Sections 45.23(b), 61.113(a) and (b), 91.7(a), 91.9(b)(2), 91.103(b), 91.109, 91.119, 91.121, 91.151(a), 91.203(a) and (b), 91.405(a), 91.407(a)(1), 91.409(a)(2), and 91.417(a) and (b) of Title 14, Code of Federal Regulations (14 CFR). The proposed exemption would allow Trudeau to operate the PHANTOM 2 Vision+ quad-copter unmanned aircraft system (UAS) to conduct aerial videography and cinematography to enhance academic community awareness for those individuals and companies unfamiliar with the geographical layout of the metro Tucson area and augment real estate listing videos.

The petitioner requests relief from the following regulations:

Part 21 prescribes the procedural requirements for issuing and changing design approvals, productions approvals, airworthiness certificates, and airworthiness approvals.

Section 45.23(b) prescribes that 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.

Section 61.113(a) and (b) prescribes that—

(a) no person who holds a private pilot certificate may act as a pilot in command of an aircraft that is carrying passengers or property for compensation or hire; nor may that person, for compensation or hire, act as pilot in command of an aircraft.

(b) a private pilot may, for compensation or hire, act as pilot in command of an aircraft in connection with any business or employment if:

(1) The flight is only incidental to that business or employment; and

(2) The aircraft does not carry passengers or property for compensation or hire.

Section 91.7(a) prescribes that no person may operate a civil aircraft unless it is in an airworthy condition.

Section 91.7(b) prescribes that the pilot in command of a civil aircraft is responsible for determining whether that aircraft is in condition for safe flight and that the PIC shall discontinue the flight when unairworthy mechanical, electrical, or structural conditions occur.

Section 91.9(b)(2) prohibits operation of U.S.-registered civil aircraft 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.

Section 91.103(b) prescribes that a pilot shall for any flight, become familiar with runway lengths at airports of intended use, and takeoff and landing distance information.

Section 91.109(a) prescribes, in pertinent part, 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.

Section 91.119 prescribes that, except when necessary for takeoff or landing, no person may operate an aircraft below the following altitudes:

(a) Anywhere. An altitude allowing, if a power unit fails, an emergency landing without undue hazard to persons or property on the surface.

(b) Over congested areas. Over any congested area of a city, town, or settlement, or over any open air assembly of persons, an altitude of 1,000 feet above the highest obstacle within a horizontal radius of 2,000 feet of the aircraft.

(c) Over other than congested areas. 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.

(d) Helicopters, powered parachutes, and weight-shift-control aircraft. If the operation is conducted without hazard to persons or property on the surface—

(1) A helicopter may be operated at less than the minimums prescribed in paragraph (b) or (c) of this section, provided each person operating the helicopter complies with any routes or altitudes specifically prescribed for helicopters by the FAA; and

(2) A powered parachute or weight-shift-control aircraft may be operated at less than the minimums prescribed in paragraph (c) of this section.

Section 91.121 requires, in pertinent part, each person operating an aircraft to maintain cruising altitude by reference to an altimeter that is set "…to the elevation of the departure airport or an appropriate altimeter setting available before departure."

Section 91.151(a) prescribes that no person may begin 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 [emphasis added].

Section 91.203(a) prohibits, in pertinent part, any person from operating a civil aircraft unless it has within it (1) an appropriate and current airworthiness certificate; and (2) an effective U.S. registration certificate issued to its owner or, for operation within the United States, the second copy of the Aircraft registration Application as provided for in § 47.31(c).

Section 91.203(b) prescribes, in pertinent part, that no person may operate a civil aircraft unless the airworthiness certificate 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.

Section 91.405(a) requires, in pertinent part, that an aircraft operator or owner shall have that aircraft inspected as prescribed in subpart E of the same part and shall, between required inspections, except as provided in paragraph (c) of the same section, have discrepancies repaired as prescribed in part 43 of the chapter.

Section 91.407(a)(1) prohibits, in pertinent part, any person from operating an aircraft that has undergone maintenance, preventive maintenance, rebuilding, or alteration unless it has been approved for return to service by a person authorized under § 43.7 of the same chapter.

Section 91.409(a)(2) prescribes, in pertinent part, that no person may operate an aircraft unless, within the preceding 12 calendar months, it has had an inspection for the issuance of an airworthiness certificate in accordance with part 21 of this chapter.

Section 91.417(a) and (b) prescribes, in pertinent part, that—

> (a) Each registered owner or operator shall keep the following records for the periods specified in paragraph (b) of this section:
>
> > (1) Records of the maintenance, preventive maintenance, and alteration and records of the 100-hour, annual, progressive, and other required or approved inspections, as appropriate, for each aircraft (including the airframe) and each engine, propeller, rotor, and appliance of an aircraft. The records must include—
> >
> > > (i) A description (or reference to data acceptable to the Administrator) of the work performed; and
> > >
> > > (ii) The date of completion of the work performed; and
> > >
> > > (iii) The signature, and certificate number of the person approving the aircraft for return to service.
> >
> > (2) Records containing the following information:
> >
> > > (i) The total time in service of the airframe, each engine, each propeller, and each rotor.
> > >
> > > (ii) The current status of life-limited parts of each airframe, engine, propeller, rotor, and appliance.
> > >
> > > (iii) The time since last overhaul of all items installed on the aircraft which are required to be overhauled on a specified time basis.
> > >
> > > (iv) The current inspection status of the aircraft, including the time since the last inspection required by the inspection program under which the aircraft and its appliances are maintained.

(v) The current status of applicable airworthiness directives (AD) and safety directives including, for each, the method of compliance, the AD or safety directive number and revision date. If the AD or safety directive involves recurring action, the time and date when the next action is required.

(vi) Copies of the forms prescribed by § 43.9(d) of this chapter for each major alteration to the airframe and currently installed engines, rotors, propellers, and appliances.

(b) The owner or operator shall retain the following records for the periods prescribed:

(1) The records specified in paragraph (a)(1) of this section shall be retained until the work is repeated or superseded by other work or for 1 year after the work is performed.

(2) The records specified in paragraph (a)(2) of this section shall be retained and transferred with the aircraft at the time the aircraft is sold.

(3) A list of defects furnished to a registered owner or operator under § 43.11 of this chapter shall be retained until the defects are repaired and the aircraft is approved for return to service.

The petitioner supports his request with the following information:

The petitioner has provided the following information – contained in his petition and supporting documentation including: 1) Supplemental Response for Petition, 2) PHANTOM Flying Flow Chart V1.0 (Simplified Version), PHANTOM Quick Start Manual v1.7, PHANTOM Advanced Manual v.1.4, 3) PHANTOM 2 Vision+ User Manual 4) restricted areas map, 5) personal protocols and controls, and 6) Safety/Flight Manual (all hereinafter referred to as operating documents).

The FAA has organized the petitioner's information into four sections: 1) the unmanned aircraft system (UAS), 2) the UAS Pilot In Command (PIC), 3) the UAS operating parameters and 4) Public Interest.

Unmanned Aircraft System

The petitioner states he plans to operate a UAS, the PHANTOM 2 Vision+, which is comprised of an unmanned aircraft (UA or PHANTOM) and a transportable ground station. The PHANTOM is referred to as a quad-copter with a maximum gross weight of about 3 pounds. It is equipped with four rotors that are driven by electric motors powered by batteries. The UA has a maximum airspeed of 30 knots. Petitioner plans to attach a small ultra-

lightweight GoPro 3+ camera to his UA and operate the UA over various areas near Tucson, Arizona to enhance academic community awareness and augment real estate listing videos. Petitioner makes the following representations of operational enhancements which he proposes to abide by to ensure this exemption will provide a level of safety at least equal to existing rules:

- He will only operate in reasonably safe environments that are strictly controlled, are away from power lines, elevated lights, airports and actively populated areas; and
- He will conduct extensive preflight inspections and protocols, during which safety carries primary importance.

The petitioner states that given the size, weight, speed, and limited operating area associated with the aircraft to be utilized by him, an exemption from 14 CFR part 21, Subpart H (Airworthiness Certificates) and § 91.203 (a) and (b) (Certifications required), subject to certain conditions and limitations, is warranted and meets the requirements for an equivalent level of safety under 14 CFR part 11 and Section 333 of P.L. 112-95 (Section 333).

Petitioner requests an exemption from § 45.23 *Marking of the aircraft* because his UA will not have a cabin, cockpit or pilot station on which to mark certain words or phrases. Further, he states that two-inch lettering is difficult to place on such a small aircraft with dimensions smaller than the minimal lettering requirement. Regardless of this, petitioner states that he will mark his UAS in the largest possible lettering by placing the word "Experimental" on its fuselage as required by § 45.29(f) so that he or anyone assisting him as a spotter will see the markings.

The petitioner states that an exemption from §§ 91.405(a), 91.407(a)(1), 91.409(a)(2) and 91.417(a) and (b) *Maintenance inspections* may be required and should be granted since they only apply to aircraft with an airworthiness certificate. However, the petitioner states as a safety precaution he will perform a preflight inspection of his UAS before each flight as outlined in his operating documents.

<u>UAS Pilot in Command (PIC)</u>

The petitioner asserts that under § 61.113 (a) and (b) private pilots are limited to non-commercial operations, however he can achieve an equivalent level of safety as achieved by current regulations because his UAS does not carry any pilots or passengers. Further, he states that, while helpful, a pilot license will not ensure remote control piloting skills. He further indicates that the risks of operating a UAS are far less than the risk levels inherent in the commercial activities outlined in 14 CFR part 61, et seq., thus he requests an exemption from § 61.113 *Private Pilot Privileges and Limitations: Pilot in command.*

Regarding UAS operational training, the petitioner states he has flown numerous practice flights in remote areas as a hobbyist simulating flights for future commercial use to gain familiarization with the characteristics of his UAS' performance under different temperature

and weather conditions. He further states that he practices computerized simulated flights to maintain adequate skills and response reflex time.

In a supplemental request to the FAA, the petitioner requests consideration of a 120 day temporary airman certificate in accordance with § 63.13, to allow him time to obtain a private pilot certificate or to allow the FAA time to establish minimum UAS airman certification standards.

UAS Operating Parameters

The petitioner states that he will abide by the following additional operating conditions under this exemption:

- operate his UAS below 300 feet and within a radius distance of 1000 feet from the controller to both aid in direct line of sight visual observation;[1]
- operate the UAS for 3-7 minutes per flight;
- land his UAS prior to the manufacturer's recommended minimum level of battery power;
- operate his UAS only within visual line of sight (VLOS);
- use the UAS' global positioning system (GPS) flight safety feature whereby it hovers and then slowly lands if communication with the remote control pilot is lost;
- conduct all operations under his own personal and flight safety protocols (including posting a warning sign reading: "Attention Aerial Photography in Progress – Remain Back 150 feet") contained in the operating documents and will actively analyze flight data and other sources of information to constantly update and enhance his safety protocols;
- contact respective airports if operations will be within 5 miles to advise them of his estimated flight time, flight duration, elevation of flight and other pertinent information;
- always obtain all necessary permissions prior to operation; and
- have procedures in place to abort flights in the event of safety breaches or potential danger.

Petitioner states that § 91.7(a) prohibits the operation of an aircraft without an airworthiness certificate. The petitioner asserts that since there is currently no certificate applicable to his operation, this regulation is inapplicable.

Petitioner states that § 91.9(b)(2) requires an aircraft flight manual in the aircraft, however since there are no pilots or passengers on board his aircraft and given its size, this regulation is inapplicable. He further indicates an equivalent level of safety will be achieved by maintaining a safety/flight manual with the UAS ground station.

