IMPORTANT
Read before flying!

IRIS

Operation Manual

3D Robotics

Contents

Meet IRIS.

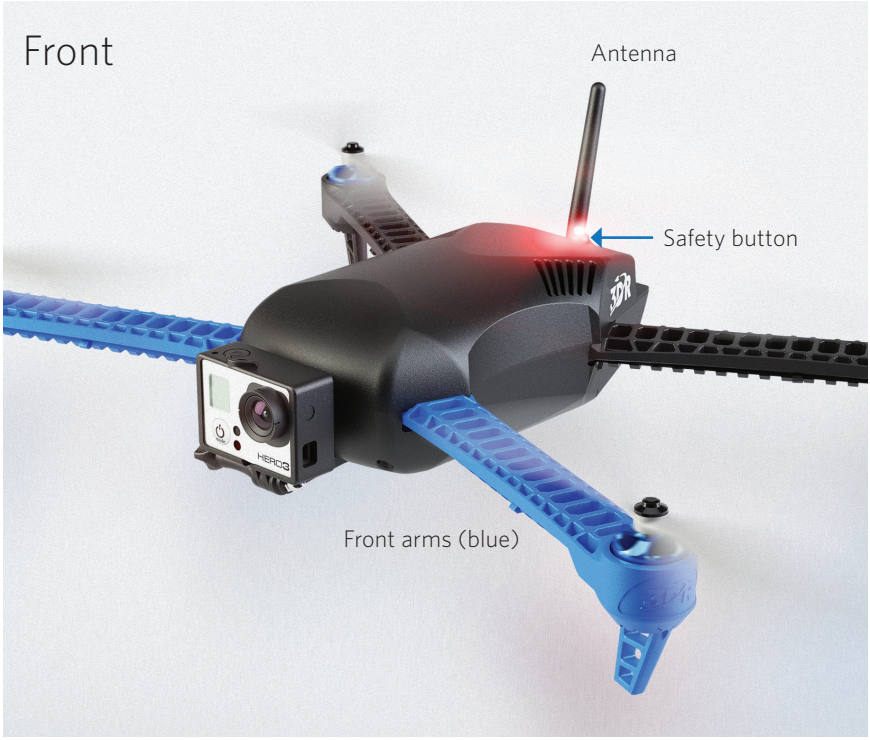
Thank you for purchasing IRIS.

IRIS is an autonomous quadcopter and 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.

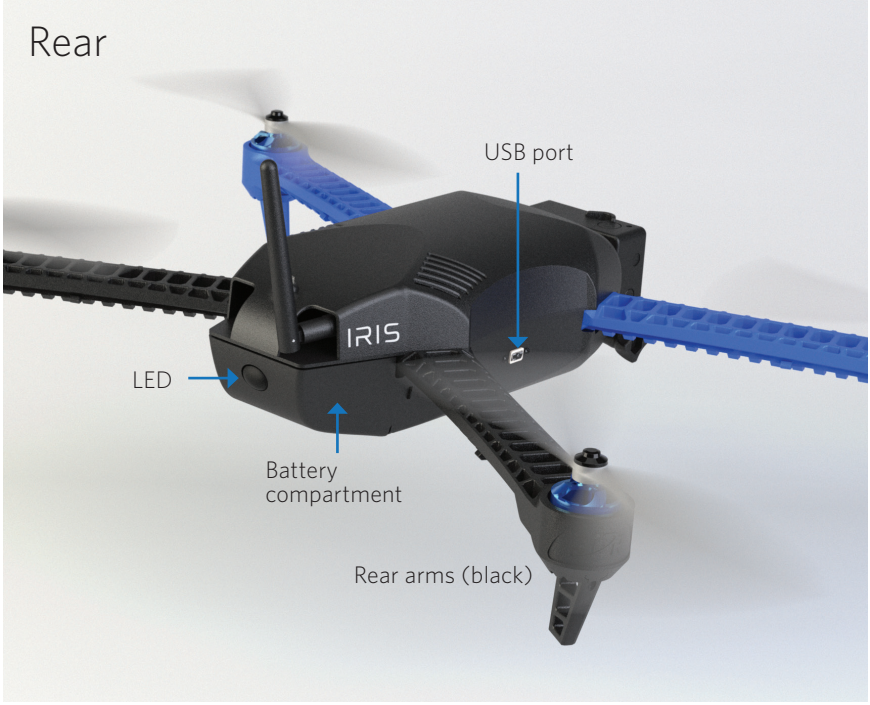
Happy flying!

