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

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

September 15, 2015

Exemption No. 12858
Regulatory Docket No. FAA−2015−2088

Mr. Steven Edward Rawley
TEXDrones Low Altitude Aerial Photos and Video
12034 Normont Drive
Houston, Texas 77070

Dear Mr. Rawley:

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

By letter posted to the public docket on June 4, 2015, you petitioned the Federal Aviation Administration (FAA) on behalf of TEXDrones Low Altitude Aerial Photos & Video (hereinafter petitioner or operator) for an exemption. The petitioner requested to operate an unmanned aircraft system (UAS) to conduct aerial photography and videography for real estate companies, farm and land owners, and businesses.

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

The FAA has determined that good cause exists for not publishing a summary of the petition in the Federal Register because the requested exemption would not set a precedent, and any delay in acting on this petition would be detrimental to the petitioner.

Airworthiness Certification

The UAS proposed by the petitioner are the 3DRobotics IRIS+ and 3DRobotics SOLO.

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 relief from 14 CFR part 21, *Certification procedures for products and parts, Subpart H—Airworthiness Certificates*, and any associated noise certification and testing requirements of part 36, is not necessary.

The Basis for Our Decision

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

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

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

Our Decision

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

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

Conditions and Limitations

In this grant of exemption, TEXDrones Low Altitude Aerial Photos & Video 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 3DRobotics IRIS+ and 3DRobotics SOLO when weighing less than 55 pounds including payload. Proposed operations of any other aircraft will require a new petition or a petition to amend this exemption.

2. Operations for the purpose of closed-set motion picture and television filming are not permitted.

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

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

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

6. All operations must utilize a visual observer (VO). The UA must be operated within the visual line of sight (VLOS) of the PIC and VO at all times. The VO may be used to satisfy the VLOS requirement as long as the PIC always maintains VLOS capability. The VO and PIC must be able to communicate verbally at all times; electronic messaging or texting is not permitted during flight operations. The PIC must be designated before the flight and cannot transfer his or her designation for the duration of the flight. The PIC must ensure that the VO can perform the duties required of the VO.

7. This exemption and all documents needed to operate the UAS and conduct its operations in accordance with the conditions and limitations stated in this grant of exemption, are hereinafter referred to as the operating documents. The operating documents must be accessible during UAS operations and made available to the Administrator upon request. If a discrepancy exists between the conditions and

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

This exemption terminates on September 30, 2017, unless sooner superseded or rescinded.

Sincerely,

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

Enclosures

United States Department of Transportation
Federal Aviation Administration
800 Independence Ave., SW
Washington, DC 20591

Petition for Exemption

Parts of certain Title 14 CFRs in regards to Section 333 of the FAA Modernization & Reform Act of 2012

Concerning Unmanned Aerial Systems (UAS)

To Whom it May Concern:

This letter is a request for exemption from a number of Title 14 CFRs that relate to the commercial operation of "unmanned aerial systems" (UAS). The following will be included in this request: Name & information of Petitioner; Executive Summary of Petitioner summarizing the rules Petitioner seeks exemption from and the reasons the exemptions would serve the public good; Specific Title 14 CFRs to which an exemption is sought; the extent & reasons for the requested exemptions; reasons why safety would not be compromised.

Personal Information:

Name: Steven Edward Rawley (hereafter referred to as "Petitioner")
Company: TEXDrones Low Altitude Aerial Photos & Video (TEXDrones)
Address: 12034 Normont Dr., Houston, Texas 77070 info@dronephototexas.com
Phone: (281) 257-1972

The Petitioner was born on September 7, 1964 in Houston, TX and is a US citizen. He is the owner of TEXDrones whose primary clients will be real estate companies in need of aerial photography and video in the state of Texas, farm and land owners that require inspections and agricultural mapping, and businesses in need of photography and video services for their own personal use. The Petitioner is a licensed pilot – Airplane Single Engine Land since age 16. The Petitioner has operated radio controlled fixed wing and rotor aircraft for over 40 years without incident and has been active in the same model aircraft club since 1977. The Petitioner is a member of the Academy of Model Aeronautics (AMA). The Petitioner is a Professional Photographer and a member of The Professional Photographer's of America (PPA). Petitioner is requesting an exemption from the current rules in Section 333 which govern the uses of UASs for commercial purposes. The Petitioner seeks authorization to perform commercial UAS operations for real estate inspections, sales and advertising. This would include residential, commercial and rural properties. Prospective customers and clients would include real estate agents and brokers along with insurance companies, banks and private property owners. Other prospective clients include land developers needing photographs of privately owned lands that cannot be reached by automobile, land owners needing crop surveys of privately owned land and other businesses that could use photography and video from a low-altitude UAS in their own sales and marketing projects.

The Title 14 CFR exemptions that this request includes are: 61.113(a) & (b); 91.7(a); 91.119(a); 91.121; 91.151(a); 91.407(a)(1)&(2); 91.417(a) & (b). Reasons for each request are cited below.

Public Good

Aerial videography for geographical awareness and for real estate marketing and inspections 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 small UAS being utilized in this application will pose no threat to the public given its small size and lack of combustible fuel when compared to larger manned aircraft. The operation of this UAS will minimize ecological damage and promote economic growth by providing information to businesses & individuals in the state of Texas and specifically Southeast Texas.

Description of UAV to be Deployed Under Requested Exemptions.

Petitioner currently owns Two (2) 3DRobotics IRIS+ Quadcopters and has a 3DRobotics SOLO Quadcopter on order to arrive in June 2015. The petitioner intends to use the IRIS+ and SOLO quadcopters as the UAV's in commercial applications described herein. The IRIS+ and SOLO are a quadcopters that can take off and land vertically. They weigh less than 5 pounds each with payload and have a maximum airspeed of approximately 40 knots. They use lithium polymer batteries which have approximately 20-25 minutes of total charge time. This gives the UAS approximately 12-15 minutes of flight time with sufficient remaining battery charge to land safely. Both models being utilized under this request for exemption have First Person View (FPV) which allows the PIC to visually monitor telemetry data on a ground station monitor including altitude (AGL), GPS signal strength, battery charge information, etc. This FPV also gives the PIC video feed from the attached Hi-Definition camera showing what images are being captured. This is a significant safety feature as it shows the attitude of the UAS and its forward direction. However, this FPV feature will never be used as a tool to deviate from VLOS operation by the PIC.

Preflight

The petitioner will always follow procedures outlined in the UAS operator's manual as to proper preflight inspection of all hardware, software, environment and any other factors needed to ensure a safe flight.

FCC Information

The UAS being deployed here is a 3DRobotics IRIS+ and SOLO.