[1] As specified in Douglas Trudeau Supplementary Information No. 2

Although petitioner requests an exemption from § 91.103(b) *Preflight action*, he provides no information supporting his request.

Similarly, the petitioner requests an exemption from § 91.109 *Flight instruction; simulated instrument flight and certain flight test*, and provides no information indicating how safety will be maintained if an exemption to this section is granted.

Petitioner states that § 91.119 prescribes safe altitudes for the operation of civil aircraft, but that it allows helicopters to be operated at lower altitudes in certain conditions. Petitioner states he will not operate his UAS above the altitude of 300 feet above ground level (AGL) and will also only operate in safe areas away from the public and traffic, thus "providing a level of safety at least equivalent to or below those in relation to minimum safe altitudes." The petitioner asserts that given the size, weight, maneuverability, and speed of his UAS, an equivalent or higher level of safety will be achieved.

Petitioner indicates that § 91.121 *Altimeter settings* is inapplicable since he UAS utilizes electronic GPS with a barometric sensor.

While petitioner requests an exemption from § 91.151(a) *Fuel requirements for flight in VFR conditions*, he provides no information supporting his request for this exemption.

Public Interest

The petitioner states that aerial videography for geographical awareness and for real estate marketing has been around for a long time through manned fixed wing aircraft and helicopters, but for small business owners, its expense has been cost-prohibitive. Granting this exemption to the petitioner would allow him to provide this service at a much lower cost. Further, the petitioner indicates his small UAS will pose no threat to the public given its small size and lack of combustible fuel when compared to larger manned aircraft. The petitioner also states that the operation of his UAS will minimize ecological damage and promote economic growth by providing information to companies looking to relocate or build in the Tucson metro area.

Discussion of Public Comments:

A summary of the petition was published in the Federal Register on August 8, 2014 (79 FR 46500). The petition received five comments. During the comment period, the petitioner submitted supplemental information in response to several of the comments.

Of the five comments received, including four from trade organizations and one submitted by an individual, three raised concerns with the petition and one was specifically opposed. The other two supported the petition. Three trade organizations submitted letters expressing various concerns with the petition for exemption, including the Air Line Pilots Association

International (ALPA), the National Agricultural Aviation Association (NAAA), and the United States Hang Gliding & Paragliding Association (USHPA).

ALPA expressed concern regarding certain conditions outlined in Trudeau's petition. ALPA noted that the proposed operations will be for "compensation or hire," and believes the UAS pilot must hold at least a current FAA Commercial Pilot Certificate with an appropriate category and class rating for the type of aircraft being flown and a current second-class airman medical certificate. ALPA also noted that this is the requirement for compensation or hire operations in the National Airspace System (NAS) today. NAAA and USHPA raised similar concerns on pilot qualification. NAAA and USHPA asserted that the operator should hold a pilot certificate and be thoroughly familiar with the limitations of manned aircraft flight. NAAA further stated that requirements for UAS pilot licensing should be developed along with other rigorous rules and qualifications to ensure safe integration of the unmanned aircraft into the NAS. The Small UAV Coalition (Coalition) disagreed with ALPA, NAAA and USHPA, asserting that a pilot certification should not be required for small unmanned operations such as the petitioner's.

The FAA has carefully reviewed the concerns expressed in these comments and the discussion regarding knowledge, training, and medical certification required by holders of both private and commercial pilot certificates. Additional details are available in the ensuing analysis of this issue with regard to 14 CFR part 61.

ALPA stated that the petitioner asserts that although he plans to fly below 300 feet above the surface and will generally not operate near populated areas, he also states he plans to survey real estate development which ALPA believes are by definition populated areas. ALPA also stated that the petitioner's area of operations as outlined in his exhibits show he would be within the airport traffic area of both Tucson International Airport and Davis-Monthan AFB. ALPA also raised concerns about whether the petitioner's UAS' barometric sensor will enable him to accurately address his altitude restrictions. ALPA also asserted that processes or mitigations, such as redundant control capability, fail-safe systems, and backups, and specific, validated procedures for system and equipment failures, must be in place to ensure the aircraft and its control system(s) operate to the same level of safety as other aircraft operated commercially in the NAS. NAAA stated commercial UAS should have to receive airworthiness certification by the FAA to ensure they can safely operate in the NAS without posing a hazard to persons or property.

ALPA commented that command and control (C2) link failures are one of the most common failures on a UAS, and that lost link mitigations should require safe modes to prevent UA fly-away or other scenarios. If lost-link occurs, mitigations like auto-hover, auto-land, return-to-home and geo-fencing boundary protection must be incorporated into the navigation and control systems for the UAS to safely land or re-establish C2.

The FAA agrees and carefully examined the proposed operation to ensure that the vehicle design and the petitioner's supporting documentation addressed potential hazards related to C2 failure. The FAA finds that the UAS to be operated by Trudeau has sufficient design features to address these hazards. Further detail is contained in the analysis of the UAS below.

Regarding use of the NAS, ALPA noted there must be means to ensure the UA remains within the defined airspace and to ensure the hazard of other aircraft intruding on the operation is mitigated. ALPA stated given the absence of an onboard pilot, the means to meet the requirements to "see and avoid" must be specified. ALPA also expressed concern, stating that "because the waiver request is not for a specific operation but rather for all operations of the same general type, the FAA's oversight task is considerably increased." Per the conditions and limitations below, the FAA has prescribed operator, pilot and notification requirements to ensure that appropriate oversight can occur.

The FAA agrees and has required specific conditions and limitations outlined below related to the use of a visual observer, that the pilot be a current FAA certificated private pilot and that a notice-to-airmen (NOTAM) be issued prior to operations.

NAAA stated that it represents the interests of small business owners and pilots licensed as commercial applicators and ensuring safe low-level airspace includes minimizing obstructions which are difficult to be seen and identified by the pilots. NAAA members operate in low-level airspace, and clear low-level airspace is vital to the safety of these operators. NAAA stated that seeing and avoiding other aircraft and hazardous obstructions is the backbone for agricultural safety, and agricultural pilots depend on pilots of other aircraft to perform their see and avoid functions needed to prevent collisions. NAAA believes that UA operations at low altitudes will increase the potential of collision hazards with agricultural aircraft. NAAA requested that operators of UAS develop ways of making the presence of UAS known to VFR air traffic if they are to be integrated into the NAS and, for areas with less UAS activity, recommended a procedure for issuing NOTAMs when they are present.

The FAA agrees and has incorporated this into the conditions and limitations of this exemption. NAAA's notification concerns are also addressed by the conditions and limitations that will require an Air Traffic Organization issued Certificate of Waiver or Authorization (COA) to address airspace requirements and notification. Further detail is contained in the analysis of the UAS operating parameters below.

NAAA proposed UAS comply with 13 measures similar to those presented by the North Dakota Agricultural Aviation Association to the North Dakota Department of Commerce, the organization awarded the North Dakota UAS test site.

The FAA believes the limitations under which the petitioner will operate (i.e. VLOS and at or below 300 feet AGL) and the UAS emergency procedures as outlined in the petitioner's supplemental documentation are sufficient mitigations to this risk so that the operations will

not adversely affect safety. Further, the FAA addressed additional concerns raised by NAAA by adding operating conditions and limitations regarding operations in the proximity of airports, stand-off distance from clouds, altitude restrictions, and operating distance from non-participating persons. Further detail is contained in the analysis of the UAS operating parameters below.

The USHPA also raised concerns about the identification marking regulations as well as the petitioner's need to coordinate his operations with airports and comply with local and state notification regulations associated with his type of activity.

Commenter James Lee wrote in support of Trudeau's petition, so long as he does not fly higher than 200 feet within a quarter mile from an airport or any flight path or flight operation and never flies above 400 feet AGL.

The FAA considered USHPA's and Mr. Lee's concerns and included conditions and limitations to address these issues as outlined below.

Lastly, the Small UAV Coalition submitted extensive comments supporting the petition. These included suggestions that the FAA: apply regulations differently to small UAVs versus those in the air transport category, not require all seven factors outlined in Section 333 as a prerequisite for every exemption (i.e. beyond visual line of sight (VLOS); weight; size, altitude, airspace, geographic area, and proposed technology), and consider Trudeau's safety protocols including his posting of signs warning of flights as sufficient to enable operations in populated areas. Regarding use in the NAS, the Small UAV Coalition stated, in part, that the FAA's safety evaluation of UAV operations should not hinge on the type of operation (i.e. public, commercial, recreational or philanthropic) rather operational risks and steps that can be taken to eliminate or reduce such risks. The Small UAV Coalition also commended the petitioner for developing a "Personal Protocols and Controls" document that details how he will contact any airport within a 5 mile radius in advance of his proposed UAV operation.

The FAA's analysis is as follows:

Unmanned aircraft system (UAS)

The petitioner requested relief from 14 CFR part 21, *Certification procedures for products and parts.* In accordance with the statutory criteria provided in Section 333 of P.L. 112-95 in reference to 49 USC § 44704, and in consideration of the size, weight, speed, and limited operating area associated with the aircraft and its operation, the Secretary of Transportation has determined that this aircraft meets the conditions of Section 333. Therefore, the FAA finds that the requested relief from 14 CFR part 21, and any associated noise certification and testing requirements of part 36, is not necessary.

Manned aircraft conducting aerial filming and photography can weigh 5,000 lbs. or more, are operated by an onboard pilot and may carry other onboard crewmembers, as well as 100

gallons or more of fuel. The petitioner's UA weighs less than 3 lbs. The pilot and crew will be remotely located from the aircraft. The limited weight reduces the potential for harm to persons or damage to property in the event of an incident or accident. The risk to an onboard pilot and crew during an incident or accident is eliminated with the use of a UAS for the proposed operation.

Manned aircraft are at risk of fuel spillage and fire in the event of an incident or accident. The Phantom 2 Vision+ carries no fuel, and therefore the risk of fire following an incident or accident due to fuel spillage is eliminated.

This exemption does not require an electronic means to monitor and communicate with other aircraft, such as transponders or sense and avoid technology. Rather the FAA is mitigating the risk of these operations by placing limits on altitude, requiring stand-off distance from clouds, permitting daytime operations only, and requiring that the UA be operated within VLOS and yield right of way to all manned operations. Additionally, the exemption provides that the operator will request a notice to airmen (NOTAM) prior to operations to alert other users of the NAS. These mitigations address concerns raised by NAAA and ALPA regarding awareness of UAS operations occurring in the airspace

The petitioner's UAS has the capability to operate safely after experiencing certain in-flight contingencies or failures and uses an auto-pilot system to maintain UAS stability and control. The UAS is also able to respond to a loss of GPS or a lost-link event with pre-coordinated automated flight maneuvers. These safety features provide an equivalent level of safety compared to a manned aircraft holding a restricted airworthiness certificate performing a similar operation and address concerns raised by ALPA and NAAA.

Regarding the petitioner's requested relief from 14 CFR 45.23(b), *Display of marks,* the petitioner requests this relief under the assumption that marking with the word "experimental" will be required as a condition of a grant of exemption. However, this marking is reserved for aircraft that are issued experimental certificates under 14 CFR 21.191. The petitioner's UAS will not be certificated under § 21.191, and therefore the "experimental" marking is not required. Since the petitioner's UAS will not be certificated under § 21.191, a grant of exemption for § 45.23(b) is not necessary.

