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1 Meet Iris

Iris is an autonomous quadcopter and personal aerial video platform powered by open-source UAV hardware, software, and firmware.

Iris has powerful motors and high-speed propellers. Safety warnings like this one provide important information about best operating practices.

1 Front arms (blue)
2 Rear arms (black)
3 Propellers

1 Safety button
2 Battery compartment
1 Camera mount
2 LED indicator

1 Telemetry antenna
2 USB port
3 Propeller nuts
4 Legs
Propellers

Iris creates lift using two 10x4.7 pusher propellers (marked SFP or P) and two 10x4.7 puller propellers (marked SF or unmarked). Pusher propellers spin clockwise on the front-left and back-right motors; puller propellers spin counterclockwise on the front-right and back-left motors.

For clockwise rotation, use pusher propellers.

For counterclockwise rotation, use puller propellers.

To tighten or remove the propellers, rotate the propeller nut using the provided wrench. Always attach propellers with writing facing up and the washer between the propeller and the nut.
Battery

Iris is powered by a rechargeable lithium polymer (LiPo) battery.

1. Charger connector (JST-XH)
2. Iris connector (XT60)

Connecting the battery to Iris

1. Press the sides together, and rotate the door down.
2. Insert battery into compartment, and connect the yellow XT60 connectors. To close, squeeze the door, and rotate up until it clicks into place.
Charger

Store your battery at half charge then charge completely the day before flying. Batteries also ship at half charge, so please charge the battery completely before your first flight. Each full battery provides between 10 and 13 minutes of flight time.

1. Connect charger to power adapter and wall outlet.
2. Connect battery to the three-pin charger connector.
3. Secure battery inside safety bag.
4. Charge until the three LED indicators appear green.

1  Connect charger to power adapter and wall outlet.
2  Connect battery to the three-pin charger connector.
3  Secure battery inside safety bag.
4  Charge until the three LED indicators appear green.
Safety

Flying

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 your local regulations.

Always follow the correct takeoff and landing procedures as described by this manual and the flight checklist.

Always use an RC transmitter as a primary or backup control system when flying Iris.

Battery

The primary potential hazard for a LiPo is combustion. The safety bag will contain a lithium fire if it occurs, so always transport, charge, and store your battery in a safety bag.

Protect battery from extreme heat, extreme cold, puncturing, and flammable surfaces.

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 upon receiving 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, dispose of the battery.

Battery Disposal

If you observe any swelling or the battery ceases to function, please locate your local battery recycling center to dispose of the battery. In the US and Canada, visit call2recycle.org to find a location near you.
2 Radio Control

Iris can be controlled using only an RC transmitter or through a combination of RC and a laptop or tablet ground station.

To connect your own RC equipment to Iris, please follow the instructions for opening the shell, installing Mission Planner, connecting an RC receiver, and performing RC calibration.

The stick configuration shown above is known as mode 2. These instructions will continue for this mode, so if you plan to use mode 1 on your transmitter (throttle on the right stick), please adjust accordingly.
The combination of the group and mode switches creates six available mode positions. Cut out the mode sticker to attach to your transmitter.

- **Stabilize**: forward / forward
- **Stabilize**: forward / back
- **Loiter**: center / forward
- **Altitude hold**: center / back
- **Full autonomy**: back / forward
- **Return to launch**: back / back
Mission Planner

Mission Planner is an open-source ground station for the APM autopilot platform. Connect Iris to a laptop using Mission Planner and the telemetry radio ground module to view data and execute commands in flight.

See the install software section (page 24) to download Mission Planner for Windows or APM Planner for Mac and Linux. APM Planner is a developing version of Mission Planner for all three platforms; instructions for Mission Planner can also be used for APM Planner.