PIC Qualifications

As stated above, the petitioner holds a FAA Single Engine Land pilot's license. Along with the years of actual flight experience, the petitioner is also an experienced radio controlled fixed wing and rotor operator of over 40 years. Petitioner has owned the UAS (IRIS+) described above since 2014 and has over 150 hours in this type of UAS as a hobbyist. The petitioner envisions being the PIC in all operations that will be performed under the requested rule exemptions and the subsequent COA request.

Description of Intended Commercial Operations

Petitioner intends to solicit work for aerial real estate inspections from real estate agents & brokers, insurance companies & related vendors, banks and private property owners to provide photography and videography of residential, commercial and rural real estate. The Petitioner will also solicit work from land developers and farmers as well as other companies requesting private photography and video services from a low-altitude UAS. This work will always be conducted with the permission of the property owner or

their respective agent. Flight operations will be restricted to flights directly over the property that has granted permission. Safety will always be the primary concern regarding all flights at all times. Petitioner agrees to place a sign during any flight operation that says: CAUTION UNMANNED AERIAL VEHICLE IN OPERATION. STAY BACK 100 FEET FROM AIRCRAFT.

UAS Operating Parameters

The UAS being deployed in this exemption request can fly at a speed of approximately 40 knots. However, given the intended use describe here, this speed will never be necessary. Much slower speeds are preferred to collect the photographic material needed.

Petitioner agrees never to fly UAS outside of VLOS and also agrees to only fly UAS during the day in VMC conditions at altitudes below 400 feet AGL, clear of clouds.

The UAS will not be operated within 5 nautical miles of an airport reference point as denoted on a current FAA published aeronautical chart.

The UAS being deployed with these exemption requests has the capability of using GPS signals to return to its initial point of takeoff if connection with the radio control link is lost. This is a safety advantage to these type aircraft.

The Petitioner agrees to yield right of way to all manned aviation activities at all times.

Exemption Requests

The following are a list of Title 14 CFRs which the petitioner seeks exemption. Please note that the Petitioner has used Exemption No. 11138 to Douglas Trudeau (Regulatory Docket No. FAA-2014-0481) as a reference. Given that the petitioner and Mr. Trudeau intend to use the exemptions in similar manners and both use similar equipment, it seemed prudent not to burden the reviewer in this matter with exemption requests that have been previously deemed that relief was not necessary. These rules are Part 21, 45.23(b). 91.9(b)(2), 91.103(b), 91.109 and 91.203(a) & (b). If the reviewer believes that these rules need to be addressed in this request, the petitioner will make a supplemental request including these additional rule exemptions.

Rule 61.113 - Private Pilot Privileges and Limitations

The Petitioner holds a Single Engine Land pilot's license (a copy included in supplemental material). As to the Private Pilot Limitations concerning operations for hire or compensation, it seems that Exemption No. 11062 to Astraecus has allowed this exemption previously and was noted in the Trudeau Exemption No. 11138.
As to airmanship skills, the Petitioner has been operating his UAS since 2014 and has over 150 hours of flight time. Petitioner currently fly's this UAS several hours a month as a hobby and is very proficient and has the skills to maintain altitude, maintain VLOS, navigate, avoid obstacles, avoid air traffic and respond to loss of control link. Petitioner understands that he must make at least 3 takeoffs and landings within a 90 day period for currency purposes.

Rule 91.7(a) Civil Aircraft Airworthiness

There is no current FAA regulatory standard for determining airworthiness of UAS and there is no certificate currently available for UAS airworthiness. Petitioner seeks an exemption from this rule by ensuring that the UAS is in an airworthy condition based on compliance with the operating documents prior to every flight. Flight manuals and other important documents will be kept in a location readily accessible to the PIC at all times.

Rule 91.119© Minimum Safe Altitudes

91.119 prescribes safe altitudes for the operation of civil aircraft, but it allows helicopters to be operated at lower altitudes in certain conditions. Petitioner seeks an exemption from this rule as Petitioner will only operate the UAS in a range from ground level up to but not exceeding 400 feet (AGL) and will only operate in safe areas away from the public thus providing a level of safety not available to manned aircraft. The petitioner asserts that given the size, weight, maneuverability and speed of the UAS, an equivalent or higher level of safety will be achieved that from conventional manned helicopters.

Petitioner will avoid actively populated areas. Petitioner intends to operate the UAS over real estate for inspection purposes, farmland and on private property.

Per the exemption granted in No. 11138 concerning 91.119(c), Petitioner agrees to act in strict accordance to that exemption. However, Petitioner seeks an exemption from the rule stipulating that a UAS cannot be operated within 500 feet of a structure without permission of the owner. Given the intended use Petitioner will use these exemptions for, which is for photography and videography of real estate for marketing & inspection purposes, agreement from the engaging property owner or their agent is an absolute necessity. The UAS will only be flown over properties with this permission. However, given the housing density in the Southeast Texas area, maintaining a 500 foot distance from other structures even while strictly flying over a permission granting owner's property is impossible in many instances. The Petitioner seeks an exemption to this rule which would allow a 50' stand-off from other structures as long as the UAS is operated completely over and within the property boundary lines of a permission granting property owner. Petitioner agrees to always keep privacy rights of other property owners in mind.

Rule 91.121 Altimeter Settings

Petitioners' UAS has GPS derived altitude capabilities with a barometric sensor. The petitioner believes this rule in not applicable to the UAS operations intended.

Rule 91.151(a) Fuel Requirements For Flight in VFR Conditions

Petitioner seeks relief from this rule due to the UAS being deployed is battery operated and the requirements under this rule are not applicable. The UAV in question has First Person Vision (FPV) capabilities which transmits certain telemetry to a monitor where the PIC can monitor certain aspects of the flight including battery level. A typical battery for a 3DR IRIS + UAS will last approximately 20-25 minutes before total exhaustion. Certain battery level warnings are set where the PIC will know when the battery state is at 30% and 15% remaining charge levels. This will normally allow a flight of 12 - 15

minutes with sufficient battery charge to make a safe landing. Petitioner will never begin a flight unless a fully charged battery is used.

Rule 91.405(a) Maintenance Required, 91.407(a) Operation After Maintenance, Preventative Maintenance, Rebuilding or Alteration; 91.409(a)(2) Inspections; 91.417(a)(b) Maintenance Records

Petitioner seeks relief from these rules due to it being an alternate inspection requirement of 91.409(a)(2). The Petitioner will inspect and ensure UAS is in a condition for safe flight and adhere to all operating documents.