Regarding the petitioner's requested relief from 14 CFR 91.405(a), *Maintenance required,* 91.407(a)(1), *Operation after maintenance, preventive maintenance, rebuilding, or alteration,* 91.409(a)(2), *Inspections,* and 91.417(a) and (b), *Maintenance records,* the FAA has determined that relief from § 91.409(a)(1) is also necessary because it is an alternate inspection requirement of § 91.409(a)(2). The petitioner proposes to inspect and ensure that the UAS is in a condition for safe flight.

Therefore, the FAA finds that adherence to the petitioner's operating documents and the conditions and limitations below, describing the requirements for maintenance, inspection,

and recordkeeping, are sufficient to ensure that safety is not adversely affected. Accordingly, the FAA finds that exemption from 14 CFR 91.405(a), 91.407(a)(1), 91.409(a)(1) and (2), and 91.417(a) and (b) is warranted.

Pilot In Command (PIC) of the UAS

Regarding the petitioner's requested relief from 14 CFR 61.113(a) and (b), *Private pilot privileges and limitations,* the petitioner requested regulatory relief to operate his UAS without an FAA-certificated pilot. In support of his request, the petitioner states that "while helpful, a pilot license will not ensure remote control piloting skills." However, the FAA does not possess the authority to exempt the petitioner from the statutory requirement to hold an airman certificate, as prescribed in 49 USC § 44711.[2] Although Section 333 provides limited statutory flexibility relative to 49 USC § 44704 for the purposes of airworthiness certification, it does not provide similar flexibility relative to other sections of Title 49.

Unlike operations pursuant to public COAs, the FAA is also requiring a pilot certificate for UAS operations for two reasons, the first of which is to satisfy the statutory requirements as stated above. The second is because pilots holding an FAA issued private or commercial pilot certificate are subject to the security screening by the Department of Homeland Security that certificated airmen undergo. As previously determined by the Secretary of Transportation, the requirement to have an airman certificate ameliorates security concerns over civil UAS operations conducted in accordance with Section 333.

Given these grounds, the FAA must determine the appropriate level of pilot certification for the petitioner's proposed operation.

Under current regulations, civil operations for compensation or hire require a PIC holding a commercial pilot certificate per 14 CFR part 61. Based on the private pilot limitations in accordance with pertinent parts of 14 CFR 61.113(a) and (b), a pilot holding a private pilot certificate cannot act as a PIC of an aircraft for compensation or hire unless the flight is only incidental to a business or employment. However, in Grant of Exemption No. 11062 to Astraeus Aerial (Astraeus), the FAA determined that a PIC with a private pilot certificate operating the Astraeus UAS would not adversely affect operations in the NAS or present a hazard to persons or property on the ground.

As discussed above, the petition received three comments registering concern about pilot certification. ALPA stated its opposition to the proposed operation by a non-certificated pilot without a required medical certificate. ALPA believes that the operation should be conducted by a PIC holding a current FAA commercial pilot certificate with an appropriate category and

[2] 49 USC § 44711 prohibits a person from serving "in any capacity as an airman with respect to a civil aircraft, aircraft engine, propeller, or appliance used, or intended for use, in air commerce…without an airman certificate authorizing the airman to serve in the capacity for which the certificate was issued . . . .".

class rating for the type of aircraft being flown and a current second-class airman medical certificate. NAAA stated that the UAS pilot should be a commercial pilot or have similar training and can demonstrate knowledge of aviation safety and communication procedures. USHPA stated that since the petitioner has not indicated any restriction to location of his operations, nor his knowledge of airspace rules, and because his operations would constitute commercial operations, he should be required to meet that level of certification.

The FAA has analyzed the petitioner's proposed operation, considered the comments above, and determined it does not differ significantly from the situation described in Grant of Exemption No. 11062 (Astraeus). The petitioner plans to operate in the NAS over private property while also limiting access to the property at times he is operating the UA. Given: 1) the similar nature of the petitioner's proposed operating environment to that of Astraeus, 2) the parallel nature of private pilot aeronautical knowledge requirements to those of commercial requirements [ref: Exemption No. 11062], and 3) the airmanship skills necessary to operate the UAS, the FAA finds that the additional manned airmanship experience of a commercially certificated pilot would not correlate to the airmanship skills necessary for the petitioner's proposed operations. Therefore, the FAA finds that a PIC holding a private pilot certificate and a third-class airman medical certificate is appropriate for the proposed operations.

With regard to the airmanship skills necessary to operate the UAS, the petitioner has provided no training program, minimum flight time hours, or test standards to demonstrate his capability to meet some of the conditions and limitations below including avoiding hazards, reacting to emergencies, or maintaining specific distances from persons or property. The petitioner indicates he avoids risks that may cause a crash and that he has flown numerous practice flights in remote areas as a hobbyist simulating flights for future commercial use to gain familiarization with the characteristics and performance of this UAS under different temperature and wind conditions. He also mentions his computerized simulated flights to maintain adequate skills and response reflex time.

Since the petitioner provides no information regarding a training program, minimum flight time hours, or test standards to demonstrate his capability to operate safely, and in response to concerns raised by ALPA, NAAA, and USHPA, the FAA reviewed the minimum requirements for providing a waiver to manned operations under 14 CFR 91.119. While this process applies to an operator seeking a waiver rather than an exemption, the exemption process is similar. Manned operations that require relief from 14 CFR 91.119 in the form of a waiver have established minimum requirements for pilot personnel (PIC). [3]

[3] FAA Order 8900.1, Volume 3, Chapter 7, Section 1 *Issue a Certificate of Waiver or Authorization: § 91.119(b) and/or (c) (Minimum Safe Altitudes*) and FAA Order 8900.1, Volume 3, Chapter 8, Section 1, *Issue a Certificate of Waiver for Motion Picture and Television Filming.*

1) at least 500 hours logged as the PIC and at least 20 hours logged as the PIC in the aircraft type;
2) a minimum of 25 hours (or 100 hours in the case of motion picture operations) in the same category and class of aircraft to be used; and
3) a minimum of 5 hours in the make and model aircraft to be used under the waiver.

However, given the relative size, weight, speed and operating parameters of the proposed UAS operations and its accompanying reduction in risk to persons and property when compared to manned operations, these minimum requirements should be reduced, but not eliminated. UAS operators still need to establish airmanship skills in order to meet the conditions and limitations listed below such as the ability to maneuver near but maintain specific distances from persons and property, respond to unexpected emergencies, or avoid objects as well as the ability to avoid potential conflicts with manned aircraft. In consideration of the above, the FAA must determine the appropriate level of pilot flight hours necessary to qualify the PIC for the petitioner's proposed operations. The FAA has considered minimum skills and associated flight-hours necessary to practice and build proficiency in these skills. The petitioner is responsible for assessing its operations and identifying any additional skills required to operate safely under normal and abnormal conditions. Normal condition skills may include the ability to maintain altitude, maintain VLOS, and navigational skills. Abnormal condition skills may include the ability to avoid obstacles, avoid air traffic, and respond to loss of link.

In making its determination the FAA considered the requirements proposed by Astraeus in Exemption No. 11062. The FAA notes that the petitioner's proposed operation is similar to that authorized in Exemption No. 11062 because both include operations closer than 500 feet from persons, vessels, vehicles, and structures. In Exemption No. 11062, the FAA required that prior to conducting operations for the purpose of motion picture filming (or similar operations), the PIC must have accumulated and logged, in a manner consistent with 14 CFR 61.51(b), 25 hours of total time as a UAS rotorcraft pilot including at least 10 hours logged as a UAS pilot with a multi-rotor UAS. Prior to operations under Exemption No. 11062, the PIC must also have accumulated and logged a minimum of 5 hours as a UAS pilot operating the same make and model of UAS to be used for operations under the exemption. For clarification, the FAA considers these minimum hour requirements to be inclusive rather than additive; i.e. 5 hours make and model time may be included in the 10 hours of multi-rotor time and the 10 hours may be included in the total 25 hours of UAS rotorcraft time. In addition to the hour requirements, the PIC must accomplish 3 take-offs and landings in the preceding 90 days (for currency purposes). The FAA finds that at a minimum, the flight-hour requirements in Exemption No. 11062 are appropriate to practice and build proficiency in the skills necessary to safely conduct the petitioner's proposed operations. The FAA also finds that prior documented flight experience that was obtained in compliance with applicable regulations would satisfy this requirement. Training, proficiency, and experience-building flights can also be conducted under the grant of exemption to accomplish the required flight

time. During training, proficiency, and experience-building flights the PIC is required to operate the UA with appropriate distances in accordance with 14 CFR 91.119.

The flight-hours above are considered appropriate given the circumstances of the proposed operation and the description provided by the petitioner of the preparations he has undertaken to conduct the UAS operation safely. The petitioner may determine through its safety assessment that additional hours are necessary to address all potential flight hazards and requisite airmanship skills. Consequently, the FAA has included in the conditions and limitations below that the petitioner may not permit any PIC to operate unless that PIC is able to safely operate the UAS in a manner consistent with how the UAS will be operated under this exemption, including evasive and emergency maneuvers and maintaining appropriate distances from persons, vessels, vehicles and structures.

In conclusion, the FAA finds that prior to operations the PIC must, at a minimum, hold a private pilot certificate, a third-class airman medical certificate, and completed the minimum flight hour and currency requirements as stated in the conditions and limitations below. Thus, the FAA finds relief from 14 CFR 61.113(a) and (b) is warranted.

In a supplemental request to the FAA, the petitioner requests consideration of a 120 day temporary airman certificate in accordance with 14 CFR 63.13, to allow him time to obtain a private pilot certificate. The requested relief is not applicable to pilot certificates because, 14 CFR 63.1, *Applicability*, states this part prescribes the requirements for issuing flight engineer and flight navigator certificates and the general operating rules for holders of those certificates, only. Thus, 14 CFR 63.13 does not provide a basis from which to issue a temporary pilot certificate as requested by the petitioner and the requested relief is denied.

The petitioner has also indicated he will supplement his proposed operation(s) with a spotter, hereafter referred to as a visual observer (VO). The conditions and limitations below stipulate that the PIC must ensure that the VO can perform the functions prescribed in the operating documents. Additionally, as discussed in Exemption No. 11109 to Clayco, Inc., there are no regulatory requirements for visual observer medical certificates. Although a medical certificate is not required for a VO, the UA must never be operated beyond the actual visual capabilities of the VO, and the VO and PIC must have the ability to maintain visual line of sight (VLOS) with the UA at all times. It is the responsibility of the PIC to be aware of the VO's visual limitations and limit operations of the UA to distances within the visual capabilities of both the PIC and VO. Moreover, the VO will not be operating the aircraft. Therefore, as in Grant of Exemption No. 11062 to Astraeus, the FAA does not consider a medical certificate necessary for the VO.

Operating parameters of the UAS

Regarding the petitioner's requested relief from 14 CFR 91.7(a) *Civil aircraft airworthiness,* petitioner's request is based on his belief that since no FAA regulatory standard exists for

determining airworthiness of the UAS, the regulation is inapplicable. While the petitioner's UAS will not require an airworthiness certificate in accordance with 14 CFR part 21, Subpart H, the FAA considers the petitioner's compliance with his operating documents to be sufficient means for determining an airworthy condition. Therefore, relief from § 91.7(a) is granted. The petitioner is still required to ensure that his aircraft is in an airworthy condition – based on compliance with the operating documents prior to every flight, and as stated in the conditions and limitations below.

Additionally, in accordance with 14 CFR 91.7(b), the PIC of the UAS is responsible for determining whether the aircraft is in a condition for safe flight. The FAA finds that the PIC can comply with this requirement, therefore relief from § 91.7(b) is not necessary.