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

Front



Rear



IRIS does not include the GoPro frame shown in these images.

Parts

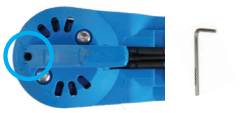
RC transmitter
Your direct link to IRIS

3DR Radio
With micro-USB and Android OTG ground station adapters

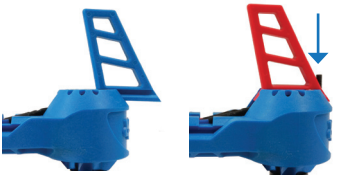
Battery kit
Power pack, charger, and guard bag

Tool kit
Wrench and small, medium, and large hex keys (1.5 mm, 2 mm, and 3 mm)

Red legs
For extra visibility (optional)



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



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

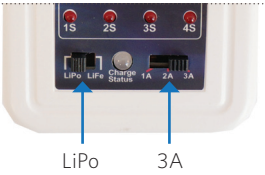
Charger

IRIS is powered by a rechargeable lithium polymer (LiPo) battery. Store 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 10 to 13 minutes of flight time.

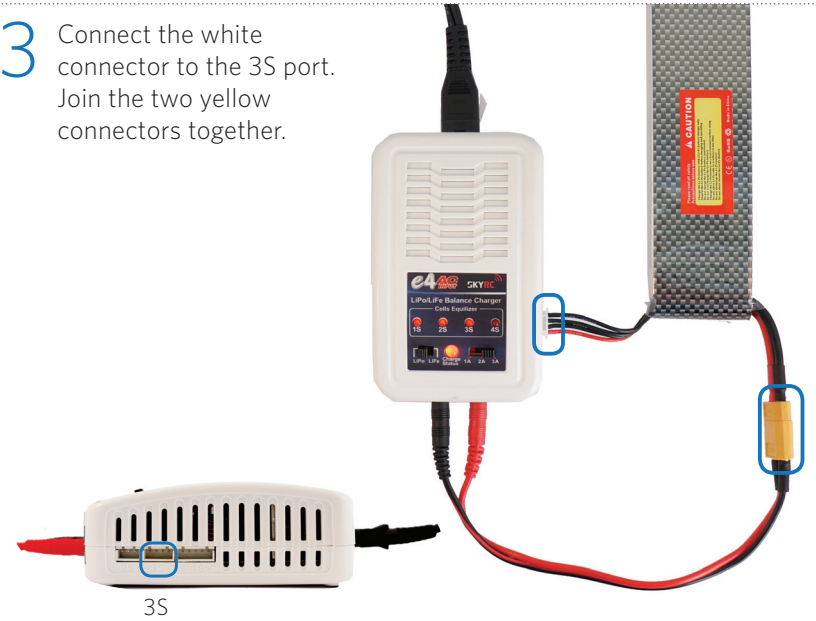
1 Connect charger to the power adapter cable and a wall outlet.

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

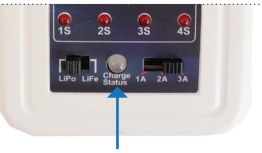
2 Set the charger to LiPo and 3A.



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

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

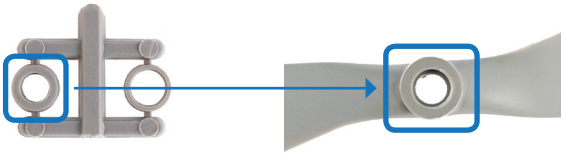
Flying with a low battery is a safety risk and can render the battery unusable. Always discontinue use when you receive a low battery notification, and always fly with a fully charged battery.

Inspect 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.

Propellers

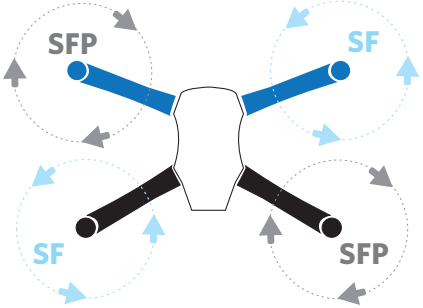
IRIS uses two SF and two SFP propellers. To attach, find the rings shown below inside the propeller package.

