



LITCHI for iOS

Litchi is a mission planning program for the DJI Phantom 3 Advanced & Professional and the Inspire 1. It allows the pre-flight creation of Missions made up of Waypoints and Points of Interest. Several parameters can be assigned to entire missions, while others can be assigned individually to waypoints. Camera moves such as lens aiming point, video recording start/stop, or shooting a photograph or panorama can be pre-programmed for individual waypoints within the mission. In addition, Litchi allows the pre-flight creation of planned Orbits around a point of interest.

Litchi for iOS requires the use of the DJI GO App to set up camera features (format, exposure, white balance etc.) Ground Station features in the DJI GO app, however, are limited in that they must be employed in real time during flight. Litchi, on the other hand, can be used to pre-program missions *prior* to flight. Since options for waypoints and flight to and among them are numerous, the ability to pre-plan a mission without time constraints is extremely helpful.

Unless aborted by the pilot, Litchi missions are autonomous and will continue through completion even if the remote controller signal is lost.

Typical Litchi for iOS Display

The screenshot displays the Litchi for iOS app interface. The top status bar shows various indicators: RC BATTERY (20%), FLIGHT MODE/STATUS (F-GPS), FLIGHT BATTERY (99%), PROGRAM SETTINGS (100%), and SATELLITE COUNT (52%). The main map area shows a mission plan with 10 numbered waypoints (1-10) and a yellow flight path. The map is labeled with 'Northfield Park' and 'Tipps Canine Hollow Dog Park'. The bottom status bar shows 'Distance 4514ft | Time 6min', 'Alt 0.0ft', 'D 2.2ft', and 'Speed 0mph'. The bottom right corner shows 'Google' and '©2016 Google'. The bottom left corner shows 'LOAD MISSION', 'SAVE MISSION', 'MISSION SETTINGS', and 'START / PAUSE A MISSION'. The bottom right corner shows 'ZOOM TO MOBILE DEVICE'. The top right corner shows 'ADD POINT OF INTEREST', 'MISSION DRAWING TOOL', and 'CLEAR ALL'. The top left corner shows 'FLIGHT MODE & RECORD SCREEN'.

Labels pointing to the interface elements:

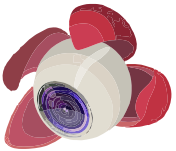
- RC BATTERY
- FLIGHT MODE/STATUS
- FLIGHT BATTERY
- PROGRAM SETTINGS
- SATELLITE COUNT
- FLIGHT MODE & RECORD SCREEN
- LOAD MISSION
- SAVE MISSION
- MISSION SETTINGS
- START / PAUSE A MISSION
- ADD POINT OF INTEREST
- MISSION DRAWING TOOL
- CLEAR ALL
- ZOOM TO MOBILE DEVICE
- MISSION INFO

General Settings



Program Settings

The cog wheel icon in the upper right of the Litchi display window allows adjustment of several program settings such as Units (Imperial or metric), Map Type (Standard, Satellite, Hybrid), Go Home Altitude (in meters), Auto Record, and others. If Auto Record is selected "On", video recording will begin automatically upon takeoff and end automatically upon motor shut down after landing.



Flight Mode & Screen Record

Touch the Litchi logo in the upper left of the display window to toggle a drop-down menu where you can select one of two Litchi modes, "Waypoint" or "Orbit". The Waypoint mode allows you to create missions consisting of waypoints and points of interest and to fly those missions or save them for later. The Orbit mode allows you to select a point of interest and establish an orbit around that point for your aircraft to fly.

The drop-down menu also allows you to log into the Litchi Mission Hub internet site (go to <https://flylitchi.com/hub#> to learn more).

Finally, the menu allows you to record a video of your mobile device display as you prepare and fly missions. Press "Start Screen Recording", then select "Record Screen & Mic" or "Record Screen Only". Stop the recording by pressing the Litchi logo again and selecting "Stop Screen Recording". You can review your video from within Litchi or press "Save" in the upper right corner of your screen. You can view your saved Litchi recordings in the iOS "Photos" app, in the "Camera Roll" folder.