Regarding the petitioner's requested relief from 14 CFR 91.9 *Civil aircraft flight manual, marking, and placard requirements* and 14 CFR 91.203(a) and (b) *Civil aircraft: Certifications required*, the FAA has previously determined that relief from these sections is not necessary. Relevant materials may be kept in a location accessible to the PIC in compliance with the regulations.

Regarding the petitioner's requested relief from 14 CFR 91.103, *Preflight Action*, the petitioner requires each PIC to take certain actions before flight to ensure the safety of the flight. The exemption is needed because the pilot will take separate preflight actions as referenced in the operating documents. Although there will be no approved Airplane or Rotorcraft Flight Manual available, the FAA believes that the petitioner can comply with the other applicable requirements in 14 CFR 91.103(b)(2). The procedures outlined in the operating documents address the FAA's concerns regarding compliance with § 91.103(b). The PIC will take all actions including reviewing weather, flight battery requirements, landings, and takeoff distances and aircraft performance data before initiation of flight. The FAA has imposed stricter requirements with regard to visibility and distance from clouds; this is to both keep the UA from departing the VLOS and to preclude the UA from operating in the NAS. The FAA also notes the risks associated with sun glare; the FAA believes that the PIC's and VO's ability to still see other air traffic, combined with the PIC's ability to initiate a return-to-home sequence, are sufficient mitigations in this respect. The PIC will also account for all relevant site-specific conditions in his or her preflight procedures. Therefore, the FAA finds that exemption from 14 CFR 91.103 is not necessary.

Regarding the petitioner's requested relief from 14 CFR 91.109(a), *Flight instruction; Simulated instrument flight and certain flight tests*, the petitioner did not describe training scenarios in which a dual set of controls would be utilized or required, i.e. dual flight instruction, provided by a flight instructor or other company-designated individual, that would require that individual to have fully functioning dual controls. Rather, the petitioner refers to his "numerous practice flights in remote areas as a hobbyist." But, as outlined above, the FAA is requiring that the petitioner's PIC possess at least a private pilot's certificate. Also, the currency requirements expressed in the conditions and limitations below will help ensure

that a PIC training on the UAS has the authority to operate the UAS during training flights as PIC in accordance with § 61.31(l). The FAA will impose a limitation that those training operations are only conducted during dedicated training sessions. As such, the FAA finds that the petitioner can conduct his operations without the requested relief from § 91.109.

The petitioner's requested relief from 14 CFR 91.119, *Minimum safe altitudes,* relief from § 91.119(a), which requires operating at an altitude that allows a safe emergency landing if a power unit fails, is not granted. The FAA expects the petitioner to be able to perform an emergency landing without undue hazard to persons or property on the surface if a power unit fails. Relief from § 91.119(b), operation over congested areas, is not granted, because, as discussed below, operations over congested areas will not be permitted under this exemption.

Relief from § 91.119(c) is necessary because the aircraft will be operated at altitudes below 300 feet AGL. Section 91.119(c) states that no person may operate an aircraft below the following altitudes: *over other than congested areas*, 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. The petitioner states that he will operate pursuant to the following, self-imposed restrictions related to § 91.119:

- operate in reasonably safe environment that are strictly controlled, are away from power lines, elevated lights, airports and actively populated areas away from public and traffic;
- conduct all operations under his own personal safety protocols (including posting a warning sign reading: "Attention Aerial Photography in Progress – Remain Back 150 Feet") contained in the operating documents and will actively analyze flight data and other sources of information to constantly update and enhance his safety protocols;
- contact respective airports if operations will be within 5 miles to advise them of his estimated flight time, flight duration, elevation of flight and other pertinent information; and
- always obtain all necessary permissions prior to operation.

The petitioner proposes to avoid "actively populated areas" but does not explain how these areas are determined. As in Exemption No. 11110 (Trimble Navigation, Ltd.), the FAA notes that avoidance of areas which are depicted in "yellow" on VFR charts is a practicable step in assuring that operations are not conducted over congested or densely populated areas. However, using these "yellow" areas solely to make this determination is not sufficient. Pilots may obtain information regarding congested areas from the local Flight Standards District Office (FSDO). Therefore, operations over congested or densely populated areas are prohibited as stated in the conditions and limitations below.

The petitioner did not describe stand-off distances from persons, vessels, vehicles and structures. Section 91.119(c) requires that aircraft operate no closer than 500 feet to these persons or objects. As discussed in Exemption No. 11109 (Clayco, Inc.), operations conducted closer than 500 feet to the ground may require that the UA be operated closer than

500 feet to essential persons, or objects that would not be possible without additional relief. Therefore, the FAA is requiring that prior to conducting UAS operations, all persons not essential to flight operations (nonparticipating persons) must remain at appropriate distances. In open areas, this requires the UA to remain 500 feet from all persons other than essential flight personnel (i.e. PIC, VO, operator trainees or essential persons). The FAA has also considered the UA's maximum gross weight of approximately 3 pounds. If barriers or structures are present that can sufficiently protect nonparticipating persons from the UA or debris in the event of an accident, then the UA may operate closer than 500 feet to persons afforded such protection. The operator must also ensure that nonparticipating persons remain under such protection. If a situation arises where nonparticipating persons leave such protection and are within 500 feet of the UA, flight operations must cease immediately. When considering how to immediately cease operations, the primary concern is the safety of those nonparticipating persons. In addition, the FAA finds that operations may be conducted closer than 500 feet to vessels, vehicles and structures when the owner/controller of any such vessels, vehicles or structures grants permission for the operation and the PIC makes a safety assessment of the risk of operating closer to those objects and determines that it does not present an undue hazard.

Thus, the FAA finds that relief from § 91.119(c) is warranted provided adherence to the procedures in the operating documents and the FAA's additional conditions and limitations outlined below. Relief from § 91.119(a) is unwarranted as the FAA expects the petitioner to be able to perform an emergency landing without undue hazard to persons or property on the surface. Relief from §§ 91.119(b) is not granted and 91.119(d) is not applicable.

Regarding the petitioner's requested relief from 14 CFR 91.121 *Altimeter Settings*, the petitioner has a barometric altimeter and GPS derived altitude capabilities. However, as stated in the conditions and limitations below, the FAA requires any altitude reported to ATC to be in feet AGL. The petitioner may choose to set the altimeter to zero feet AGL rather than local barometric pressure or field altitude before flight. Considering the limited altitude of the proposed operations, relief from 14 CFR 91.121 is granted to the extent necessary to comply with the applicable conditions and limitations stated below.

Regarding the petitioner's requested relief from § 91.151 (a) *Fuel requirements for flight in VFR conditions*, prior relief has been granted for manned aircraft to operate at less than prescribed minimums, including Exemption Nos. 2689, 5745, and 10650. In addition, similar UAS-specific relief has been granted in Exemption Nos. 8811, 10808, and 10673 for daytime, VFR conditions. The petitioner's only reference to this section is his commitment to land the UAS prior to the manufacturer's recommended minimum level of battery power. The operating documents indicate that two low-voltage (low battery) alerts are issued - warning that the first alert should be followed (30% - low battery level warning). Further, the petitioner has indicated his flights will last only 3-7 minutes each. Also, the UAS has an automated function which results in immediate landing when a low battery is detected. These

factors provide the FAA with sufficient reason to grant the relief from 14 CFR 91.151(a) as requested in accordance with the conditions and limitations below, that prohibit the PIC from beginning a flight unless (considering wind and forecast weather conditions) there is enough power to fly to the first point of intended landing and, assuming normal cruising speed, land the UA with 30% battery power remaining.

Regarding an Air Traffic Organization (ATO) issued Certificate of Waiver or Authorization (COA), the majority of current UAS operations occurring in the NAS are being coordinated through Air Traffic Control (ATC) by the issuance of a COA. This is an existing process that not only makes local ATC facilities aware of UAS operations, but also provides ATC the ability to consider airspace issues that are unique to UAS operations. The COA will require the operator to request a NOTAM, which is the mechanism for alerting other users of the NAS to the UAS activities being conducted. The conditions and limitations below prescribe the requirement for the petitioner to obtain an ATO-issued COA.

Public Interest

The FAA finds that a grant of exemption is in the public interest. The enhanced safety and reduced environmental impact achieved using a UA with the specifications described by the petitioner and carrying no passengers or crew, rather than a manned aircraft of significantly greater proportions, carrying crew in addition to flammable fuel, gives the FAA good cause to find that the UAS operation enabled by this exemption is in the public interest. The following table summarizes the FAA's determinations regarding the relief sought by the petitioner:

Relief considered (14 CFR)	FAA determination (14 CFR)
Part 21	Relief not necessary
45.23(b)	Relief not necessary
61.113(a) and (b)	Relief granted with conditions and limitations
63.13	Relief not granted
91.7(a)	Relief granted with conditions and limitations
91.9(b)(2)	Relief not necessary
91.103(b)	Relief not necessary
91.109	Relief not necessary
91.119	Paragraph (c) granted with conditions and limitations
91.121	Relief granted with conditions and limitations
91.151(a)	Paragraph 91.151(a)(1), day, granted with conditions and limitations
91.203(a) and (b)	Relief not necessary
91.405(a)	Relief granted with conditions and

Relief considered (14 CFR)	FAA determination (14 CFR)
	limitations
91.407(a)(1)	Relief granted with conditions and limitations
91.409(a)(1) and (2)	Relief granted with conditions and limitations
91.417(a) and (b)	Relief granted with conditions and limitations

The FAA's Decision

In consideration of the foregoing, I find that a grant of exemption is in the public interest. Therefore, pursuant to the authority contained in 49 U.S.C. 106(f), 40113, and 44701, delegated to me by the Administrator, Mr. Douglas Trudeau, Realtor®, of Tierra Antigua Realty, is granted an exemption from 14 CFR 61.113(a) and (b), 91.7(a), 91.119(c), 91.121, 91.151(a)(1), 91.405(a), 91.407(a)(1), 91.409(a)(1) and (2), and 91.417(a) and (b) to the extent necessary to allow petitioner to operate an unmanned aircraft systems (UAS) for the purpose of aerial videography/cinematography and augment real estate listing videos. This exemption is subject to the conditions and limitations listed below.

Conditions and Limitations

Relative to this grant of exemption, Trudeau is hereafter referred to as the operator.

The following documents provided by the operator in its petition, 1) Supplemental Response for Petition, 2) PHANTOM Flying Flow Chart V1.0 (Simplified Version), PHANTOM Quick Start Manual v1.7, PHANTOM Advanced Manual v.1.4, 3) PHANTOM 2 Vision+ User Manual 4) restricted areas map, 5) personal protocols and controls, and 6) Safety/Flight Manual, are hereinafter referred to as operating documents.

Failure to comply with any of the conditions and limitations of this grant of exemption will be grounds for the immediate suspension or rescission of this exemption.

1) Operations authorized by this grant of exemption are limited to the following aircraft described in the operating documents which is a quad-rotor aircraft weighing less than 3 pounds: PHANTOM 2 Vision+ Unmanned Aircraft System. Proposed operations of any other aircraft will require a new petition or a petition to amend this grant.

2) The UA may not be flown at an indicated airspeed exceeding 30 knots.

3) The UA must be operated at an altitude of no more than 300 feet above ground level (AGL), as indicated by the procedures specified in the operating documents. All altitudes reported to ATC must be in feet AGL.

4) The UA must be operated within visual line of sight (VLOS) of the Pilot In Command (PIC) at all times. This requires the PIC to be able to use human vision unaided by any device other than corrective lenses, as specified on the PIC's FAA-issued airman medical certificate.