Supplemental Information

The Petitioner has provided the following information to support these requests for rule exemptions and personal identification: 1) Copy of Petitioner's FAA License, 2) 3DRobotics IRIS+ Manual, 3) Petitioner's Texas Driver's License 4) Petitioner's Academy of Model Aeronautics Card

Closing

The Petitioner believes that exemption from the above listed Title 14 CFRs is warranted given: 1) Petitioner's background as a licensed private pilot, 2) proficiency as a model aircraft operator, 3) professional photographer, 4) the nature of the type of UAS flights that will be undertaken, 5) the size & weight of the UAS being deployed, 6) the safety precautions to the general public the Petitioner intends to adhere to, 7) the positive environmental impact of the flight operations would have compared to manned fuel consuming missions, and 8) the economic benefit the Petitioner's business would have in this new area of aviation.

Thank you for your review of this matter. Please feel free to contact me at any time with requests for additional information regarding this matter.

Sincerely,

Steven E. Rawley
TEXDrones
12034 Normont Dr
Houston, TX 77070

IMPORTANT
Read before flying!

IRIS+ Operation Manual

3DR

Contents

Meet IRIS+.

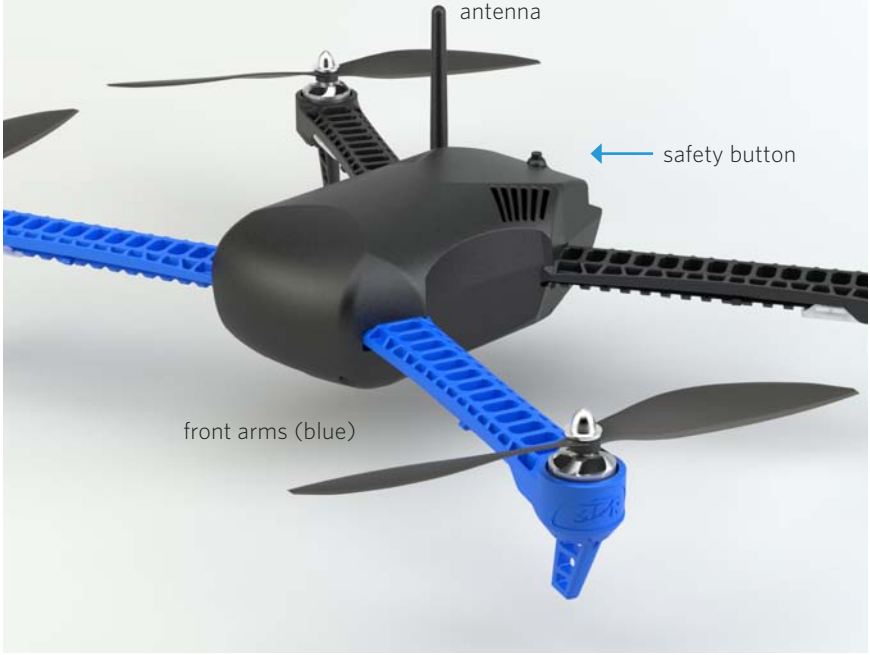
Thank you for purchasing IRIS+.

IRIS is a personal aerial imaging platform powered by open-source hardware, software, and firmware. Please read this manual carefully before your first flight and pay close attention to safety information.

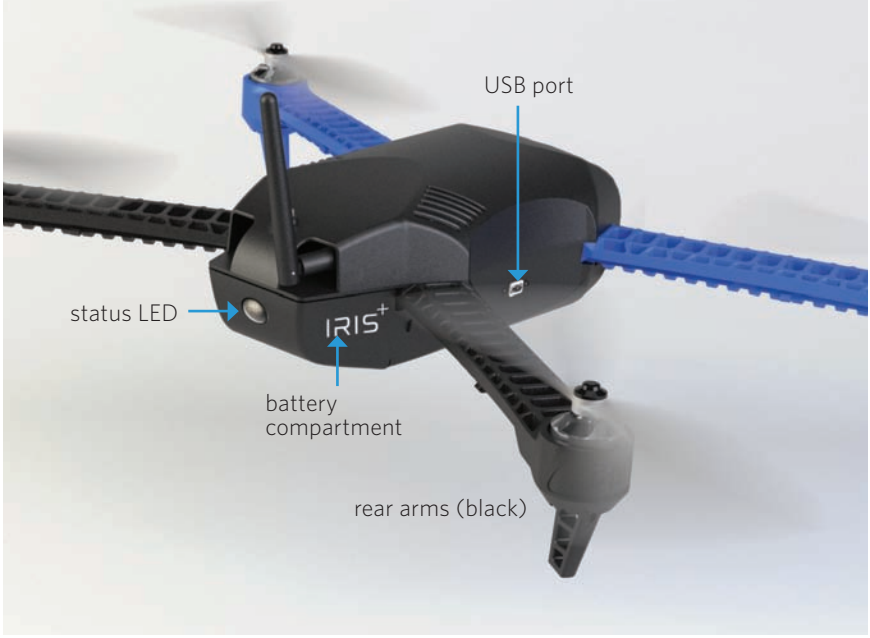
Happy flying!

Important note: When using a GoPro with IRIS, always ensure that the WiFi on the GoPro is turned **OFF**.

Front


antenna
safety button
front arms (blue)

Rear


USB port
status LED
IRIS+
battery compartment
rear arms (black)

Parts

Controller
your direct link to IRIS

Ground station radio
with USB and Android adapters

Battery kit
battery, guard bag, and charger
with international travel adapters

Propellers and tool kit
four propellers with propeller tool and
small, medium, and large hex keys
(1.5 mm, 2 mm, and 3 mm)

Tall legs
Switch to tall legs to use IRIS with the Tarot Gimbal or for extra clearance on landing.

Use the small (1.5 mm) hex key to loosen the set screw in the bottom of the leg.

Slide out the leg to remove it, and replace with the tall leg. Tighten the set screw until it sits flush with the surface. Do not tighten the screw beyond this point.