Waypoint Mode Settings



Mission Settings

Mission Settings apply to an entire mission and are saved with that mission. They affect aircraft activity at and between waypoints, and after the last waypoint has been reached.

Heading: Defines the heading of the aircraft during the mission. Choose between "**Auto**" where the aircraft will point toward the next waypoint (i.e. point forward along the route), "**Initial**" where the aircraft will maintain the heading it had when the mission was started, "**Manual**" where you are able to control the heading of the aircraft during the mission using the left joystick left/right (mode 2) or "**Custom**" where the aircraft will use the heading you have defined for each waypoint. Using "**Custom**" also means that the aircraft will smoothly transition from one waypoint heading to the next.

Finish Action: Choose an action that the aircraft will perform upon arrival at the last waypoint. Available choices are **"None"**, **"RTH"** (Return to Home), **"Land"**, **"Back to 1"** (back to the first waypoint), and **"Reverse"** (fly back along the same route).

Path Mode: Choose between **"Straight Lines"** where the aircraft will go straight to each waypoint then turn, or **"Curved Turns"** where the aircraft will make smooth curved turns around, but not directly over, waypoints.

Cruising Speed: Defines the autonomous flight speed of the aircraft during the mission. This speed can be overridden during a mission by using the right joystick (mode 2). The Cruising Speed can be set to negative values if you want the aircraft to travel backwards autonomously.

Remote Controller Speed: This is the maximum speed that can be commanded from the remote controller during a mission when the right joystick (mode 2) is used to *override* the autonomous Cruising Speed. The Remote Controller Speed should normally be set to a value that is higher than the Cruising Speed.

Default Curve Size: Entered as a percentage of the minimum length available on either side of a new waypoint. Larger numbers result in smoother wider curves. Curve size can also be individually adjusted at each waypoint (addressed in Waypoint Settings below).

Default Gimbal Pitch Mode: Default Gimbal Pitch Mode is applied to newly added waypoints. This default mode can be changed in individual Waypoint Settings, addressed below. You can select **Disabled**, which allows the remote controller to control pitch, **Focus POI**, which automatically pitches to center the waypoint's target POI in the view, or **Interpolate**, which allows pitch to be individually specified for each waypoint and which results in smooth pitch transitions between successive waypoints with specified pitch settings.

Rotations Direction: When set to Managed, aircraft heading changes from waypoint to waypoint will always use the shortest direction (clockwise/anticlockwise).

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Waypoints

To add a waypoint, tap anywhere on the map (make sure that the POI toggle is not on - see Points of Interest below). You can add up to 99 waypoints. Waypoint symbols include the waypoint Number (1-99) and the programmed altitude at that waypoint.

To view or adjust waypoint settings, tap the waypoint itself. To drag a waypoint, do a long press on the waypoint, then move it around.

To delete a waypoint, tap the waypoint to open its settings, then tap the trash icon at the top left corner of the waypoint settings window.

Waypoint Settings

Each waypoint can be assigned individual parameters which will be saved with the Mission. Tap the waypoint to open the Waypoint Settings dialog.

Altitude: Waypoint altitude relative to the elevation of the aircraft where it took off.

Curve Size: Defines the size of the curved turn at this waypoint. A bigger size means the aircraft will start the turn earlier while traveling to this waypoint. *The Curve Size setting is ignored unless the "Path Mode" is set to "Curved Turns" in Mission Settings.* Curve Size does not apply to the first or last waypoint as there are no turns at these waypoints. The path of the curve is drawn in turquoise on the map. It will update dynamically as you adjust the curve size setting.

Heading: The heading of the aircraft as it passes a waypoint. The programmed heading at each waypoint is displayed at that waypoint by the blue aircraft icon on the map display and in the Waypoint Settings associated with that waypoint (tap on the waypoint icon). You can adjust a waypoint's heading only if "Custom" is selected in Mission Settings. Otherwise, the heading parameter will be grayed out. Heading adjustments you make will be retained *even* if you go back to Mission Settings and select a mode other than "Custom" (with the single exception of "Auto", which overrides headings entered for all except the *final* waypoint).