5) All operations must utilize a visual observer (VO). The UA must be operated within the visual line of sight (VLOS) of the VO at all times. The VO may be used to satisfy the VLOS requirement as long as the PIC always maintains VLOS capability. The VO and PIC must be able to communicate verbally at all times. The PIC must be designated before the flight and cannot transfer his or her designation for the duration of the flight. The PIC must ensure that the VO can perform the functions prescribed in the operating documents.

6) The operating documents and this grant of exemption must be accessible during UAS operations and made available to the Administrator upon request. If a discrepancy exists between the conditions and limitations in this exemption and the procedures outlined in the operating documents, the conditions and limitations herein take precedence and must be followed. Otherwise, the operator must follow the procedures as outlined in its operating documents. The operator may update or revise its operating documents. It is the operator's responsibility to track such revisions and present updated and revised documents to the Administrator upon request. The operator must also present updated and revised documents if he petitions for extension or amendment to this grant of exemption. If the operator determines that any update or revision would affect the basis upon which the FAA granted this exemption, then the operator must petition for amendment to its grant of exemption. The FAA's UAS Integration Office (AFS-80) may be contacted if questions arise regarding updates or revisions to the operating documents.

7) Prior to each flight, the PIC must inspect the UAS to ensure it is in a condition for safe flight. If the inspection reveals a condition that affects the safe operation of the UAS, the UAS is prohibited from operating until the necessary maintenance has been performed and the UAS is found to be in a condition for safe flight. The Ground Control Station must be included in the preflight inspection. All maintenance and alterations must be properly documented in the aircraft records.

8) Any UAS maintenance or alterations that affect the UAS operation or flight characteristics, e.g. replacement of a flight critical component, must undergo a functional test flight. The PIC who conducts the functional test flight must make an entry in the aircraft records.

9) The pre-flight inspection section in the operating documents must account for all discrepancies, i.e. inoperable components, items, or equipment, not already covered in the relevant sections of the operating documents.

10) The operator must follow the UAS manufacturer's aircraft/component, maintenance, overhaul, replacement, inspection, and life limit requirements.

11) The operator must carry out its maintenance, inspections, and record keeping requirements, in accordance with the operating documents. Maintenance, inspection, and alterations must be noted in the aircraft records, including total flight hours, description of work accomplished, and the signature of the authorized person returning the UAS to service.

12) Each UAS operated under this exemption must comply with all manufacturer Safety Bulletins.

13) The authorized person must make an entry in the aircraft record of the corrective action taken against discrepancies discovered between inspections.

14) UAS operations must be conducted by a PIC possessing at least a private pilot certificate and at least a current third-class medical certificate. The PIC must also meet the flight review requirements specified in 14 CFR 61.56 in an aircraft in which the PIC is rated on his or her pilot certificate.

15) Prior to operations conducted for the purpose of aerial videography/cinematography and augmenting real estate listing videos (or similar operations), the PIC must have accumulated and logged, in a manner consistent with 14 CFR 61.51(b), a minimum of 25 hours of total time as a UAS rotorcraft pilot including at least 10 hours logged as a UAS pilot with a multi-rotor UAS. Prior documented flight experience that was obtained in compliance with applicable regulations may satisfy this requirement. Training, proficiency, and experience-building flights can also be conducted under this grant of exemption to accomplish the required flight time. However, said training operations may only be conducted during dedicated training sessions. During training, proficiency, and experience-building flights the PIC is required to operate the UA with appropriate distances in accordance with 14 CFR 91.119.

16) Prior to operations conducted for the purpose of aerial videography/cinematography and augmenting real estate listing videos (or similar operations), the PIC must have accumulated and logged, in a manner consistent with 14 CFR 61.51(b), a minimum of 5 hours as UAS pilot operating the make and model of the UAS to be used in operations under the exemption; 5 hours make and model time may be included in the 10 hours of multi-rotor time prescribed above. The PIC must accomplish 3 take-offs and landings in the preceding 90 days (for currency purposes). Training, proficiency, experience-building, and take-off and landing currency flights can be conducted under this grant of exemption to accomplish the required flight time and 90 day currency. However, said training operations may only be conducted during dedicated training sessions. During training, proficiency, and experience-building flights the

PIC is required to operate the UA with appropriate distances in accordance with 14 CFR 91.119.

17) The operator may not permit the PIC to operate the UAS for the purpose of aerial videography/cinematography and augmenting real estate listing videos (or similar operations), unless the PIC has demonstrated and logged in a manner consistent with 14 CFR 61.51(b), the ability to safely operate the UAS in a manner consistent with how the UAS will be operated under this exemption, including evasive and emergency maneuvers and maintaining appropriate distances from people, vessels, vehicles and structures.

18) UAS operations may not be conducted during night, as defined in 14 CFR 1.1. All operations must be conducted under visual meteorological conditions (VMC).

19) The UA may not operate within 5 nautical miles of an airport reference point as denoted on a current FAA-published aeronautical chart.

20) The UA may not be operated less than 500 feet below or less than 2,000 feet horizontally from a cloud or when visibility is less than 3 statute miles from the PIC.

21) If the UA loses communications or loses its GPS signal, it must return to a pre-determined location within the planned operating area and land or be recovered in accordance with the operating documents.

22) The PIC must abort the flight in the event of unpredicted obstacles or emergencies in accordance with the operating documents.

23) The PIC is prohibited from beginning a flight unless (considering wind and forecast weather conditions) there is enough power to fly at normal cruising speed to the intended landing point and land the UA with 30% battery power remaining.

24) The operator must obtain an Air Traffic Organization (ATO) issued Certificate of Waiver or Authorization (COA) prior to conducting any operations under this grant of exemption. This COA will also require the operator to request a Notice to Airman (NOTAM) not more than 72 hours in advance, but not less than 48 hours prior to the operation.

25) All aircraft operated in accordance with this exemption must be identified by serial number, registered in accordance with 14 CFR part 47, and have identification (N-Number) markings in accordance with 14 CFR part 45, Subpart C. Markings must be as large as practicable.

26) Before conducting operations, the radio frequency spectrum used for operation and control of the UA must comply with the Federal Communications Commission (FCC) or other appropriate government oversight agency requirements.

27) The documents required under 14 CFR 91.9 and 91.203 must be available to the PIC at the Ground Control Station of the UAS any time the UAS is operating. These documents must be made available to the Administrator or any law enforcement official upon request.

28) The UA must remain clear and yield the right of way to all manned aviation operations and activities at all times.

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

30) The UA may not be operated over congested or densely populated areas.

31) Flight operations must be conducted at least 500 feet from all nonparticipating persons, vessels, vehicles, and structures unless:
    a. Barriers or structures are present that sufficiently protect nonparticipating persons from the UA and/or debris in the event of an accident. The operator must ensure that nonparticipating persons remain under such protection. If a situation arises where nonparticipating persons leave such protection and are within 500 feet of the UA, flight operations must cease immediately and/or;
    b. The aircraft is operated near vessels, vehicles or structures where the owner/controller of such vessels, vehicles or structures has granted permission and the PIC has made a safety assessment of the risk of operating closer to those objects and determined that it does not present an undue hazard, and;
    c. Operations nearer to the PIC, VO, operator trainees or essential persons do not present an undue hazard to those persons per § 91.119(a).

32) All operations shall be conducted over private or controlled-access property with permission from the land owner/controller or authorized representative. Permission from land owner/controller or authorized representative will be obtained for each flight to be conducted.

33) Any incident, accident, or flight operation that transgresses the lateral or vertical boundaries of the operational area as defined by the applicable COA must be reported to the FAA's UAS Integration Office (AFS-80) within 24 hours. Accidents must be reported to the National Transportation Safety Board (NTSB) per instructions contained on the NTSB Web site: www.ntsb.gov.

Unless otherwise specified in this grant of exemption, the UAS, the UAS PIC, and the UAS operations must comply with all applicable parts of 14 CFR including, but not limited to, parts 45, 47, 61, and 91.

This exemption terminates on January 31, 2017, unless sooner superseded or rescinded.

Issued in Washington, DC, on January 5, 2015.

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

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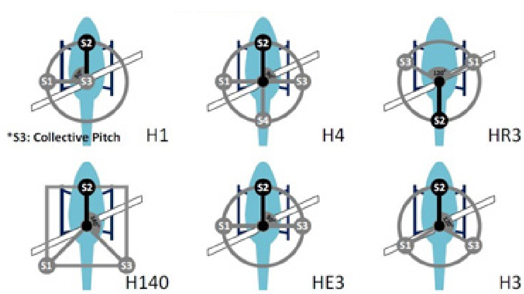
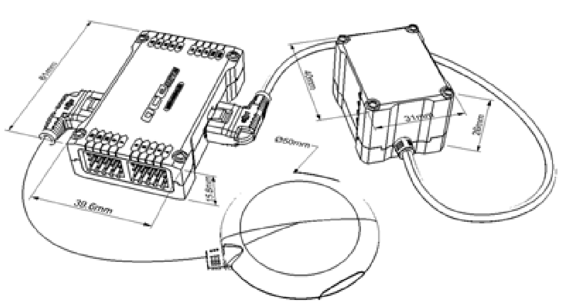


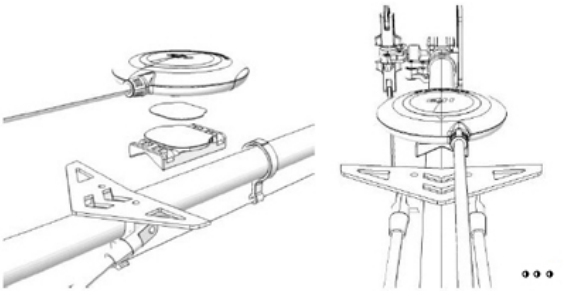
Designed For All Uav Helicopter Platform

ACE ONE works on all kinds of helicopters: Bi-blade, tri-blade aircraft, aircraft with or without flybar, all kinds of swash plates and rotor heads, electronic or gasoline or turbine helicopter engines. All types of helicopter can be installed with ACE ONE quickly and easily.



Compact Size & Light Weight

ACE ONE components weigh under 150g combined, which can be almost ignored from the payload. The size of the main controller is 61mm x 39.6mm x15.8mm, IMU module is 40mm x 31mm x 26mm, and the GPS module has a diameter of 50mm and a height of 9mm. The whole ACE ONE package is smaller than a standard package cigarette box. ACE ONE can even be installed on size 450 helicopter.



Easy Installation

The innovative built-in damping system allows the helicopter to be installed without additional frames and dampers. The system helps customers to minimize size, reduce weight and gives simplified installation that can be applied on different helicopter models. Customers also have more options for physical installation.

■ ***Multiple control mode based on autopilot system:***

	GPS Cruise Mode	GPS Atti. Mode	Atti. Mode	Manual Mode
Command Stick Meaning	Flight speed control; Stick center position for 0m/s, its endpoint for maximum speed set by user.	Helicopter attitude control; Stick center position for 0° attitude, its endpoint for 45°which is a fixed limit.		Mechanical driving directly
Command Linearity	YES			NO
Stick Released	Lock the position when GPS signal is adequate		Only altitude stabilizing	Recommend for experience pilot only
Altitude lock	Maintain the altitude best above 3 meters			NO
Stabilization	Flybarless stabilizing on ELEV and AILE direction is available for all control mode			
GPS Lost	After 10s when GPS signal lost, System enters ***Atti. Mode***. Automatically.		Only performing attitude stabilizing without position lock.	---
Safety	Maintain constant speed	Attitude & speed mixture control ensures stability.		Depends on experience
	Enhanced fail-safe featured, auto hover or Go-Home if transmitter signal lost			
Appropriate Applications	Long and smooth flight route	High agility for all flying		---

Multiple Flight Control Mode/ Intelligent Switching

ACE ONE offers four types of control modes : GPS Cruise Mode， GPS Atti. Mode, Atti. Mode, Manual Mode. Customers can switch between the four modes to adjust different flight environments even in the specially weak GPS environment such as: Building clearance, valley clearance, bridge bottom or mountain cave. ACE ONE can also adjust automatically in the flight environment. For example when aircrafts come through the bridge bottom with GPS intermittence, ACE ONE system will switch between GPS mode and Atti. Mode automatically to ensure safety and security of flight.