1 Select the ring with the smaller internal diameter and insert it into the back of the propeller hub.



2 Use the wrench to remove the nut and washer from the motor.

Add SFP propellers to the front-left and back-right motors and SF propellers to the front-right and back-left motors with the writing on the propellers facing up.



3 Place the washers over the propellers, and use the wrench to secure the nuts tightly on top. Always ensure that the propellers are fastened tightly to the motors before flying.

Learn to Fly

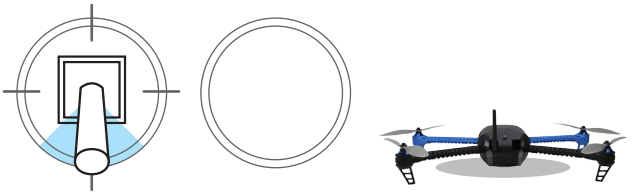
Control IRIS in flight using the transmitter's left and right sticks.

Throttle

Move the left stick forward and backward to control altitude and acceleration.

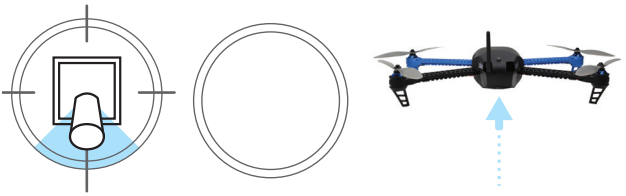
left stick

Before takeoff, set stick fully down.

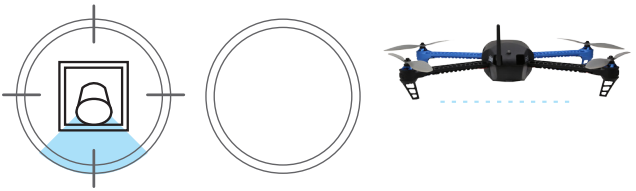


Take off by raising stick halfway to center.

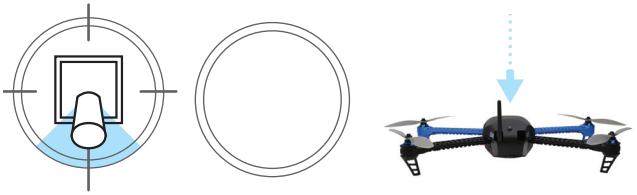
To increase altitude, raise stick slowly.



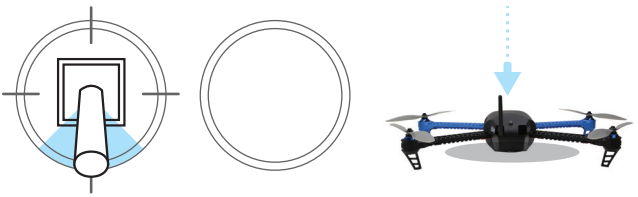
To maintain altitude, set stick to center position.



Lower stick to decrease altitude.



Land by setting stick fully down once IRIS is a few inches above the ground.

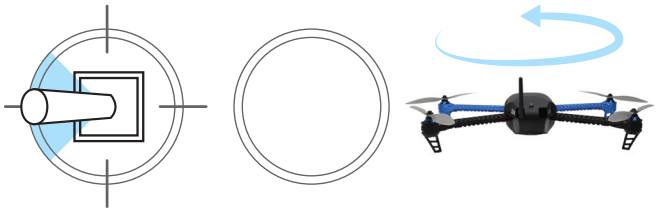


Yaw

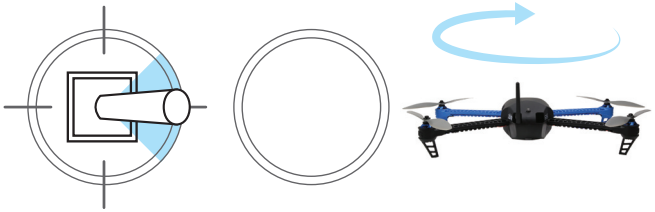
Move the left stick horizontally to rotate IRIS and change orientation. For a slow rotation, move the stick slightly away from the center in either direction. Moving the stick farther from the center creates a faster rotation.

left stick

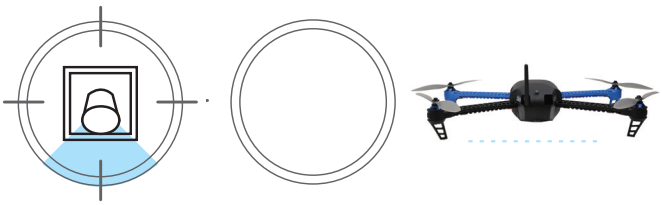
Move stick to the left to rotate counterclockwise.