Connect to Mission Planner

1. Connect the telemetry radio to your laptop’s USB port.
2. Connect battery to Iris.
3. After drivers automatically install, select the available COM port, set the baud rate to 57600, select ArduCopter (if offered), and select Connect.
Mission Planner Flight Data: Attitude

1. Heading direction
2. Bank angle
3. Altitude (black) and rate of climb (blue bar)
4. Ground speed

Actions

1. Change waypoints or restart a mission
2. Change modes
3. Change altitude
Status

1. Telemetry signal
2. GPS time
3. Currently enabled mode
4. Distance to current waypoint > current waypoint number
5. GPS status
6. Battery status

Flight Map

1. Current heading
2. Direct path to current waypoint
3. GPS-reported direction of travel
4. Actual flight path
5. Latitude & longitude
6. Altitude
Using a Tablet

View in-flight data from your Android tablet! This exciting functionality is available using the Andropilot and DroidPlanner apps, developed by the open-source community for the APM autopilot platform. The provided Android tablet adapter cable and telemetry radio ground module allow you to connect Iris to Andropilot or DroidPlanner and access many of the same features found in Mission Planner as well as some features unique to tablets. Visit the Google Play store to download the apps and view a list of compatible devices.

Tablet ground station apps are under development for supplemental flight control. The primary control method for Iris is an RC transmitter.

Connecting to a tablet

1. Connect the colored end of the Android adapter to your tablet.
2. Connect the black end of the adapter to the telemetry radio ground module.
3 Takeoff & Landing

When selecting a flying location, choose an area away from buildings and spectators where Iris does not pose a risk to bystanders and will not be flying over people. Remember to bring a fully charged battery, a wrench for tightening propellers, and the flight checklist.

Preflight Preparation

Ensure the propellers are tight and your camera is secured to the mount. Place Iris in a designated launching location before takeoff with the blue front arms facing away from you. This is known as the home position and will be stored by the autopilot as the location Iris will return to when executing a return-to-launch command, so ensure that the home position is free of obstructions and can provide a clear landing path. Do not use your staging area as the home position.

Control

Turn on your RC transmitter with the throttle stick set down. For manual takeoff, set the transmitter to stabilize mode (both switches forward). For assisted takeoff, set the transmitter to loiter (mode switch center, group switch forward) or altitude hold (mode switch center, group switch back). Turn on your ground control application, and connect the telemetry radio to your laptop or tablet.

System Start

Connect the battery to Iris, and close the battery door. Check the status of the safety button to receive system permission to arm. When the button blinks slowly, press it for one second or until it goes solid. Select connect on your ground station laptop or tablet.

Safety Button Meanings

- Fast blinking: performing system check. Please wait.
- Slow blinking: system ready. Press the safety button.
- Solid: ready to arm. Proceed to the arming procedure.
Arming

The LED on the bottom side of the battery compartment indicates the status of Iris when powered.

- Flashing red and blue: initializing. Please wait.
- Double flashing yellow: error. System refuses to arm. If error persists, see troubleshooting for more instructions.
- Flashing blue: disarmed, searching for GPS. Full autonomy, loiter, and return-to-launch modes require GPS lock.
- Flashing green + quick double tone: disarmed, GPS lock acquired. Ready to arm.

To arm Iris, hold the transmitter’s left stick throttle down and yaw right (bottom-right corner) for 2 seconds.

- Solid green + single long tone: armed with GPS lock. Ready to fly!
Iris will spin its propellers at a low speed when armed! Ensure Iris is properly situated at its launch point and clear of obstructions before arming.

Apply a small throttle input to takeoff. Iris is sensitive to control inputs, so use small stick movements when flying.

Landing

After landing, set throttle down and disarm Iris by holding the left stick to throttle down and yaw left (bottom-left corner) for 2 seconds.

To disarm

Left stick

Press the safety button for one second or until it flashes, indicating successful disarming.

After disarming, disconnect the battery then turn off the RC transmitter.
Flying Manually

Stabilize (STB) is Iris’ manual flight mode. Fly using the four controls: throttle, yaw, pitch, and roll.

Throttle **Left stick** 🔺
Sends power to the motors creating lift. Controls speed and altitude.