(//www.youtube.com/embed/fmlb6cTnpDc)

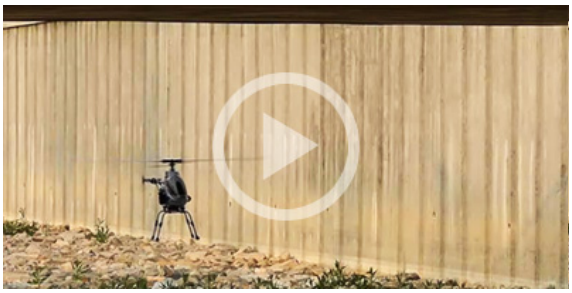
GPS Cruise Mode

In GPS cruise mode, it not only keeps aircraft attitude stable, it will also lock the aircraft position accurately. Flight speed control; Stick center position for 0m/s, its endpoint for maximum speed set by user. GPS cruise mode helps aircraft with accurate and smooth flight movement that is specifically required for aerial photography.

(//www.youtube.com/embed/ffqfxQx_Th8)

GPS Atti. MODE

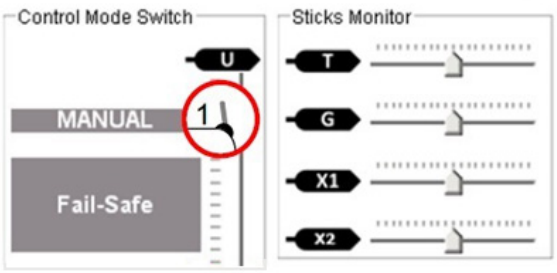
GPS Atti. mode has the same performance as GPS cruise mode. The only difference is the helicopter attitude control. Stick center position for 0˚ attitude, its endpoint for 45˚which is a fixed limit. GPS Atti. mode can be used promptly and with a big flight movement. It will bring to you a new and excellent flight experience.



(//www.youtube.com/embed/wT6VD7MYl2M)

Attitude Mode

Atti. Mode is suitable for when no GPS or weak GPS signal is achieved. ACE ONE can control attitude stabilization and lock flight altitude accurately; Stick center position for 0˚ attitude, its endpoint for 45˚which is a fixed limit. Atti. mode also can be used promptly and with a big flight movement.



Manual Mode

Manual Mode is mechanical driving directly. With flybarless support, autopilot will not stabilise the aircraft. Manual Mode is suitable for the experienced pilot.

(//www.youtube.com/embed/K5F26wdHrCE)

Accurate Position & Altitude-Lock Hovering

Autopilot system offers longitude & latitude locking and high accuracy hovering. Even in a windy environment, aircraft can hover in a small scale area. Accuracy: horizontal≤2 meters. Altitude≤0.5 meters.

(//www.youtube.com/embed/8CHDh2B2Onk)

High Accuracy & Driving Handfeel

With the help of ACE ONE, controlling aircraft feels like driving a car, as simple and intuitive strong control of the flight itself has become an easy and precise operation; The pilot can focus more attention in other areas, such as controlling the camera angle, without tension in the driving.

(//www.youtube.com/embed/4uwk88Ozh38)

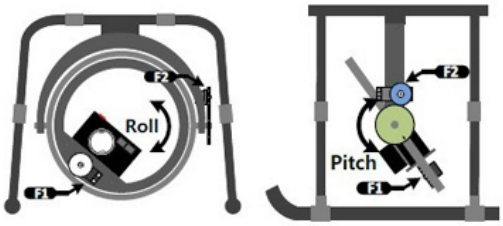
Semi-Auto Take-Off & Landing

In【GPS Cruise Mode】or【GPS Atti. Mode】or【Atti. Mode】, requiring only a push of the throttle (collective pitch) stick gently to take-off helicopter, the autopilot system will be in charge of the cyclic pitch/roll stabilization.

(//www.youtube.com/embed/DNLc5g4rQZ4)

Enhanced Failsafe

Enhanced failsafe is the feature to ensure that the helicopter will hover automatically if it loses the RC signal. After losing the signal in a certain time period, ACE ONE will calculate the safest way to return the helicopter to the home position. The helicopter will hover over your GPS start point and land automatically. This feature will protect your expensive payloads and equipments.

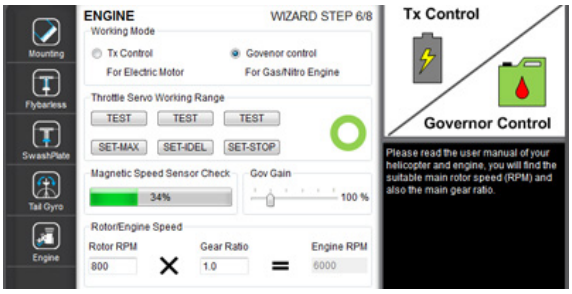


Built-In Gimbal Stabilization Function

The gimbal stabilization module is compatible with almost all 2-axis gimbal systems. The system will adjust the gimbal and camera according to the attitude of the helicopter after setting the parameters the first time.

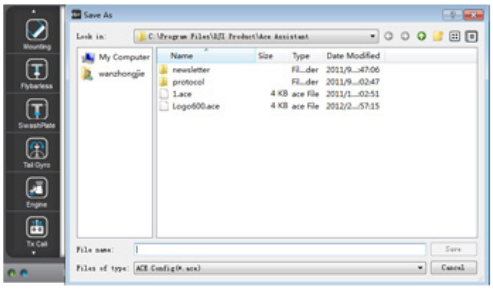
Build-In Tail Gyro & Flybarless Support

The tail gyro and FBL have become standard features of ACE ONE. No more extra work installing additional tail gyros and FBL electronic parts. The helicopter's electronic system has been greatly simplified. Therefore different electrical parts can be connected much more easily. One central piece calculates all of the flying configurations.



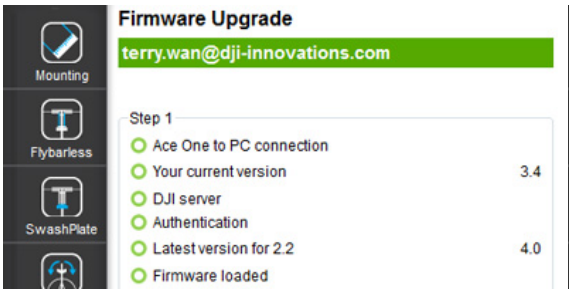
Build-In Engine Governor

The engine speed lock and governor are also standard features for ACE ONE. The built-in engine governor simplifies the parameter settings, and increases the compatibility of the system. All you need is to connect an extra standard sensor to use.



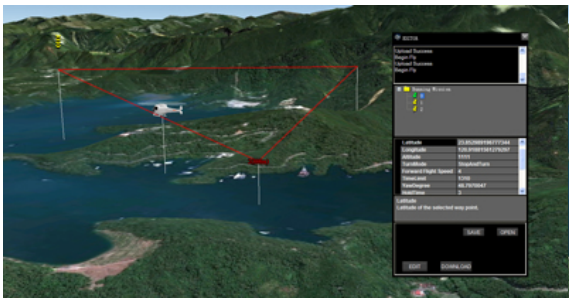
Data Import & Export

All the setting data can be saved as files that export from ACE ONE system . Or importing the file to current main controller to avoid reboot calibration.



Core Firmware Online Upgrade

The professional DJI R&D team continuously provide the latest control algorithm and features/modules. You don't have to mail the unit back or find service centres to upgrade anymore. All the upgrades can be done online. All you have to do is clicks!



Ground Station

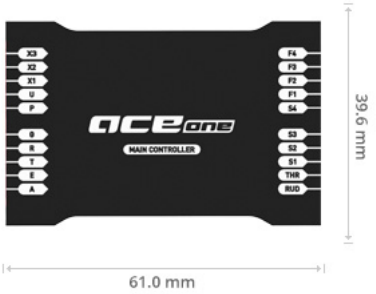
Ace One can be upgraded to ground station. This is more powerful un-manned platform to satisfy the high requirements of our customers. Customer can activate the different function to meet their specific requirement.

Ground Station equipped with 3D map and virtual flight dashboard that offers the flight real time data of attitude, position, speed and angle. The radio signal, accelerator position and Servo voltage are also displayed on ground station.

Our autopilot systems and autonomous aerial platforms are used and applied in a wide range of commercial and industrial applications such as; aerial photography, surveillance, cartography, survey & rescue, power/ lines inspection, forest patrol, filming & advertising, police pursuit, military stealth, etc.

Size and Weight

MAIN CONTROLLER



IMU

GPS

Main Controller:
61.0 mm x 39.6 mm x 15.8 mm

IMU:
40.0 mm x 31.0 mm x 26.0 mm

GPS & Compass:
50.0 mm (diameter) x 9.0 mm

Basic Performance	**Supported Helicopter**	Electric and fuel powered
	Supported Swashplate	Normal Three Servo 120° / 140° / 90° Four Servo 90° (All the types are fine tuning supported)
	Supported Servo Output *	500Hz (760us) / 200Hz (1520us) for Rudder Channel; Others depend on your receiver output.
	Recommended Transmitter	1 — PCM or 2.4GHz 2 — Minimum 7 channels 3 — Failsafe function available on all channels
	Recommended Power Supply	DC 4.8~8.4V (Not be exceed MAX operating voltage of servo motor) More than 4000 n Discharge current more than 5C No separate servo power supply require
	Operating Temp	-5°C to +70°C
	Power Consumption	MAX 5W (0.9A@5V, 0.7A@5.8V, 0.5A@7.4V, 0.4A@8V)
	Built-in Memory	4GB Flash Memory for flight information recording
	Assistant Software System Requirement	Windows XP / Windows Vista / Windows 7 / Windows 8
Flight Performance	**Hovering Accuracy**	Vertical : ± 0.5m Horizontal : ± 1m
	Suitable Wind Condition	< 8 m/s (17.7mph)
	Forward / BackwardLeft / Right	± 72 km/h (44.74 mph) ± 56.7 km/h (35.77 mph)
	Acceleration Ascent / Descent	Adjustable via ACE ONE ASSISTANT software,can be limited by user preci
Hardware	**Weight**	<= 150g (The devices on helicopter)
	Dimensions	Main Controller : 61 mm x 39.6 mm x 15.8 mm IMU : 40 mm x 31 mm x 26 mm GPS & Compass : 50 mm (diameter) x 9 mm
	Built-in Functions	Autopilot / Tail Gyro / Flybar-less / Engine Speed Control / Gimbal Stabiliz safe Go-Home
	Packaging List	Main Controller × 1 IMU × 1 GPS & Compass Module × 1 Micro USB Cable × 1 3-PIN Servo Cable × 10 Quick Start Manual × 1

** Recommended tail servos for Ace One:*

Futaba BLS251 Brushless Digital Tail Servo FUTM0521 Torque @ 4.8V: 53 oz-in (3.8 kg-cm) Speed @ 4.8V: 0.06 sec