Move stick to the right to rotate clockwise.



Release stick to stop rotating and maintain current orientation.



Flight Tip

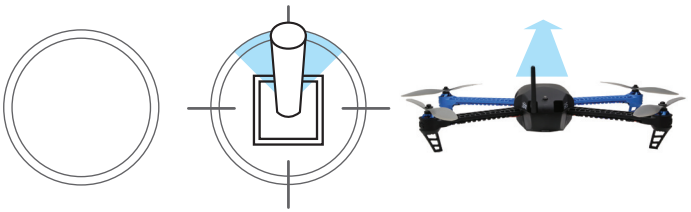
When adjusting orientation, move the left stick horizontally without changing its vertical position.

Pitch and Roll

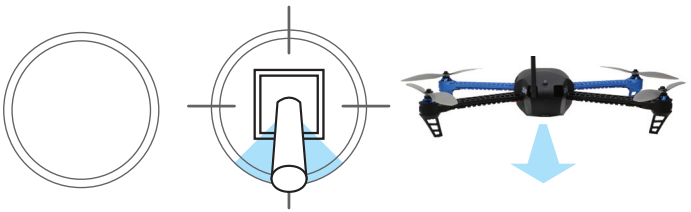
The right stick allows you to control IRIS' position in the air. Move the right stick to tell IRIS to move in that direction: forward (toward the blue arms), back (toward the black arms), left (toward the left arms), or right (towards the right arms). How far you move the stick from the center before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

right stick

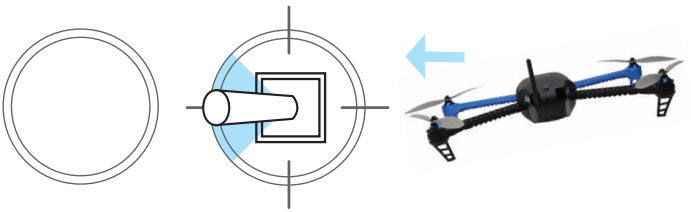
Move stick forward to fly forward.



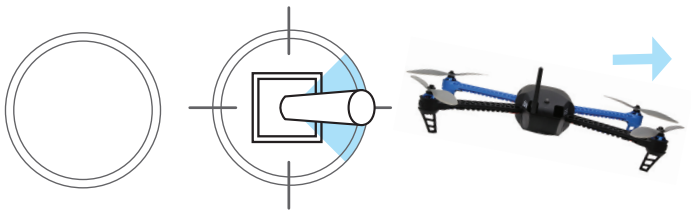
Move stick back to fly backward.



Move stick left to fly left.



Move stick right to fly right.

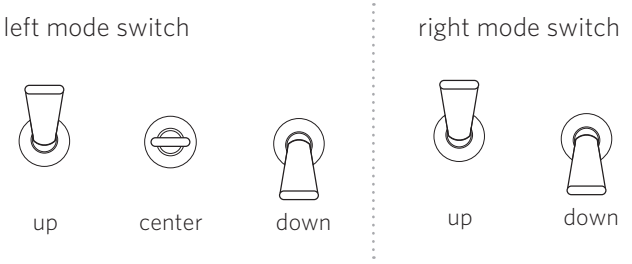


Flight Tip

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

Flight Modes

Use the two switches above the right stick to select a flight mode. Set the right switch in the up position to select the group of modes shown in white on the transmitter, or set the right switch in the down position to select the group of modes shown in blue. After selecting a group of modes using the right switch, set the left switch in the up, center, or down position to select a mode. Both switches must be set to the correct position to select a mode. In this manual, the position of the left switch is specified first, followed by the position of the right switch. For the example center/down, set the left switch to center and the right switch to down.



Flight 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 automatically landing if it detects an unsafe flying condition due to loss of RC signal, loss of GPS signal, or low battery. To avoid potential hazards due to environmental factors, identify the boundaries of your flying area before takeoff, and recover IRIS manually by switching into stabilize mode if it moves outside your designated flying area. If you observe any inconsistent behavior, land, and consult the troubleshooting guide at 3drobotics.com/iris/info.