Yaw **Left stick** ↔
Swivels Iris left and right. Changes the direction Iris is facing and a mounted camera is pointing.

Pitch **Right stick** 🔼
Controls the forward and back angle of Iris. Pitching forward tilts the front arms down and moves Iris forward; pitching back lowers the back arms and moves Iris back.

Roll **Right stick** ↔
Moves Iris horizontally through the air. Rolling left banks Iris left by raising the right arms; rolling right banks right by raising the left arms.

Stabilize is the recommended mode for takeoff and landing.

Switch positions

**Stabilize**

forward / forward

**Stabilize**

forward / back
Assisted Flight

Altitude hold and loiter modes allow the autopilot to regulate Iris’ flight behavior, providing cruise-control flying. Assisted flight makes it easy to capture aerial video sequences with simplified control and automatic positioning.

Altitude holding

Altitude hold mode (ALT) maintains Iris at a consistent altitude while allowing manual control of yaw, pitch, and roll. Use throttle to adjust the altitude while flying in ALT.

To switch to altitude hold from stabilize mode

1. Hover Iris in STB with throttle at mid-stick.
2. Switch into ALT.
3. Control yaw, roll, and pitch normally.
4. Use the throttle stick to make adjustments to the altitude.
5. Bring throttle to mid-stick before switching out of ALT.

Altitude hold is supported for takeoff and landing.

Switch position

Altitude hold

[Image of control stick with altitude hold settings]
Loitering

Loiter mode (LTR) commands Iris to hold its current longitude, latitude, and altitude using GPS positioning. Use roll and pitch to make changes to Iris’ position, use throttle to adjust altitude, and use yaw to aim a mounted camera. LTR is the easiest way to fly.

Loiter mode is supported for takeoff and landing.

To switch into loiter from stabilize mode

1. Hover Iris in STB with throttle at mid-stick.
2. Switch into LTR.
3. Use controls to make small adjustments to Iris’ position.
4. Bring throttle to mid-stick before switching out of LTR.

Switch position

Loiter

center / forward
Full Autonomy

Engage the autopilot’s navigation control and fly using a series of waypoint commands. When switched into full autonomy (AUTO) mode, Iris executes the mission stored on the autopilot and heads for the first scripted waypoint.

Waypoints are GPS-positioned points in 3D space with a latitude, longitude, altitude, and radius. A waypoint can be a simple navigation command (go here), or it can include a command to takeoff, land, loiter (for a designated time period, number of turns, or indefinitely), or execute an RTL. Plan, save, and write waypoints by connecting Iris to Mission Planner using the telemetry radio.

Auto mode can be engaged for takeoff and landing if takeoff and land waypoints have been scripted into the mission. For more information on using Mission Planner for configuring full autonomy, visit the online documentation at planner.ardupilot.com.

Switch position

Full autonomy

back / forward
To pre-configure waypoints in Mission Planner’s Flight Plan screen

1. Click to select your waypoints on the map, and drag to arrange. Or right-click, draw a shape of polygon points, and select an Auto WP option to generate waypoints automatically.
2. Configure the altitude, radius, and commands for each waypoint.
3. Select Write WPs to save your mission to Iris.

To command waypoints in flight using the Flight Data map

In Mission Planner, right-click on the point on the flight data map where you would like to create a waypoint, and select Fly to Here to create a guiding waypoint at the current altitude or Fly to Here Alt to select a new altitude for your guided waypoint.

Fly to Here creates a waypoint at the current altitude and immediately sends Iris there. If you select Fly to Here Alt, Mission Planner will prompt you for an altitude (in meters) before sending Iris to that point.
Return to launch

Return to launch (RTL) mode commands Iris to return to the home position. Try RTL when you’re ready to end your flight or to recall Iris on demand.

When commanded to RTL, Iris will

1. Achieve minimum altitude of 15 meters (50 feet) or maintain current altitude if above 15 m.
2. Move to the home position. Loiter for 5 seconds.
3. Land at the home position.

RTL mode is not approved for takeoff.