Charging the Battery

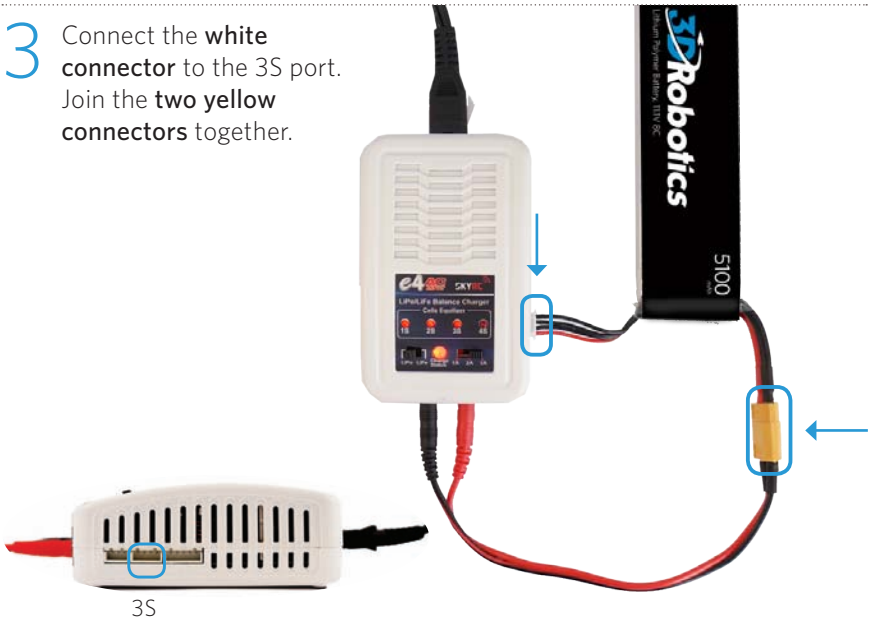
IRIS is powered by a rechargeable lithium polymer (LiPo) battery. Store the battery at half charge then charge fully before flying. Batteries must ship at half charge, so please charge before your first flight. Each full battery provides up to 22 minutes of flight time without a gimbal and up to 16 minutes when using a Tarot Gimbal.*

1 Connect charger to the power adapter cable and a wall outlet.

Connect the red cable to the + port and the black cable to the - port.

2 Set the charger to **LiPo** and **3A**.

3 Connect the **white connector** to the 3S port. Join the **two yellow connectors** together.



4 Secure battery inside the guard bag while charging. Charge until the status indicator displays green.

Charging **Complete**

Battery Safety

Protect the battery from extreme heat, extreme cold, puncturing, and flammable surfaces. Always transport, charge, and store the battery in the guard bag.

Charge the battery using a designated LiPo balance charger only. Always monitor the battery while charging.

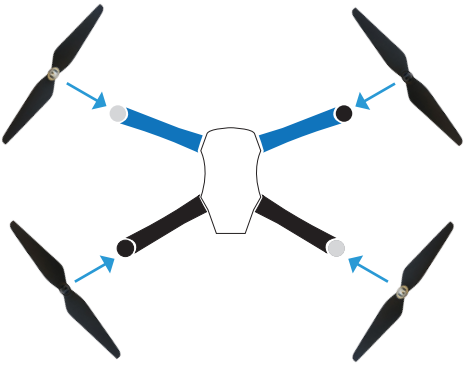
Flying with a low battery is a safety risk and can render the battery unusable. Always discontinue use when you receive a low battery notification, and always fly with a fully charged battery.

Inspect the battery for damage before takeoff and after landing. If you observe any swelling of the package or the battery ceases to function, locate your local battery recycling center to dispose of the battery. In the US and Canada, visit call2recycle.org to find a location. Do not dispose of the battery in the trash.

*Flight time varies with payload, wind conditions, elevation, temperature, humidity, flying style, and pilot skill. See the Flight Checklist for instructions on managing battery levels during flight.

Attaching Propellers

IRIS uses four propellers: two with black nuts and two with silver nuts. Attach the propellers with black nuts to the motors with black tops and the propellers with silver nuts to the motors with silver tops.



Each propeller has locking and unlocking direction symbols. **To attach**, spin the propeller in the direction of the locking symbol. The propellers will automatically tighten onto the motors when you arm IRIS before takeoff.

For propellers with black nuts:

Spin clockwise to attach.

Spin counterclockwise to remove.

For propellers with silver nuts:

Spin counterclockwise to attach.

Spin clockwise to remove.

To remove, hold the motor in place with the propeller tool, and spin the propeller in the direction of the unlocking symbol.

Safety

IRIS has powerful motors and high-speed propellers. Never place your hands near propellers while IRIS is armed or the safety button displays solid red. Always press the safety button until it displays blinking red before handling.

Always fly in an open area away from people and buildings; do not attempt to fly indoors or in a confined space. Do not fly over people, near airports, or in any situation that could pose a hazard to those around you. Always fly within your line of sight and in compliance with local regulations. IRIS will not avoid obstacles on its own. As the operator, it is your job to recognize and avoid obstructions while flying. Always follow the preflight and postflight steps in the order described in this manual, and remain attentive at all times while flying.

Environmental factors, such as wind and GPS irregularities, can cause instability in flight. IRIS will attempt to compensate for these factors by triggering a failsafe if it detects an unsafe flying condition due to loss of controller signal, loss of GPS signal, or low battery (see below for details). To avoid potential hazards due to environmental factors, identify the boundaries of your flying area before takeoff, and recover IRIS manually by switching into standard (STD) if it moves outside your designated flying area. If you observe any inconsistent behavior, land, and consult the troubleshooting guide at 3DR.com/iris/info.

Failsafes

Loss of RC signal 

Always use the controller as a primary or backup control system when flying. Ensure that the controller is turned on any time IRIS is powered. If contact with the controller is lost during flight, IRIS will land and display a blinking yellow LED. If IRIS is more than 2 meters (6.5 feet) from the launch point, it will return to launch (RTL) before landing. (See page 13 for more information about RTL.)

Loss of GPS signal 

IRIS requires an active GPS signal before takeoff. If IRIS loses GPS signal in flight, it will trigger a GPS failsafe, indicated by a blinking blue and yellow LED with a high-high-high-low tone, and **automatically switch to manual control** (standard - altitude hold mode). Always be prepared to regain manual control of IRIS at any time while flying and choose an unobstructed flying area to improve GPS signal strength. When flying a mission, we recommended changing the GPS failsafe behavior to land. (Visit 3DR.com/iris/info for more information about configuring the GPS failsafe.)

Low battery 

When the battery reaches 25% of its remaining charge, IRIS will land and display a blinking yellow LED with a quick repeating tone. If IRIS reaches the low battery limit during a mission, it will return to the launch point before landing.

Learn to Fly

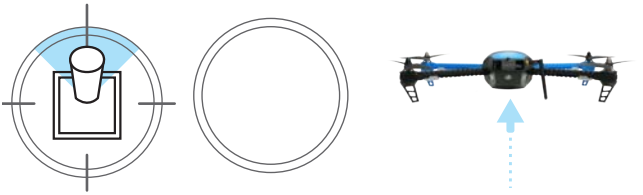
Maneuver IRIS in flight using the controller sticks.