Rotation: When two consecutive waypoints have different headings, the aircraft will smoothly rotate from the first heading to the next. This setting defines the direction in which the aircraft will rotate, clockwise or anti-clockwise. If "Managed" was set in Mission Settings, the aircraft will always turn the shortest way to the new direction. In this case, Rotation settings are unavailable (greyed out).

Point of Interest: If you have created one or more Points of Interest, you can select which POI will be the focus as the aircraft passes a waypoint. You can also select "None".

Gimbal Pitch Mode: Choose from among "**Disabled**" where the gimbal pitch control will be manual from the remote controller, "**Focus POI**" where Litchi will automatically control the gimbal pitch to keep the target POI for that waypoint in the center of the frame, or "**Interpolate**" where you can specify the gimbal pitch angle at this waypoint. For "Interpolate" to work, at least one neighboring waypoint needs to be set to "Interpolate" as well. Litchi will then automatically adjust the gimbal pitch angle to start and end at the specified angles and smoothly transition while traveling between the two waypoints.

Gimbal Pitch Angle: If "Focus POI" is set for the Gimbal Pitch Mode, the appropriate gimbal pitch angle for the target POI is calculated and displayed but cannot be adjusted. If "Interpolate" is selected for the Gimbal Pitch Mode, you can adjust the Gimbal Pitch Angle as desired. If "Disabled" is selected for the Gimbal Pitch Mode, the Gimbal Pitch Angle is irrelevant (as it will be controlled from the R/C controller) and is not displayed.

Actions: Each waypoint can have up to 15 different actions (more details below).

Waypoint Actions (Disabled with curved turns)

Waypoint Actions are performed when the aircraft arrives at a waypoint for which you have programmed Actions. There are six different Waypoint Actions, three of which accept an additional parameter. You can add up to 15 different Actions for each waypoint.

Waypoint *Actions* are IGNORED if “Curved Turns” is selected in Mission Settings. This is because the aircraft curves *around* waypoints, never actually arriving directly *at* them, so Waypoint Actions associated with a waypoint are never initiated. If you have difficulty getting programmed Waypoint Actions to work, make sure you have selected “Straight Lines”, not “Curved turns” in Mission Settings.

Stay for: The time in seconds that the aircraft will pause at the waypoint.

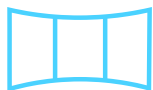
Take Photo: The camera will take a picture. This Action requires video recording to be off.

Start Recording: The camera will start video recording.

Stop Recording: The camera will stop video recording.

Rotate Aircraft: The aircraft will rotate to the specified heading (0° is North, 90° is East, 180° is South, 270° is West). For example, setting it to 135° will command the aircraft to rotate to point Southeast.

Tilt Camera: The gimbal will move to the specified angle (tilt). The valid value range is 0° (straight ahead) to -90° (straight down).



Panorama Preset: A tap on the small blue Panorama icon next to the Action settings of each waypoint will automatically add the 14 necessary Actions for a full 360° panorama made up of 7 photos (51° angle variation). The resulting 7 images will need to be combined later into one single panorama using a computer program such as Photoshop.

Ensure that the aircraft is not recording video when it arrives at a waypoint for a panorama because on Litchi Missions, still photos cannot be taken while video is being recorded. If you selected Auto Record in Litchi Settings, or if you initiated video recording manually, your aircraft may be recording video and you will need to stop recording prior to a panorama waypoint. Because a Panorama requires a series of 14 preset Actions to be inserted and the maximum number of preset Actions allowed at any waypoint is 15, it is not possible to add a Stop Recording command, a Panorama Preset series, and then a Start Recording command at any one single waypoint (too many commands). You may wish to consider adding a waypoint immediately prior to the panorama waypoint (where you can insert a stop video recording command) and another immediately after (to re-start video recording).



Points of Interest

When you place one or more Points of Interest (POI's) on the map, Litchi can automatically keep the aircraft (and therefore, for Phantoms, the camera) pointed toward the selected one. Additionally, Points of Interest enable the use of the "Focus POI" waypoint gimbal setting.