S9256 Heli High-Speed for GY601/GY611 Gyro 47 oz-in (3.4 kg/cm) 0.06 sec/60°

Outrage BL 9188 High Voltage Brushless Digital Tail Servo 6.0v. 0.045/sec 7.4v 0.037/sec 8.4v 0.034/sec

Outrage BL 9088 6.0v. 0.05/sec 7.4v 0.04/sec 8.4v 0.03/sec

JR DS8900G Digital Tail Servo 0.05secs/60°

JR MP80G Brushless Digital Servo 0.05secs/60°

Align DS650 0.058 sec/60° (4.8V), 0.048sec/60° (6.0V)

Notice: Flight Performance can be effected by mechanical performance and payloads

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ACE ONE (http://www.dji.com/product/ace-one)

INDUSTRIAL HELICOPTER AUTOPIL

Gallery

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Ace One Features

- Designed For All Uav Helicopter Platform
- Compact Size & Light Weight
- Easy Installation
- Multiple flight control mode/ Intelligent Switching
- GPS Cruise Mode
- GPS Atti. mODE

- Attitude Mode
- Manual Mode
- Accurate position & altitude-lock hovering
- High Accuracy & Driving Handfeel
- Semi-auto Take-off & Landing
- Enhanced Failsafe
- Built-in Gimbal Stabilization Function
- Build-in Tail Gyro & Flybarless Support
- Build-in Engine Governor
- Data Import & Export
- Core Firmware Online Upgrade
- Ground Station

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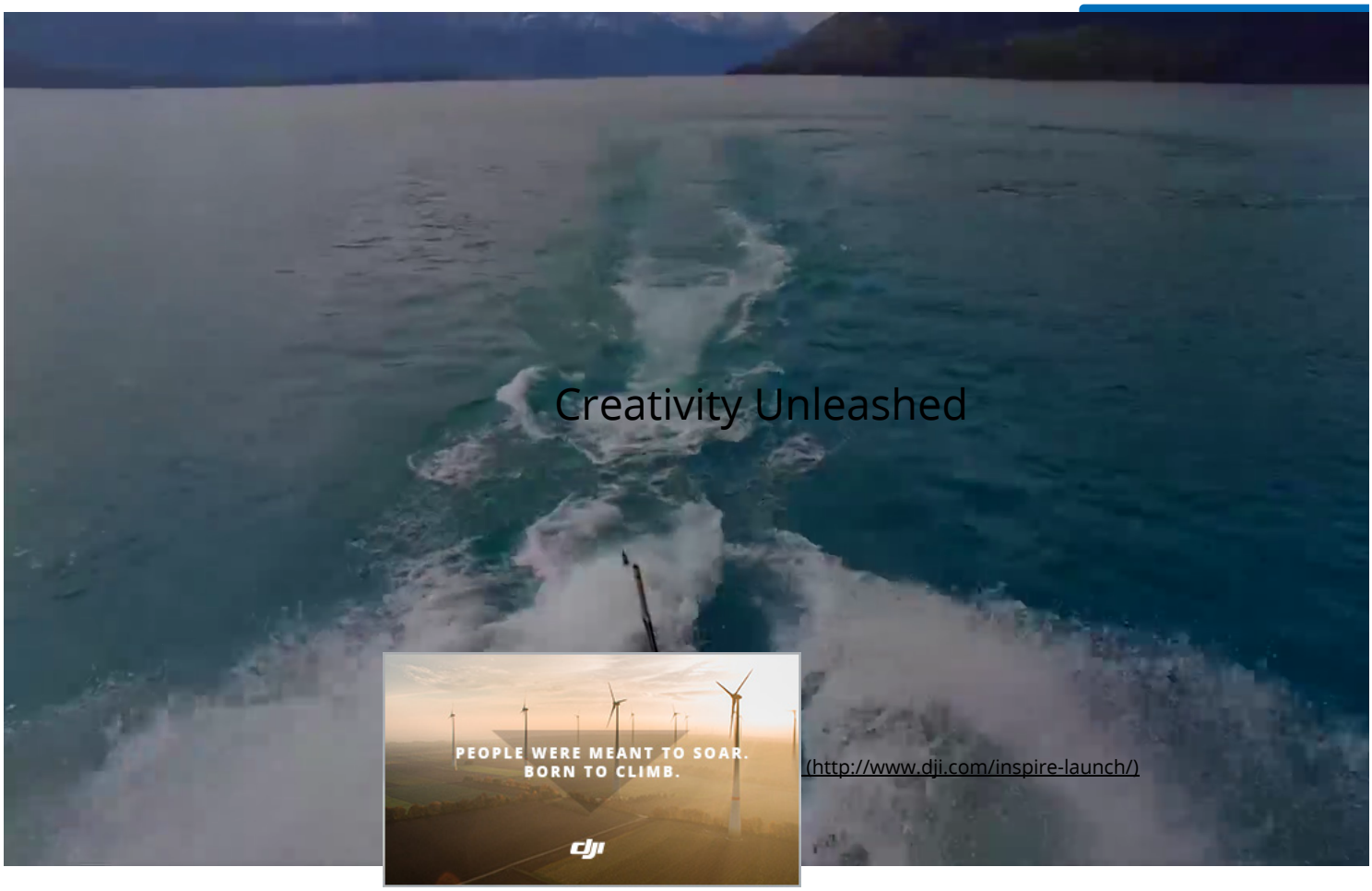


(http://www.dji.com/inspire-launch/)

DJI's most advanced technology comes together in an easy to use, all-in-one flying platform that empowers you to create the unforgettable.

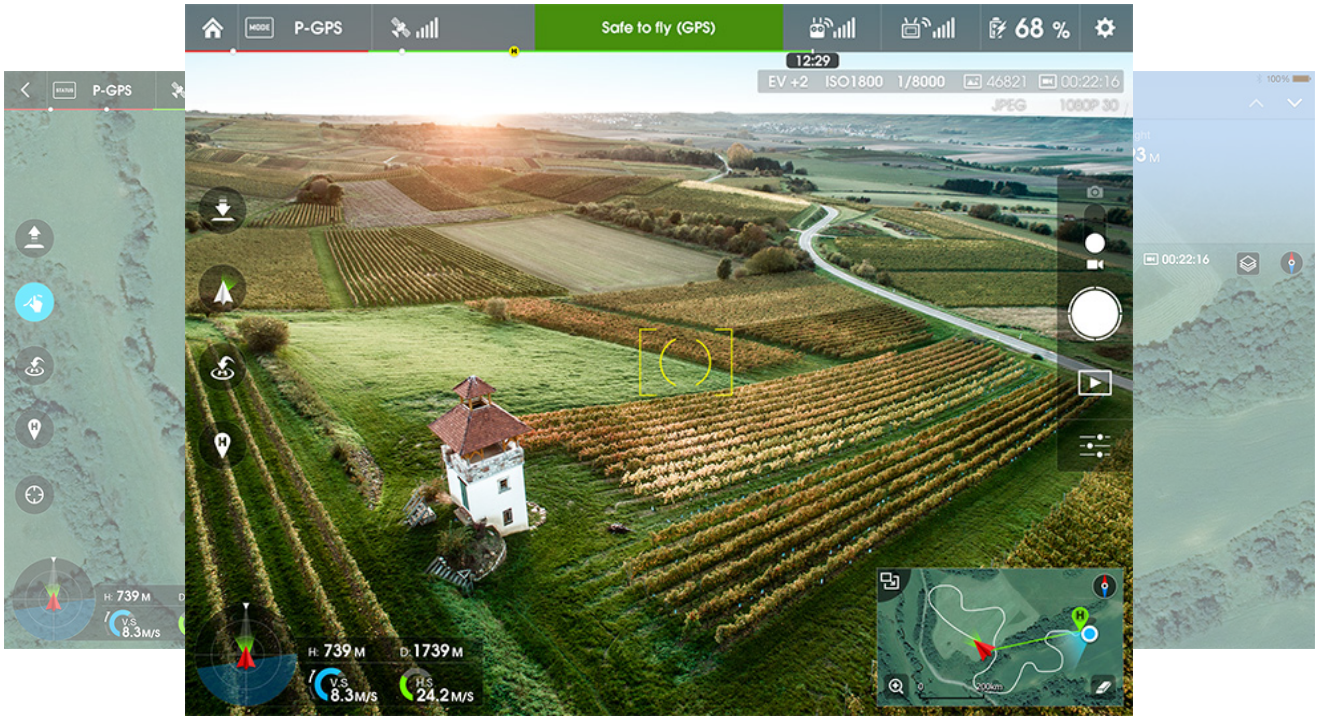
TRANSFORMING DESIGN

Strong carbon fiber arms lift out of sight, transforming the way you shoot. Get a full, unrestricted 360º view of the world below and create images like never before.

4K CAMERA

Shoot up to 4K video and capture 12 megapixel photos with the Inspire 1 camera. The lens consists of 9 seperate elements, including an aspherical element, for extreme clarity, while Adobe DNG RAW support gives you the power to make every shot a masterpiece.

ISO 1C



FULL-FEATURED APP

Take complete control of your camera and flight system with a comprehensive mobile app. Everything from manual camera controls to flight telemetry and even auto takeoff and landing are just a tap away, with more functions and updates coming soon.

OPTIONAL DUAL-OPERATOR CONTROL

Fly with a friend and share your vision. Achieve shots that never would have been possible alone by using two remote controllers. One person flies, while the other controls the camera.

FLIGHT SIGNAL

GIMBAL/CAMERA SIGNAL

REMOTE ONE
Flight Control

REMOTE TWO
Camera Control

More Features > (htt

click and drag

Everything you need for aerial filmmaking, integrated into an elegant, ready-to-fly system.

ADVANCED, READY-TO-FLY DESIGN

Imagine holding the future in your hands. Designe
while lightweight, flexible while providing the st
the Inspire 1 is DJI's most advanced complete p
latest aerial technology is packed into one sir
system, putting you in the sky within minutes.

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(/product/inspire-1/flight-control)

POWERFUL PROPULSION SYSTEM

The Inspire 1's propulsion system is unique among all flight platforms. We re-engineered and re-built the system to handle the demands of advanced flight, while increasing efficiency and reliability.

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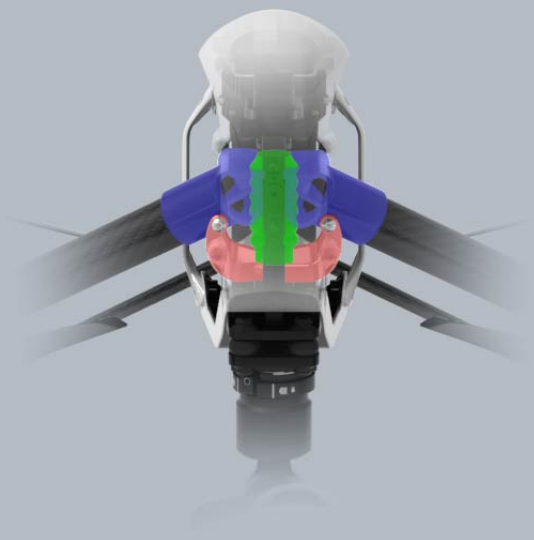
(/product/inspire-1/propulsion-system)



AERODYNAMIC TRANSFORMING DESIGN

Carbon fiber arms give you the strength to maneuver in the air and they transform, moving out of the camera's way a switch. With a full 360º unobstructed view, you now have the freedom to capture shots independent of the direction y

Every part, every component of the Inspire 1 was engineered to be durable and lightweight. The body's aerodynamic des the sky and further enhances your control over the aircraft. This ensures long flight times and a long operation

MODULAR, UPGRADEABLE SYSTEM

Inspire 1's gimbal and camera system can be removed from the aircraft for safe transport and future upgra

NEW CAMERA AND GIMBAL SYSTEM

Get crystal clear images with DJI's most advanced camera to date. The gimbal holding your camera is the result of DJI's years of expertise in camera stabilization, giving you smooth, stable footage in any flight conditions.