Switch position

Return to launch

back / back
Low Battery

Mission Planner will issue a low battery announcement when the battery reaches the low voltage limit of 10.5 volts. When you receive the low battery warning, safety land Iris or execute an RTL command.

Warning! Battery at 10.5 volts.

Do not continue to fly after receiving the low battery warning, it could cause inconsistent flight reactions and damage the battery.
4 Opening the Shell

1 Place Iris upside down, open the battery door, and remove the inside screw using the regular Allen key.
2 Remove the two deep-set screws on either side of camera mount.
3 Holding the body together, flip Iris over and open top shell.
Install Software

Download Mission Planner (Windows)
Ardupilot.com ➔ Downloads ➔ Mission Planner

Mission Planner « Downloads
Sort by: Title | Hits | Date
- MissionPlanner - MSI - Latest

Select latest MSI to download the most recent version.

Download APM Planner (Mac & Linux)
Ardupilot.com ➔ Downloads ➔ APM Planner 2.0

APM Planner 2.0 « Downloads
Sort by: Title | Hits | Date
- APMPlanner - RPM - Latest
- APMPlanner - DMG - Latest

Select DMG for Mac and RPM for Linux.

After selecting the correct file, read the safety information on the following page and select Download.

Open the file to run the setup wizard. Proceed through any security warnings, and install all suggested drivers.

Please always run the most recent version of Mission Planner and APM Planner.
Connecting an RC Receiver

Iris supports only PPM-compatible receivers.

To connect your own RC receiver to Iris

1. Open the top shell. (Instructions on page 23)
2. Connect the PPM encoder to Pixhawk’s RC pins using the red, black, and white three-wire cable.
3. Connect your receiver’s channel pins to the PPM encoder.

ground (−)     black wire
power (+)      red wire
signal (s)     white wire
RC Calibration

After connecting your own RC receiver to Iris, you will need to complete transmitter calibration and flight mode setup using either Mission Planner or APM Planner. If you opted to receive an RC transmitter with Iris, this process has already been done for you.

1. Connect the battery to Iris, and connect Iris’ USB port to your ground station computer. Turn on your RC transmitter.

2. Open Mission Planner or APM Planner. Select the communication port that displays PX4, set the Baud rate to 115200, select ArduCopter (if offered), and select Connect.

3. Select Initial Setup → Mandatory Hardware → Radio Calibration

Select Calibrate Radio.
On your transmitter, move both sticks and all mode switches to their extreme positions so the red bars register the limits of each input. We recommend moving the sticks in the largest possible circle. Once the red lines show the limits for roll, pitch, throttle, yaw, and any mode switches, select **Click when Done**.

Correct calibration values are between 800 - 1200 for the low limits and 1800 - 2200 for the high limits.

4 Select **Config/Tuning** → **Flight Modes**

The currently selected position will display in the list with green highlighting. Set the flight modes as shown below. Select **Save Modes** to apply.

| Flight Mode 1 | Stabilize |
| Flight Mode 2 | AltHold |
| Flight Mode 3 | RTL |
| Flight Mode 4 | Stabilize |
| Flight Mode 5 | Loiter |
| Flight Mode 6 | Auto |

1 STB
2 ALT
3 RTL
4 STB
5 LTR
6 AUTO
Updating the Firmware

Firmware updates keep Iris in sync with the latest developments and help improve flight performance. Update Iris’ firmware using Mission Planner or APM Planner on your ground station computer.

1. Connect Iris to your ground station computer using the micro USB cable.
2. Select Initial Setup, Install Firmware, Beta Firmware.

Mission Planner must show that Iris is disconnected to load firmware.
3 Select ArduCopter v3.1 rc Quad, and follow Mission Planner’s instructions to install the firmware.

4 Power cycle Iris by disconnecting and reconnecting the USB. Listen for the tone! If you hear a musical tone only, the update is complete. If you hear a tone sequence followed by three beeps, perform step 5 to complete the firmware update.