To enter POI edit mode, tap the POI toggle located in the top right corner of the map display. When this button is enabled, tap anywhere on the map to place a POI. Waypoints will have their headings automatically adjusted to target the first POI you add (unless you selected "Auto" for your Heading selection in Mission Settings. "Auto" will always override any other programmed headings). If you have created more than one POI, you can change the target POI for any waypoint in Waypoint Settings. If you wish to override the POI heading at a waypoint, you can adjust it so long as "Custom" is selected for Heading in Mission Settings.

To drag a POI, do a long press on the POI, then move it around. This will automatically adjust the Heading setting of the waypoints that are currently targeting the POI.

To view the POI settings, tap on the POI. You will be able to adjust the POI's altitude (relative to takeoff altitude) which is used for the "Focus POI" waypoint gimbal setting.

To delete a POI, tap on the trash can icon in the top left corner of that POI's Settings window.

Gimbal Pitch Mode Litchi can control the gimbal pitch automatically during the mission, *as long as the aircraft is within range of the remote controller*. To specify how the gimbal pitch should be controlled, each waypoint has a Gimbal Pitch Mode setting which can be one of the following:

Disabled: The gimbal pitch control will be manual at and outbound from this waypoint.

Focus POI: Litchi will automatically control the gimbal pitch from this waypoint to the next in order to keep the selected POI in the center of the frame. The POI altitude will be taken into account to determine the gimbal pitch angle.

Interpolate: You can specify the gimbal pitch angle at this waypoint. For "Interpolate" to work, at least one neighboring waypoint needs to be set to "Interpolate" as well. Litchi will then automatically adjust the gimbal pitch angle to start and end at the specified angles, and smoothly transition while traveling between the two waypoints.



Drawing Tool

The drawing tool allows you to quickly setup a multi-waypoint mission by simply drawing the path you want the aircraft to follow.

To enter the drawing mode, tap the pencil icon located in the top right corner of the map. Then, draw the mission path on the map. When you are done, lift your finger from the screen and a Batch Waypoint Settings window will appear, use it to set global settings for the waypoints that will be created from the drawn path.

Loading / Saving a mission

To save a mission, tap the “save” button in the left button bar. Enter a filename, click Ok and the mission will then be saved in the "LitchiApp/missions" folder located in the mobile device's internal storage.

To load a mission, tap the “load” button in the left button bar, select the mission then click load.

Flying a mission

Prior to flying a mission, use the DJI GO app to ensure that all of your aircraft and camera settings are up-to-date and as desired. When you are ready to fly the mission, close the DJI GO app and open the Litchi app. Make certain there are no obstacles between the aircraft initial location and the first waypoint, then takeoff manually using the remote controller (takeoffs are normally performed with the Flight Mode Switch on the controller in the P mode - the normal “Positioning” mode). Now, with your aircraft in a hover, change the Flight Mode Switch on the remote controller to the F mode (the “Function” mode required for Intelligent Orientation Control (IOC) which allows automatic navigation features) and then touch the "Start/Pause" button located in the left button bar on the Litchi display. If you receive a “Requirements Not Met” error message and your controller is definitely in the F mode, try climbing to a higher altitude and then re-try the Start/Pause button. When prompted, confirm your intent to begin the mission and your aircraft will initially climb to 6 meters (about 20 ft.) and then proceed autonomously to the first waypoint in a direct path, where the mission will commence.

Pausing a mission

Pausing a mission can be done by tapping on the Start/Pause Mission button in the left button bar.

Stopping a mission

Stopping a mission can be done by switching the RC switch from "F" to "P".

Completing a mission

Upon completing a mission, your aircraft will proceed in accordance with your Finish Action choice in Mission Settings. Video recording, if on, will stop automatically when the motors turn off.

Orbit Mode Settings

The Litchi Orbit Mode allows you to place a Point of Interest and establish an orbit around it for your aircraft to fly. You can adjust the orbit position, size, and other parameters affecting how the orbit mission will be flown and where the camera will point.