Always use an RC transmitter as a primary or backup control system when flying. Ensure that the transmitter is turned on any time IRIS is powered. If contact with the transmitter is lost during flight, IRIS will land and display a blinking yellow light. If IRIS is more than 2 meters (6.5 feet) from the launch point, it will return to launch (RTL) before landing. (See page 19 for more information about RTL.)

Loss of RC signal 

Autopilot-positioned flight modes (loiter, autonomous, and return to launch) require an active GPS signal. If GPS signal is lost during flight, IRIS will land and display a blinking blue and yellow light with a high-high-high-low tone. Always choose an unobstructed flying area to improve signal strength.

Loss of GPS signal 

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

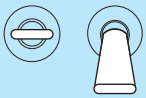
Low battery 

Altitude Hold Mode **(ALT)**

Allow IRIS' autopilot to help you fly by engaging altitude hold mode (ALT). This autopilot-assisted flight mode maintains altitude automatically. Set the left stick to center, and IRIS will hover at the current altitude. Adjust altitude and orientation with the left stick, and navigate with the right stick.

To select altitude hold mode, set the left mode switch to center and the right switch to down (center/down).

Altitude hold (ALT)
center/down



» Autopilot-assisted altitude control
» Great for new fliers

Once you feel comfortable flying in altitude hold, try out IRIS' other flight modes for GPS-positioned and autonomous flight.

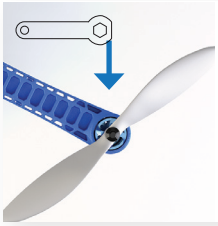
First Flight

Select an open area for flying, away from people and buildings, and remember to bring the Flight Checklist, wrench, 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.

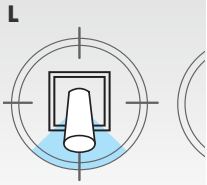
Preflight

1 Check IRIS.

Check that the IRIS and transmitter antennas are oriented vertically for the strongest signal.



Check that the propellers are tight. Use the wrench to tighten if necessary.



Check that the left stick on the transmitter is set fully down.

Altitude hold (ALT)

center/down

Set the switches to select a flight mode. For your first flight, select altitude hold mode (shown here).

2 Power on transmitter.

If the left stick is not fully down, the transmitter will display an alert message.

Ensure the transmitter is always turned on while IRIS is powered. If communication with the transmitter is lost, IRIS will initiate an automatic recovery landing.

3 Connect battery.

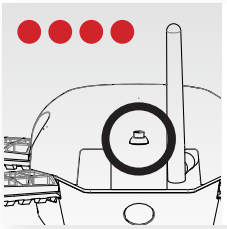
Press the sides of the battery compartment together and rotate the door down.

Insert battery and attach the yellow connectors. 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.

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

If you are using a ground station with IRIS, select Connect. For Mission Planner or APM Planner, select COM or USB and set the rate to 57600 before connecting. To learn about using a ground station in flight, visit 3drobotics.com/iris/info.

4 Press safety button.



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

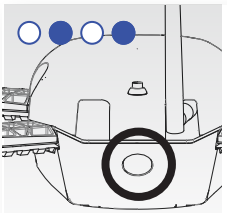
Stand back!

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 propellers.

Inactive, safe to handle

Active, deactivate before handling

5 Check LED.



Check the LED to view the status of IRIS. Wait to proceed until you see the blinking blue light indicating that you're ready to fly. If you plan to use loiter, RTL, or autonomous modes during your flight, please wait to see the blinking green light indicating that IRIS has acquired GPS lock.

Initializing, please wait.

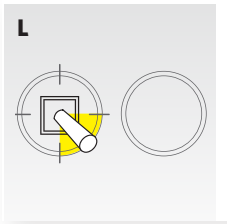
Autopilot ready, no GPS

Autopilot ready, GPS locked

Error, disconnect battery and restart flight procedure. See the troubleshooting guide at 3drobotics.com/iris/info.

RTL, loiter, and autonomous modes require GPS lock before takeoff. Do not initiate these modes during flight unless you observed a blinking green light prior to takeoff. IRIS may take a few minutes to acquire GPS lock depending on your flying location.