Throttle

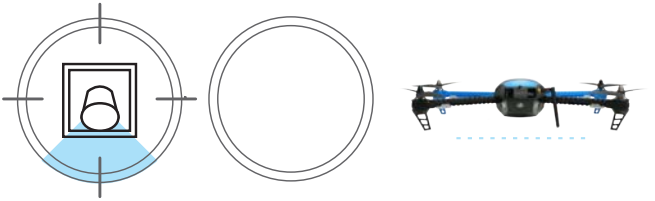
Move the left stick up and down to control altitude.

left stick

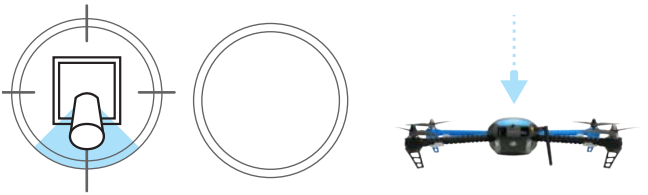
To take off and to gain altitude, raise the throttle stick slightly above center position.



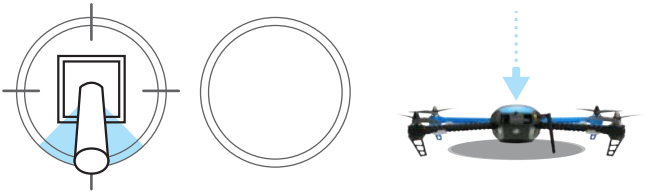
Set the throttle stick to center to maintain the current altitude.



Lower the throttle stick below center to decrease altitude.



Set the throttle stick fully down to land once IRIS is a few inches above the ground.

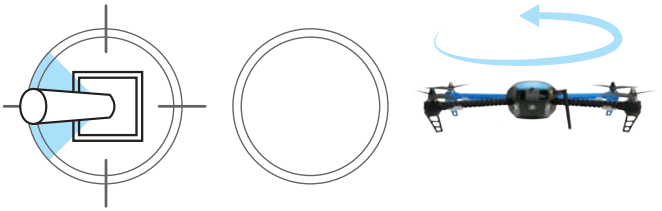


Yaw

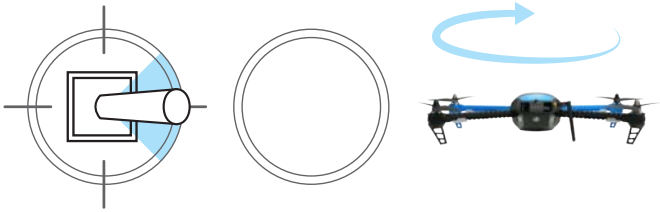
Move the left stick horizontally to rotate IRIS and change orientation. For a slow rotation, move the stick slightly away from the center in either direction. Moving the stick farther from the center creates a faster rotation.

left stick

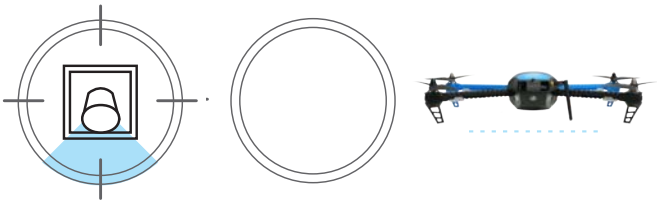
Move the stick to the left to rotate counterclockwise.



Move the stick to the right to rotate clockwise.



Release the stick to stop rotating and maintain the current orientation.



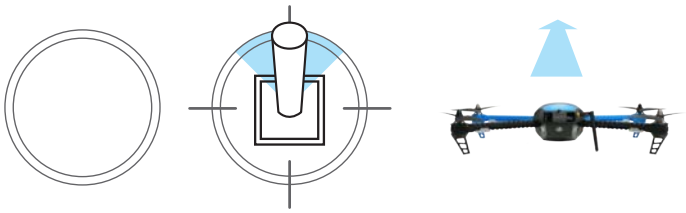
Flight Tip
When adjusting orientation, move the left stick horizontally without changing its vertical position.

Pitch and Roll

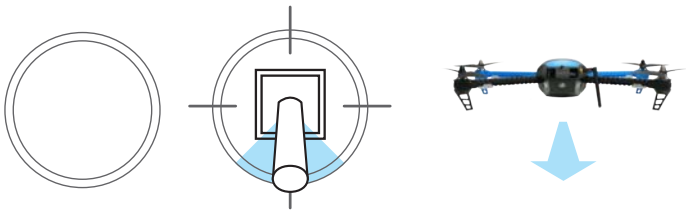
The right stick allows you to control IRIS' position in the air. Move the right stick to tell IRIS to move in that direction: forward (toward the blue arms), back (toward the black arms), left (toward the left arms), or right (towards the right arms). How far you move the stick from the center before releasing it tells IRIS how fast to move.

right stick

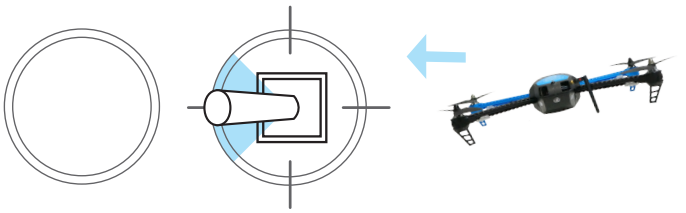
Move the right stick forward to fly forward.



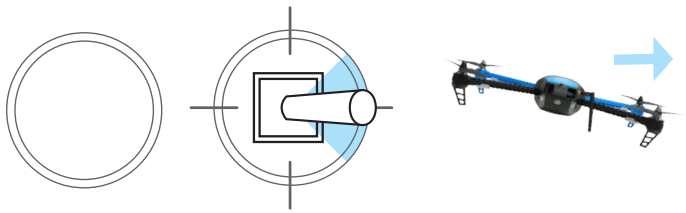
Move the right stick back to fly backward.



Move the right stick left to fly left.



Move the right stick right to fly right.



Flight Tip

IRIS moves according to its orientation. The blue arms and white lights face forward, and the black arms and red lights face backward. Before using the right stick, use yaw to keep IRIS facing in outward orientation so that the black arms and red lights face towards you and the blue arms and white lights face away from you.

Flight Modes

IRIS includes three flight modes: manual flight (STD-altitude hold), hover mode (LTR-loiter), and mission flight (AUTO). Use the switch on the right side of the controller to select a flight mode.

Standard (altitude hold mode)
STD

fly manually

Start your flight in standard to select altitude hold mode, and fly IRIS manually using the controller.

Loiter mode
LTR

hover

Select loiter to set IRIS to hover in place automatically. Use the controller to adjust IRIS' position then release the sticks to hold that position. Loiter is a great way for beginners to learn how to fly! If you're new to flying, start your first flight in loiter instead of standard.

To avoid sudden changes in altitude, set the throttle stick to center position before switching modes, including in the event of a GPS failsafe.

Advanced Operator Note: If you choose to modify the flight mode configuration to include Stabilize mode, please fly only with the provided set of tall legs. Flying in Stabilize with short legs can cause vibrations that may interfere with autopilot calculations and produce unexpected behavior.