5 (Optional) Disconnect the USB. Press and hold the safety button while reconnecting the USB. You will hear several tone sequences followed by two beeps. This indicates your firmware has updated successfully.
Replacing the Legs

1 Use the small Allen key to remove the set screw in the bottom of the leg.
2 Slide out the leg to remove it, and replace with the new leg.
3 Replace set screw until it secures the leg but not so that it is screwed completely into the arm where it could interfere with the motor.
5 Support

For customer support, contact us as help@3drobotics.com or call our support line at +1 (858) 225-1414.

For more information about flight modes, further instructions, and configuration tutorials, visit the APM:Copter community documentation project at copter.ardupilot.com.

APM:Copter is a highly flexible autopilot platform. Many aspects of Iris’ flight programming (yaw behavior during autonomous flight, descent speed during RTL, etc) can be configured in the standard and advanced parameter screens in Mission Planner. Visit the online documentation to learn more about configuring parameters.

For more instructions on using Mission Planner and APM Planner ground station applications, visit planner.ardupilot.com.

Troubleshooting

I am receiving a persistent error indication when arming.

See Mission Planner for the specific error in the pre-arm safety check and visit copter.ardupilot.com/wiki/prearm_safety_check for instructions.

I am having trouble taking off or hovering, or my transmitter’s throttle stick isn’t functioning properly.

Perform the throttle-mid configuration procedure described at copter.ardupilot.com/wiki/ac_throttlemid.

My transmitter doesn’t have six available switch positions.

Consult your transmitter’s documentation for mixing two three-position switches into six position options. For more information, visit copter.ardupilot.com/wiki/common-six-modes.

I cannot update the firmware.

Make sure you have installed the latest Mission Planner MSI file from ardupilot.com.
### Parts

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<table>
<thead>
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<tbody>
<tr>
<td>1</td>
<td>Iris quadcopter</td>
</tr>
<tr>
<td>2</td>
<td>Micro USB cable</td>
</tr>
<tr>
<td>3</td>
<td>Android adapter cable</td>
</tr>
<tr>
<td>4</td>
<td>Small 1.5 mm Allen key</td>
</tr>
<tr>
<td>5</td>
<td>Regular 2 mm Allen key</td>
</tr>
<tr>
<td>6</td>
<td>Large 3 mm Allen key</td>
</tr>
<tr>
<td>7</td>
<td>Propeller wrench</td>
</tr>
<tr>
<td>8</td>
<td>Telemetry radio ground module</td>
</tr>
<tr>
<td>9</td>
<td>Flight checklist</td>
</tr>
<tr>
<td>10</td>
<td>Battery kit</td>
</tr>
<tr>
<td>11</td>
<td>Red legs (2)</td>
</tr>
<tr>
<td>12</td>
<td>Transmitter mode sticker</td>
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</tbody>
</table>

### Optional Parts

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<table>
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<tbody>
<tr>
<td>1</td>
<td>Radio control transmitter</td>
</tr>
<tr>
<td>2</td>
<td>PPM encoder module</td>
</tr>
<tr>
<td>3</td>
<td>Three-wire PPM encoder cable</td>
</tr>
</tbody>
</table>
Specs

Iris Developer Edition

Autopilot hardware: Pixhawk
Firmware: APM:Copter 3.1.1 SB 3.1-RC 1
GPS: 3DR uBlox GPS with Compass (LEA-6H module, 5 Hz update)
Telemetry radio: 3DR Radio Telemetry (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 warning 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)
Recommended voltage: 12.6 V 3 cell

Payload capacity: 400 g (.8 lbs)
Telemetry range: 1 km (.6 miles)
Flight time: 10-13 minutes

Online resources:
Hardware documentation     3drobotics.com/iris
Firmware documentation      ardupilot.com
Software documentation      planner.ardupilot.com
3DR Store                    store.3drobotics.com
Community                    diydrones.com

Thank you for purchasing a developer edition of Iris. Happy flying!

Iris Operation Manual V2
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