6 Arm motors.

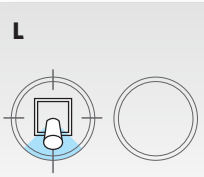


To activate the motors, hold the left stick down-right until the motors spin.

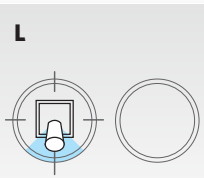
Now you're ready for takeoff!

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

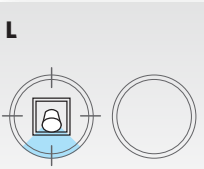
Flight



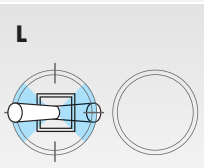
Take off by raising the left stick halfway to center.



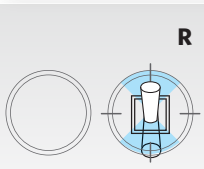
Gain altitude by raising the left stick.

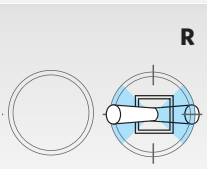


Hover by setting the left stick to center.

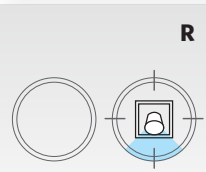


Rotate counter-clockwise and clockwise by moving the left stick left and right.

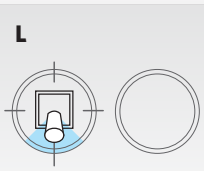




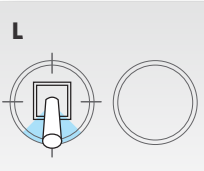
Fly forward, backward, left, or right by moving the right stick in the direction you want to fly.



Release the right stick to level IRIS.



Slowly lower the left stick to descend.

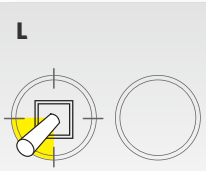


Set the left stick fully down to land once IRIS is a few inches above the ground.

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

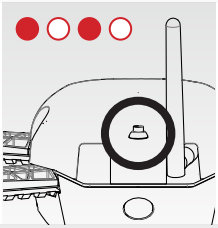
Postflight

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 transmitter.

Your first flight is now complete!

Refer to 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.

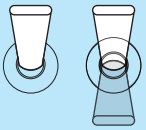
Skill 3: Figure Eight
When you can confidently navigate a box while maintaining altitude and orientation, try flying a figure-eight pattern. Once again, make sure to fly the figure eight in front of you and not around you. Use the right stick to create a smooth flight path while using the left stick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

Stabilize Mode **(STB)**

Stabilize mode (STB) is IRIS' most acrobatic flight setting. In stabilize, the autopilot provides basic stabilization while allowing full manual control of both sticks. In this mode, you'll need to make continuous, small adjustments to the left and right sticks to maintain a hovering altitude, navigate, and maintain orientation without autopilot assistance.

Select stabilize mode by setting both switches up. The transmitter has an additional setting (up-down) for stabilize mode to allow you to switch between modes without triggering a mission or return-to-launch command.

Stabilize (STB)
up-up
up-down



» Manual flight
» Acrobatic flying
» Recovery

Flying confidently in stabilize mode is required for flying your first mission.
To practice, try the exercises on page 17.

Loiter Mode **(LTR)**

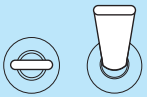
Loiter mode (LTR) uses GPS positioning to hold IRIS' current position and altitude automatically. Just release the sticks and IRIS will hover in place. Use the left stick to adjust altitude and orientation; use the right stick to navigate and change IRIS' position.

To select loiter mode, set the left switch to the center position and the right switch to the up position (center-up).

Loiter mode requires GPS lock (flashing green LED) prior to takeoff.

Loiter (LTR)
center-up

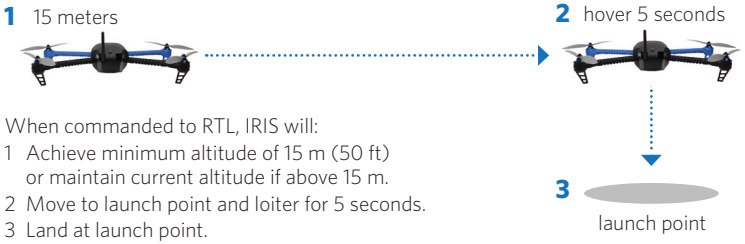
GPS required before takeoff



» Automatic positioning
» Easy flying

Return-to-Launch Mode **(RTL)**

To recall IRIS to the launch point during flight, execute a return-to-launch (RTL) command. RTL automatically returns IRIS to the launch point, and can be used any time you would like to land quickly. RTL requires GPS lock prior to takeoff.