To enter Orbit Mode, touch the Flight Mode icon in the upper left of the display (Litchi logo). From the drop-down menu, select Orbit. Now touch the desired point on the map display to place a Point of Interest (POI) with an orbit around it.

To move a POI, touch and hold the POI, then drag it.

To adjust a POI's orbit parameters, tap the POI to open the Orbit Settings menu. You can adjust the following parameters:

Altitude	The altitude the aircraft will fly relative to the takeoff altitude.
Radius	The distance from the POI at which the aircraft will orbit.
Speed	The angular speed the aircraft will fly in degrees per second and in seconds to complete a full circle. Because the maximum forward speed of the aircraft is limited, the maximum selectable angular speed (degrees per second) will be reduced as the radius increases (resulting in a longer distance around the orbit).
Entry Point	The point on the circle where the aircraft will enter the orbit. Select from compass rose points "North", "South", "West", "East" or "Nearest".
Heading Mode	The heading the aircraft will fly (and, for Phantoms, the camera will point) as it flies around the orbit path. Select from "Forward", "Backward", "Center" (toward the POI), "Outward", or "Manual" (controlled by the remote controller).
Rotation	Select from "Anti-Clockwise" or "Clockwise" around the orbit path.
Gimbal	Select from "Manual" (controlled by the remote controller) or "Auto" (automatically set to center the POI in the camera if the Heading Mode is set to "Center"). The "Auto" mode is mostly useful when the Heading Mode has been selected to "Center". "Manual" may be more useful when the Heading Mode is set to anything else.
Subject Height	The height of the POI (relative to the takeoff altitude). This setting allows the gimbal to automatically seek the angle which centers the POI in the camera.

Flying an Orbit

Prior to flying an orbit mission, use the DJI GO app to ensure that all of your aircraft and camera settings are up-to-date and as desired. When you are ready to fly the mission, close the DJI GO app and open the Litchi app with an Orbit mission you have defined for your flight. Make certain there are no obstacles between the aircraft initial location and the entry point for your orbit, then takeoff manually using the remote controller (takeoffs are normally performed with the Flight Mode Switch on the controller in the P mode - the normal "Positioning" mode). Now, with your aircraft in a hover, change the Flight Mode Switch on the remote controller to the F mode (the "Function" mode required for Intelligent Orientation Control (IOC) which allows navigation features) and then touch the "Start" button at the bottom of the Orbit Settings window. If you receive a "Requirements Not Met" error message and your controller is definitely in the F mode, try climbing to a higher altitude and then re-try the "Start" button. When prompted, confirm your intent to begin the mission and your aircraft will climb to 6 meters (about 20 ft.) and then proceed autonomously to the orbit entry point in a direct path, where the orbit mission will commence.

Adjusting Orbit parameters while flying an Orbit mission:

- Altitude: Altitude can be adjusted during an Orbit mission using the left controller joystick (Mode 2), "up" to climb, "down" to descend.
- Radius: The Orbit radius can be adjusted during an Orbit mission using the right controller joystick (Mode 2). "Up" reduces the radius, "down" increases the radius.
- Speed: Speed can be adjusted during an Orbit mission using the right controller joystick (Mode 2). For anti-clockwise orbiting, "Left" to increase speed, "Right" to reduce speed. For clockwise orbiting, "Right" to increase speed, "Left" to reduce speed.

While Orbit missions have a POI around which the aircraft orbits, they do *not* have waypoints. Thus, there is no "final waypoint" at which the mission ends, so the aircraft will *continue to orbit the POI until the pilot stops the orbit mission*.

Stopping an orbit mission

Stopping an orbit mission can be done by switching the RC switch from "F" to "P". The aircraft will stop and hover in place. The pilot can then fly the aircraft manually or initiate a Return to Home from the R/C controller.

Failsafe

If the signal is lost between the aircraft and the remote controller, the aircraft will continue the orbit session until it reaches the critical battery level (which can be set in the DJI Go app). The aircraft will then land in place automatically, even if your failsafe is "Return to Home".