Auto mode
AUTO

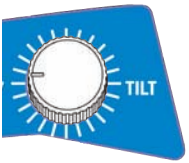
fly a mission

Select auto mode to fly an autonomous mission. IRIS will automatically fly the series of waypoints saved to the autopilot. See pages 19 and 20 for instructions on planning and flying missions.

Do not activate auto mode unless you have saved a mission to IRIS using a ground station application.

Gimbal control
TILT

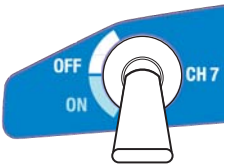
tilt the camera up and down



Connect a Tarot Gimbal (sold separately), and use the TILT knob to control the angle of the camera in flight. Visit **3DR.com/iris/info** for instructions.

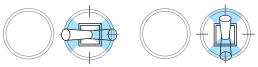
Land
CH 7

land at the current position

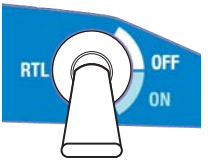


Set the CH 7 switch to ON to end your flight and land IRIS at its current position. Once you activate land, set the throttle stick fully down, and IRIS will automatically disarm after landing. IRIS will not disarm automatically unless the throttle stick is set fully down.

Reposition during landing: During landing, use the right stick on the controller to adjust IRIS' position.

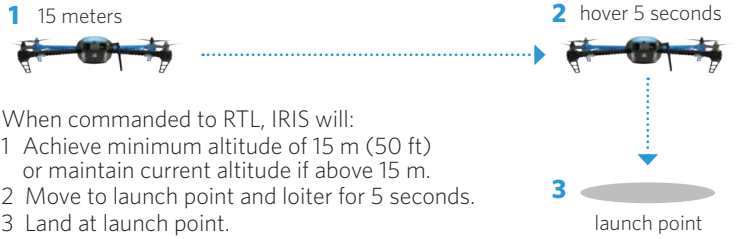


Return to Launch (RTL)



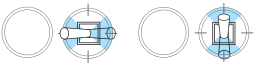
land at the launch point

Set the RTL switch to ON to end your flight and return IRIS to the launch point automatically. Ensure that the RTL switch is set to OFF before takeoff.



When commanded to RTL, IRIS will:
1 Achieve minimum altitude of 15 m (50 ft) or maintain current altitude if above 15 m.
2 Move to launch point and loiter for 5 seconds.
3 Land at launch point.

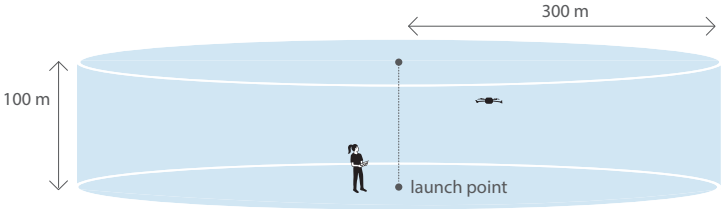
Reposition during landing: During landing, use the right stick on the controller to adjust IRIS' position.



RTL returns IRIS to the location where IRIS was armed. Always arm IRIS in a safe, unobstructed launch point.

Geofence

A safety fence restricts IRIS to within 300 meters (980 feet) of the launch point and under 100 meters (320 feet) in altitude. If IRIS reaches the edge of the geofence, it will initiate an automatic return to launch.



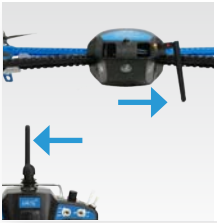
In the event of a GPS failsafe, the horizontal geofence will be disabled. If IRIS breaches the vertical geofence during a GPS failsafe, it will land at its current position.

First Flight

Select an open area for flying, away from people and buildings, and remember to bring the Flight Checklist and a fully charged battery. Determine the boundaries of your flying area before takeoff, and select a level, unobstructed space as a launch point. Follow these preflight and postflight steps in the order shown here and on the Flight Checklist every time you fly.

Preflight

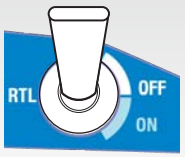
1 Check IRIS.



Point the controller antenna up and the IRIS antenna down for the strongest signal.

Set the mode switch to standard (STD).

If you're new to flying, try starting your first flight in loiter (LTR) instead of standard.



Ensure that the RTL switch is set to OFF.

2 Power on controller.

Ensure that the controller is always turned on while IRIS is powered. If IRIS loses communication with the controller in flight, IRIS will initiate an automatic return to launch.

Press and hold the DN button on the controller to view flight data from IRIS. See the Flight Checklist for more information about controller flight data.

3 **Connect battery.**

Press the sides of the battery compartment together and rotate the door down.

Insert battery, and attach the yellow connectors.

Wait 10 seconds before closing the battery door or moving IRIS at all while the internal sensors calibrate and the status LED shows blue and red.

To close, squeeze the door, and rotate up until it clicks into place, ensuring that the battery cables do not interfere with the LED cables.

If you see a flashing yellow status LED, it's likely that the sensors did not calibrate correctly during startup. Re-connect the battery and make sure to **keep IRIS absolutely still and level during the blue-and-red status LED indicator**.

Place IRIS at the launch point with the black arms facing towards you and the blue arms facing away from you.

Connect the radio to your ground station, and select Connect.

A ground station (recommended) lets you view live data in flight and unlock IRIS' advanced autonomous features. To download a ground station app for you laptop or Android device, visit 3DR.com/iris/info.

4 Press safety button.

Press the safety button until it is solid red.
IRIS is now live.

Stand back!

Do not handle IRIS while the safety button is solid red and IRIS is live. Always press the button until it displays blinking red before approaching the propellers.

Motors inactive, safe to handle

Motors active, deactivate before handling

5 Check LED.

Check the LED to view the status of IRIS. Wait to proceed until you see the blinking green light indicating that IRIS has acquired GPS lock.

Initializing, hold IRIS still, please wait.

Acquiring GPS, please wait.

Autopilot ready, GPS locked

Pre-arm safety check failure. Connect to a ground station and see the trouble-shooting guide at 3DR.com/iris/info.

GPS lock requires a clear view of the sky. IRIS may take a few minutes to acquire GPS lock depending on your flying location. Always fly in an open area to improve GPS signal strength, and review the GPS failsafe information on page 7.

6 Arm motors.

To activate the motors, hold the left stick down-right until the motors spin.

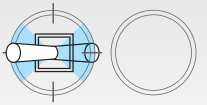
Now you're ready for takeoff!

IRIS will spin its propellers when armed. Ensure that the launch point is clear of obstructions before arming. Always disarm the motors before approaching IRIS.