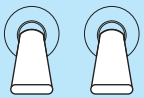


When commanded to RTL, IRIS will:
1 Achieve minimum altitude of 15 m (50 ft) or maintain current altitude if above 15 m.
2 Move to launch point and loiter for 5 seconds.
3 Land at launch point.

To RTL, set both switches to the down position (down-down). Ensure the launch point is clear to allow IRIS to land safely.

Return to launch (RTL)
down-down

GPS required before takeoff



» First, achieve altitude of 15 m
» Next, return to launch point
» Then, land

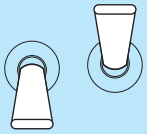
Autonomous Mode **(AUTO)** and Missions

Fly a fully autonomous mission using a computer or Android device as a ground station. When switched into autonomous (AUTO) mode, IRIS will automatically perform the mission and report data back to the ground station. For instructions on setting up your ground station, planning a mission, and saving it to IRIS, visit 3drobotics.com/iris/info.

Autonomous mode requires GPS lock (flashing green LED) prior to takeoff.

Autonomous (AUTO)
down-up

GPS required before takeoff



» Fly a planned mission
» Fully autonomous flight

Follow these steps to run a fully autonomous mission with automatic takeoff and landing. If your mission is not planned with an automatic takeoff and landing, fly to the location of your first waypoint before switching to autonomous mode.

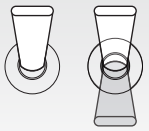
Missions

1 Perform a pre-mission test flight.

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

2 Arm in stabilize mode.

STB

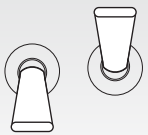


up-up

Set the switches to stabilize and follow the preflight steps shown on page 13 and the Flight Checklist. Wait to arm until you see the blinking green light.

3 Switch to autonomous mode (AUTO).

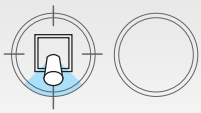
AUTO



down-up

With the motors armed, switch to AUTO by setting the left switch down and the right switch up.

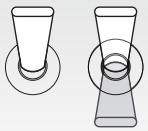
4 Raise the left stick slightly to initiate the mission.



IRIS will take off and begin the mission.

Use the ground station to view IRIS' status on the Flight Data screen. For more information about using a ground station, visit **3drobotics.com/iris/info**.

STB



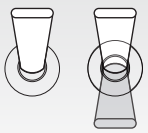
up-up

To recall IRIS during a mission, use the transmitter to switch to stabilize mode and land manually. Or switch to RTL, and automatically return to the launch point.

To avoid sudden changes in altitude when switching from autonomous mode to stabilize mode, ensure that the left stick is set to the center position.

5 Switch to stabilize mode before disarming.

STB



up-up

When the mission is complete and IRIS has landed, use the transmitter to switch to stabilize mode before disarming and proceeding with the postflight steps.

Specifications

Autopilot hardware:	Pixhawk
Firmware:	APM:Copter 3.1
GPS:	3DR uBlox GPS with Compass (LEA-6H module, 5 Hz update)
Telemetry radio:	3DR Radio Telemetry V2 (915 mHz or 433 mHz)
Motors:	850 kV
Frame type:	V
Propellers:	10 x 4.7 SF puller type, counterclockwise rotation (2) 10 x 4.7 SFP pusher type, clockwise rotation (2)
Battery:	3 cell 11.1 V 3.5 Ah lithium polymer
Low battery voltage:	10.5 V
Minimum voltage:	9.9 V 3 cell (13.2 V 4 cell)
Maximum voltage:	12.6 V 3 cell (16.8 V 4 cell)
Payload capacity:	425 g (.9 lbs)
Radio range:	1 km (.6 miles)
Flight time:	10-13 minutes

Resources

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

Happy flying!

Learn More

Visit **3drobotics.com/iris/info** to learn about:
- Opening the shell
- Replacing the arms and motors
- Connecting and calibrating an RC system
- 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@3drobotics.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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