• Video: 4K @ 24-30 fps, or 1080p @ 24-60fps,
• Photos: 12 Megapixels
• Lens: 9 elements in 9 groups including an aspherical element
• 1/2.3 inch CMOS sensor
• 94º wide-angle FOV
• 3-axis, 360º rotating gimbal

LEARN MORE >

(/product/inspire-1/camera)

LIVE HD VIEW

A beautiful, 720p HD view shows you exactly what your camera sees at all times. Frame your shots and fly as though you're in the sky yourself.

This is made possible by an all new and improved version of DJI's Lightbridge technology which can transmit video from up to 2km away.

WIRELESS HD VIDEO
LIGHTBRIDGE TECHNOLOGY BUILT IN

CREATE TOGETHER

For an even greater level of precision, use a second remote controller and fly with a friend. With two operators controlling the same Inspire 1, one person pilots the flight path while the other aims the gimbal and camera.

Each user can have their own screen to see exactly what is being shot in real-time. By working in tandem, you're capturing shots that are more complex and artistic than ever before.

LEARN MORE ›

(/product/inspire-1/remote)

FLY INDOORS AND WITHOUT GPS USING VISION POSITIONING SYSTEM

Indoor flight has always been a true test of skill for all levels of pilots. DJI's new Vision Positioning technology uses a specially designed camera as well as sonic waves to bring simplicity to flying indoors. This technology allows the Inspire to hold its position, stop when the controls are released, and respond to your commands even when GPS is unavailable.

LEARN MORE ›

(/product/inspire-1/vision-positioning)

INTELLIGENT POWER MANAGEMENT SYSTEM

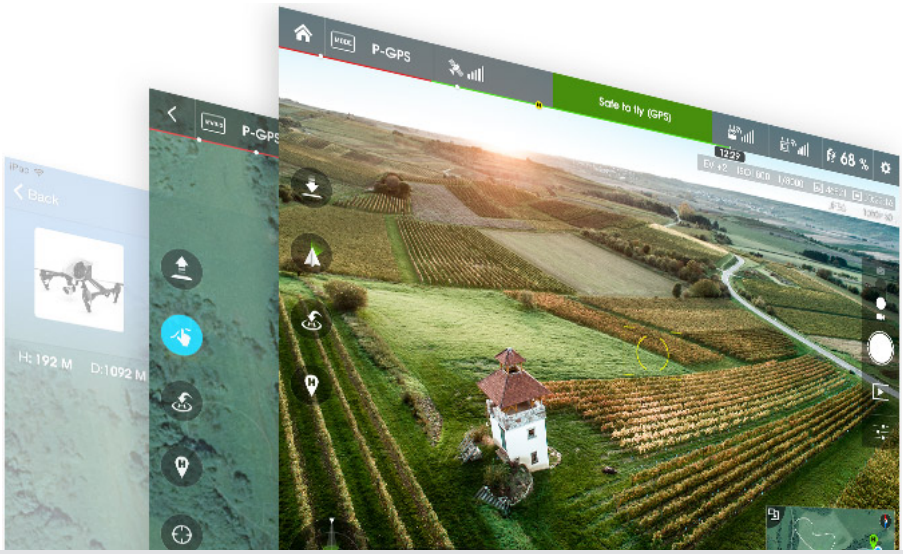
A fully integrated intelligent battery powers your Inspire 1 and virtually manages itself.

When in flight, your remaining battery power is shown live, letting you know how long you can continue to fly. Advanced algorithms calculate the distance of your aircraft and estimated time to return home, letting you know when it's time to fly back.

The battery reports the voltage of each cell, the total lifetime charges and discharges, and the overall health and battery status. All this helps you keep your Inspire 1 in the air and flying for years to come.

FULL-FEATURED APP

Install the mobile app onto your phone or tablet and you'll see what your Inspire 1 sees while taking control of its camera and flight settings.



MANUAL MODE

Change all of your camera settings, including ISO, White Balance, Exposure, and more on the fly ensuring every shot looks exactly the way you want.

AUTO-TAKEOFF AND LANDING

Takeoff and landing is easier than ever before, just a tap away. Tap once to takeoff and your I transform, ready to start filming. Then tap aga

into landing mode and auto land.

LIVE MAP AND RADAR

See precisely where your Inspire 1 is at all times on the live map. The map can be enlarged when needed and shows your most recent flight path.

DYNAMIC HOME POINT

When GPS signal is available on the remote, the Home Point automatically refreshes. This becomes useful while traveling in a car or on a boat allowing the return-to-home point to move where the operator goes. Multiple configurations are available via the Dynamic Home Point function.

FLIGHT TELEMETRY

All of the information you need to fly safely is j
Altitude, flight speed, distance, and more are r

REMOTE CONTROL CUSTOMIZATION

Put yourself in charge by tailoring the Inspire 1
personal needs. This way, your Inspire 1 move
you're most comfortable with.

THE COMPLETE PACKAGE,
AND THE LATEST TECHNOLOGY,
FROM THE MOST TRUSTED NAME IN AERIAL

PLATFORMS, DJI.

DEDICATED CONTROLS

Take absolute control of your Inspire 1 with DJI's most sophisticated remote controller to date. Featuring dedicate
for photo and video capture, a gimbal control dial, an integrated rechargeable battery and more, it's easy and intu
The controller has an mini-HDMI and USB port allowing you to connect mobile devices or compatible scree

Return Home

One Button
Take-off

EASY, SAFE FLIGHT

Even if you've never flown before, taking off and landing your Inspire 1 is easy and safe. It takes just one tap to make your Inspire 1 takeoff and transform, ready to start filming. Then tap again to have it transform into landing mode and land.

When GPS is available, the Home Point (the location you are standing) automatically refreshes, so your Inspire 1 always knows where you are even if you move around. When you tell it to come back, or in case of an emergency, it knows exactly where to go and land safely.

A COMPLETE READY-T SYSTEM

Everything you need is included and ready to aerial filmmaking tool in one box. Just add screen to use the live HD view.

INSPIRE 1 CAMERA MOUNT

Take the Inspire 1 camera from the air to the ground with this handheld system. Coming soon.

Aircraft	**Model**	T600
	Weight (Battery Included)	2935 g
	Hovering Accuracy (GPS Mode)	Vertical: 0.5 m Horizontal: 2.5 m
	Max Angular Velocity	Pitch: 300°/s Yaw: 150°/s
	Max Tilt Angle	35°
	Max Ascent Speed	5 m/s
	Max Descent Speed	4 m/s
	Max Speed	22 m/s (ATTI mode, no wind)
	Max Flight Altitude	4500 m
	Max Wind Speed Resistance	10 m/s
	Max Flight Time	Approximately 18 minutes
	Motor Model	DJI 3510
	Propeller Model	DJI 1345
	Indoor Hovering	Enabled by default
	Operating Temperature Range	-10° to 40° C
	Diagonal Distance	559 to 581 mm
	Dimensions	438x451x301 mm
Gimbal	**Model**	ZENMUSE X3
	Output Power (With Camera)	Static: 9 W In Motion: 11 W
	Operating Current	Station: 750 mA Motion: 900 mA
	Angular Vibration Range	±0.03°

	Mounting	Detachable
	Controllable Range	Pitch: -90° to +30° Pan: ±320°
	Mechanical Range	Pitch: -125° to +45° Pan: ±330°
	Max Controllable Speed	Pitch: 120°/s Pan: 180°/s
Camera	**Name**	X3
	Model	FC350
	Total Pixels	12.76M
	Effective Pixels	12.4M
	Image Max Size	4000x3000
	ISO Range	100~3200
	FOV (Field Of View)	94°
	CMOS	Sony EXMOR 1/2.3”
	Lens	f/2.8 (20 mm equivalent) 9 Elements in 9 groups Aspherical lens element Anti-distortion filter UV filter
	Still Photography Modes	Single shoot Burst shooting (BURST: 3/5/7 frames，AEB: 3 or 5 bracketed frames at 0. Time lapse
	HD Video Recording Modes	UHD (4K): 4096x2160p24/25，3840x2160p24/25/30 FHD: 1920x1080p24/25/30/48/50/60 HD: 1280x720p24/25/30/48/50/60
	Max Bitrate Of Video Storage	60 Mbps
	Supported File Formats	FAT32/exFAT Photo: JPEG，DNG Video: MP4/MOV (MPEG-4 AVC/H.264)
	Supported SD Card Types	SD/SDHC/SDXC Micro SD Max capacity: 64 GB. Speed: Class 10 or higher
	Operating Temperature Range	0° to 40° C
Remote Controller	**Name**	C1
	Operating Frequency	922.7~927.7 MHz (Japan Only) 5.728~5.850 GHz 2.400~2.483 GHz
	Transmitting Distance (Outdoor And Unobstructed)	2 km
	EIRP	10dBm@900m，13dBm@5.8G，20dBm@2.4G
	Video Output Port	USB, mini-HDMI

	Power Supply	Built-in battery
	Charging	DJI charger
	Dual User Capability	Host-and-Slave connection
	Mobile Device Holder	Tablet or Phone
	Max Mobile Device Width	170mm
	Output Power	9 W
	Operating Temperature Range	-10° to 40° C
	Storage Temperature Range	Less than 3 months: -20° to 45° C More than 3 months: 22° to 28° C
	Charging Temperature Range	0-40° C
	Battery	6000 mAh LiPo 2S
Charger	**Model**	A14-100P1A
	Voltage	26.3 V
	Rated Power	100 W
Battery (Standard)	**Name**	Intelligent Flight Battery
	Model	TB47
	Capacity	4500 mAh
	Voltage	22.2 V
	Battery Type	LiPo 6S High voltage battery
	Energy	99.9 Wh
	Net Weight	570 g
	Operating Temperature Range	-10° to 40° C
	Storage Temperature Range	Less than 3 months: -20° to 45° C More than 3 months: 22° C to 28° C
	Charging Temperature Range	0° to 40° C
	Max Charging Power	180 W
Battery (Optional)	**Name**	Intelligent Flight Battery
	Model	TB48

	Capacity	5700 mAh
	Voltage	22.8 V
	Battery Type	LiPo 6S
	Energy	129.96 Wh
	Net Weight	670 g
	Operating Temperature Range	-10° to 40° C
	Storage Temperature Range	Less than 3 months: -20 to 45° C More than 3 months: 22° to 28° C
	Charging Temperature Range	0° to 40° C
	Max Charging Power	180 W
Vision Positioning	**Velocity Range**	Below 8 m/s (2 m above ground)
	Altitude Range	5-500 cm
	Operating Environment	Brightly lit (lux > 15) patterned surfaces
	Operating Range	0-250 cm
DJI Pilot App	**Mobile Device System Requirements**	iOS version 7.1 or later Android version 4.1.2 or later
	Supported Mobile Devices	* iPhone 6 Plus, iPhone 6, iPhone 5S, iPad Air 2, iPad Mini 3, iPad Air, iPac 4 * Samsung Note 3、Samsung S5、Sony Z3 EXPERIA * Note: It is recommended that you use a tablet for the best experience *Support for additional Android devices available as testing and develop continues