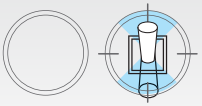
Flight

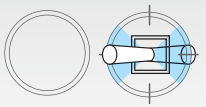
Take off and gain altitude by raising the left stick slightly above center.

Set the left stick to center to maintain the current altitude.

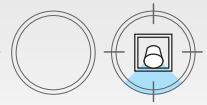


Rotate counter-clockwise and clockwise by moving the left stick left and right.



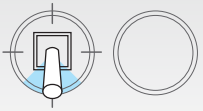


Fly forward, backward, left, or right by moving the right stick in the direction you want to fly.



Release the right stick to level IRIS.

Lower the left stick below center to descend.



Set the left stick fully down to land once IRIS is a few inches above the ground.

IRIS is a powerful and agile flier. Move the sticks in small increments until you feel comfortable with how IRIS responds to controls.

Postflight

1 Disarm motors.

After landing, hold the left stick down-left until the motors stop spinning.

2 Press safety button.

Press the safety button until it displays blinking red to make IRIS safe to handle.

3 Disconnect battery.

4 Power off controller.

Your first flight is now complete!

Follow the steps shown here and on the Flight Checklist every time you fly.

Tips for New Fliers: Practice these exercises to help you master flight controls.

Skill 1: Hover
Your first step is to maintain a consistent altitude while keeping IRIS oriented so the black arms face towards you and the blue arms face away from you. Practice taking off, rising to a comfortable hovering altitude, and keeping IRIS in place without allowing for any changes in orientation or position. If IRIS drifts forward, backward, left, or right, or rotates clockwise or counterclockwise, use the corresponding stick controls to correct.

Skill 2: Box
When you feel comfortable with your ability to maintain a consistent hovering altitude, try flying a box pattern. To practice this, take off, reach your hovering altitude, then fly forward, right, backward, and left by making small adjustments to the right stick. Make sure to fly the box in front of you and not around you. Use the left stick to rotate IRIS so the black arms face towards you and blue arms face away from you for the duration of the exercise.

Skill 3: Figure Eight
When you can confidently navigate a box while maintaining altitude and orientation, try flying a figure-eight pattern. Once again, make sure to fly the figure eight in front of you and not around you. Use the right stick to create a smooth flight path while using the left stick to correct orientation and maintain altitude.

Planning Missions

To plan a mission, download a ground station application from 3DR.com/iris/info, and install onto your laptop or Android device.

DroidPlanner 2 for Android

Mission Planner for Windows

APM Planner for OS X

1 Power IRIS, connect the radio to your laptop or Android device, and select Connect.

Connect the blue end of the Android adapter to your device and the black end to the radio. Select Connect.

Connect the USB adapter to the radio and your laptop. Select AUTO, 57600, and Connect.

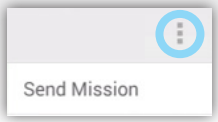
2 Configure waypoints.

Select Edit and tap to add waypoints, or select the brush tool and draw a path for IRIS to follow.

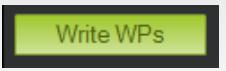
Select Flight Plan, and click to add waypoints. Select the green arrows at the bottom of the screen to configure altitude and change waypoint types.

3 Save the mission to IRIS.

Select the option menu in the top-right corner, and select Send Mission.



Select Write WPs.



When flying missions, we recommend changing the GPS failsafe behavior to set IRIS to land in the event of a loss of GPS signal. For instructions, visit 3DR.com/iris/info.

Flying Missions

1 Perform a pre-mission test flight.

Fly a brief test flight to verify that all controls (throttle, yaw, roll, and pitch) are responding normally.

2 Arm IRIS in standard.

When you're ready to start the mission, arm IRIS in standard (STD).

3 Switch to AUTO.

If you planned a takeoff waypoint into your mission, switch to AUTO on the ground, and **raise the throttle to initiate the mission.** If you did not add a takeoff waypoint, switch to AUTO mode after takeoff to initiate the mission in flight.

For auto-takeoff, raise throttle to start mission.

To recall IRIS during a mission, use the controller to switch to standard (STD) and land manually. Or switch to RTL, and automatically return to the launch point.

To avoid sudden changes in altitude when switching from auto to standard (STD), ensure that the left stick is set to the center position.

4 Switch to standard before disarming.

When the mission is complete and IRIS has landed, use the controller to switch to standard (STD) then disarm and proceed with the postflight steps.

If you added an automatic landing waypoint to your mission, IRIS will disarm automatically after landing.

Specifications

Autopilot:	Pixhawk v2.4.5
Firmware:	ArduCopter 3.2
GPS:	3DR uBlox GPS with Compass (LEA-6H module, 5 Hz update)
Telemetry radio:	3DR Radio Telemetry v2 (915 mHz or 433 mHz)
Motors:	950 kV
Frame type:	V
Propellers:	9.5 x 4.5 T-Motor multirotor self-tightening counterclockwise (2) 9.5 x 4.5 T-Motor multirotor self-tightening clockwise (2)

Battery:	3S 5.1 Ah 8C lithium polymer
Low battery voltage:	10.5 V
Maximum voltage:	12.6 V
Battery cell limit:	3S
Battery weight:	320 g

IRIS is compatible with 3S lithium polymer batteries only. Using a 4S battery can cause permanent damage to the gimbal electronics and will void the warranty.

Weight with battery:	1282 g
Height:	100 mm
Motor-to-motor:	550 mm
Payload capacity:	400 g (.8 lbs)
Radio range:	up to 1 km (.6 miles)
Flight time:	16-22 minutes*

*Flight time varies with payload, wind conditions, elevation, temperature, humidity, flying style, and pilot skill. Listed flight time applies to elevations less than 2,000 ft above sea level.

Resources

Hardware:	3DR.com/iris/info
Firmware:	copter.ardupilot.com
Software:	planner.ardupilot.com and planner2.ardupilot.com
3DR Store:	store.3DR.com
Community:	diydrones.com

Happy flying!

Learn More

Visit **3DR.com/iris/info** to learn about:
- 3PV™ Follow Me and DroidPlanner
- Opening the shell
- Replacing the arms and motors
- Installing software
- Planning a mission
- Updating firmware
- LED meanings and tones

Visit **copter.ardupilot.com** to learn about:
- Additional flight modes
- Configuring parameters, including yaw behavior during autonomous flight, descent speed during RTL, and more

Visit **planner.ardupilot.com** (Mission Planner) and **planner2.ardupilot.com** (APM Planner) to learn about:
- Planning a mission with waypoints and events
- Using a ground station to command IRIS in flight
- Downloading and analyzing flight logs

Join the community and share your experience at **diydrones.com**.

Follow us on Facebook and Twitter **@3DRobotics**.

Support

For customer support, contact us at **help@3DR.com** or call our support line at **+1 (858) 225-1414** Monday through Friday, from 8 am to 5 pm, PST.

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3DR

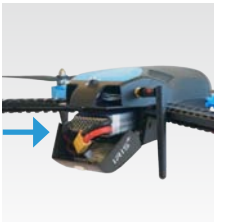
IRIS+

Flight Checklist

Go outside to an open area!

1 Power on controller; set to STD and RTL OFF.

2 Connect charged battery.



3 Place IRIS at launch point.

Choose a clear launch point, and face IRIS away from you.

4 Press and hold safety button until solid red.

The motors are now active.

⚠ Stand back!

5 Check LED.

6 Arm motors.

Hold left stick down-right until motors spin.

LED

- Initializing, please wait
- Acquiring GPS, please wait
- Autopilot ready, GPS locked
- Armed
- Loss of RC signal, automatic landing
- Low battery, automatic landing
- Loss of GPS signal, switch to manual
- Pre-arm safety check failure, see troubleshooting guide

Safety Button

- Motors inactive, safe to handle
- Motors active, deactivate before handling (see reverse)

Flight Modes

Standard position (altitude hold mode)
STD
fly manually

Loiter mode
LTR
hover

Auto mode
AUTO
fly a mission

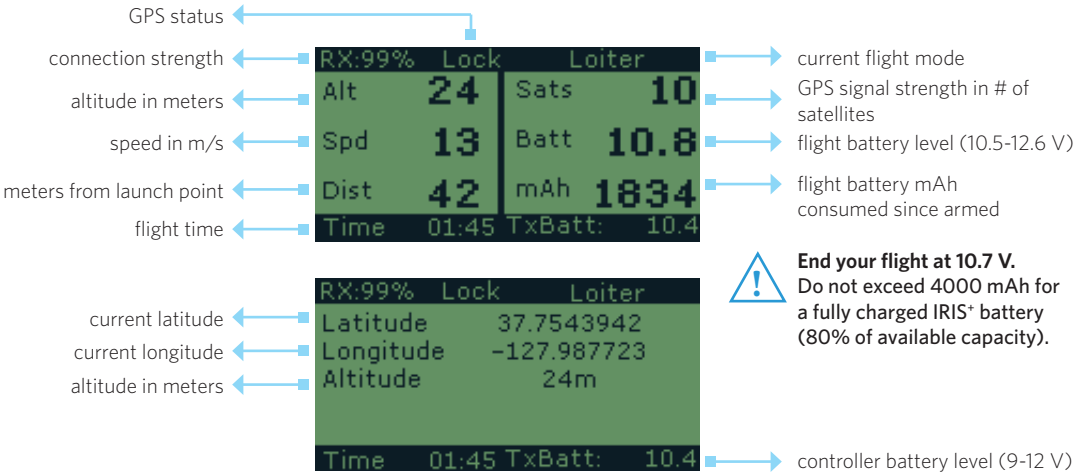
Return to launch
RTL
land at the launch point

Land
CH7
land at the current position

Control gimbal
TILT
tilt the camera down and up

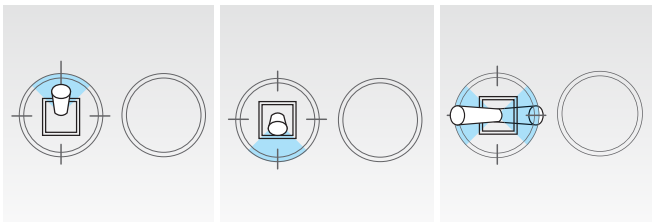
Controller Flight Data

Press and hold the DN button to access the flight data screens. Press DN again to toggle between screens.



End your flight at 10.7 V.
Do not exceed 4000 mAh for a fully charged IRIS⁺ battery (80% of available capacity).

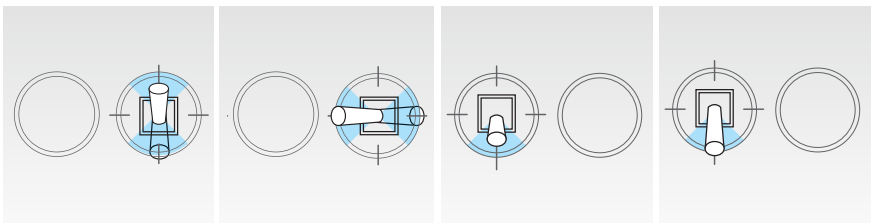
Flight



Raise left stick above center to take off and gain altitude.

Set left stick to center to maintain altitude.

Move left stick left and right to rotate.



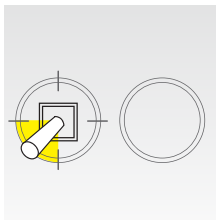
Use right stick to fly forward, backward, left, and right.

Lower left stick below center to descend.

Set left stick fully down to land when near the ground.

Postflight

1 Disarm motors.



Hold left stick down-left until motors stop.

2 Press safety button.

Press and hold until blinking red to deactivate.

3 Disconnect battery.

4 Power off controller.

For customer support, contact us at **help@3DR.com**
or call our support line at **+1 (858) 225-1414**
Monday through Friday, from 8 am to 5 pm, PST.

3DR.com/iris/info

I **UNITED STATES OF AMERICA** XI

DEPARTMENT OF TRANSPORTATION • FEDERAL AVIATION ADMINISTRATION

IV NAME

STEVEN EDWARD RAWLEY

V ADDRESS 18131 HOLLY GREEN DR
HOUSTON TX 77084-6711

VI NATIONALITY	SEX	HEIGHT	WEIGHT	HAIR	EYES
IVa D.O.B. 7 SEP 1964	M	73	240	BROWN	BLUE

IX HAS BEEN FOUND TO BE PROPERLY QUALIFIED TO EXERCISE THE PRIVILEGES OF

II PRIVATE PILOT

III CERTIFICATE NUMBER 3493341

X DATE OF ISSUE 24 MAR 2010

XIV

VIII ADMINISTRATOR

Texas

USA
TX

DRIVER LICENSE

4d DL 10184797 9 Class C

4a Iss 08/19/2014 4b Exp 09/07/2020

3 DOB 09/07/1964

1 RAWLEY

2 STEVEN EDWARD

8 12034 NORMONT DR
HOUSTON TX 77070

12 Restrictions NONE 9a End NONE

16 Hgt 6-01 15 Sex M 18 Eyes BLU

5 DD 812144000891298170 90

ACADEMY OF MODEL AERONAUTICS

2014 MEMBER expires: 12/31/2015

STEVEN E RAWLEY

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