



PIX4D**scan**

PIX4DSCAN MISSION TYPES

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Grid Mission

The grid mission is meant to plan and fly polygonal mission shapes with a single grid flight pattern for 2D maps or a double grid flight pattern for 3D models. It is suitable for most environments that require flexible boundaries or complex mapping shapes and ensures that images are taken with the gimbal pitch and the overlap required for optimal processing.

How to position and design the mission

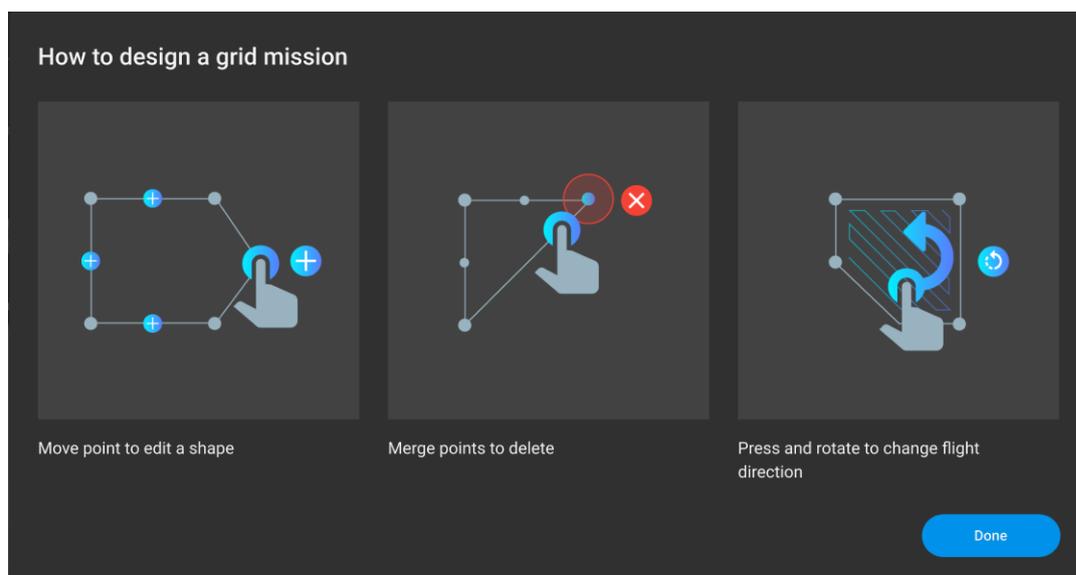
Once entering the grid mission, the default mission shape is displayed over the basemap at the current location.

Important point to Note: To facilitate the design of the mission, the properties panel (on the right side of the screen) is collapsible by tapping on the arrow beside the mission title.

The following actions can be performed.

1. **Move the survey area:** the survey area can be displaced by tapping on the center cross and dragging the shape to a new location.
2. **Move a vertex:** tap on a vertex and drag it to a new position to extend or reduce the survey area.
3. **Remove a vertex:** two adjacent vertices can be merged by dragging one on top of the other one.
4. **Add a vertex:** a vertex can be added by tapping on the "+" icon displayed over a segment.
5. **Rotate the flight lines:** tap and rotate within the survey area to modify the direction of the flight lines.

Point to Note: The reset mission button (top of the map view) allows the mission shape and location to be reset to the default one upon confirmation.



Point to Note: The "how to design a grid mission onboarding guide" is automatically displayed the first time this grid mission is entered and is always accessible in the general settings of PIX4Dscan (*Help - Onboarding guides - Grid mission*).

Define the properties of the mission

Once entering the grid mission, the panel containing the properties is automatically displayed at the right side of the screen.

- *Mission information: estimations for the currently designed mission*
 - Time: estimated duration of the mission execution
 - Area [m², ft²]: area covered by the mission
 - GSD (ground sampling distance) [cm/pixel, inch/pixel]: distance between two consecutive pixel centers measured on the ground. The GSD depends on different parameters such as the camera specifications, the flight height and the camera angle.
- *Mission parameters*
 - Flights pattern:
 - Use a single grid pattern to take images perpendicular to the ground (nadir), with the overlap required for optimal processing. Recommended in the following cases: main interest in 2D map outputs, relatively flat surface (e.g. earthworks, fields), large area.
 - Use a double grid pattern to take images from multiple sides (oblique), with the overlap required for optimal processing. Compared to the single grid, this pattern is recommended for flying closer to objects in order to capture more vertical details. Recommended in the following cases: main interest in 3D model outputs, surface with height fluctuations or objects (e.g. buildings, forest), small and medium area (flight time is doubled compared to single grid pattern).
- *Flight height [m, ft]:* height of the mission in reference to the take-off location. The range is 10 - 150m.
- *Front overlap [%]:* percentage of an image covered by the next one at the ground level with respect to the flight direction. The range is 20 - 90%.
- *Side overlap [%]:* percentage of an image covered by an adjacent one (in adjacent flight line) at the ground level. The range is 20 - 90%.
- *Gimbal pitch [°]:* pitch of the camera during the mission execution. The range is 0° - -90° (nadir).
- *Drone speed [m/s, mph]:* speed of the drone during the mission execution. The maximum speed depends on the selected front overlap and flight height. The slider allows to select percentages (10% steps) of the maximum speed.
Note: the restore button can be used to reset the settings to their default values.

Point to Note: The restore button can be used to reset the settings to their default values.

To generate the best 2D and 3D outputs, we highly recommend using the default mission settings values according to the selected flight pattern:

Parameters	Single grid	Double grid
Front overlap	80%	80%
Side overlap	70%	70%
Gimbal pitch	-90°	-70°



Orbit mission

Define the point of interest center

An animated description will guide the user through the setting of the point of interest center.

1. In manual mode, place the drone on top of the structure/tower.
2. Ensuring that all the conditions below are satisfied, tap **Set**.
 - In the *Flight view*, the green target aims at the center of the structure/tower.
 - The *gimbal pitch* angle is -90° (looks nadir). To do so, use the controls or tap **Set to -90°** .
 - The height is higher than 10 m.
 - The *GPS signal* is strong enough. 6 satellites in view are at least needed to start the mission.

Define the properties of the mission

The following properties are editable on the right panel.

- *Light condition template selection*: extremely sunny, mostly sunny, mostly cloudy, and extremely cloudy. Those are loading predefined recommended white balance and exposure value according to the weather conditions: [General recommendations for exposure value and white balance](#). When expanding that section, white balance and exposure value are also customizable.
- *White balance*: it can be changed according to the weather conditions. White balance options are:
 -  **Automatic**: automatically optimizes the white balance.
 -  **Sunny**: optimizes the white balance for sunny weather conditions.
 -  **Cloudy**: optimizes the white balance for cloudy weather conditions.
- *Exposure value*: exposure value compensation whose values range from -3 to 3.

Mission Tip: Check out our [General recommendations for exposure value and white balance](#).

- *Mission settings*: a default value is applied to the following setting. When making edits to this value, tap **Restore** to replace the edited value with the default one.
- *Images per orbit*: defines the number of images per orbit.

Rather than choosing parameters in the panel, values such as gimbal pitch, radius, and height are based on the drone telemetry, so from the current drone position, which is manually adjusted with the drone's controller.

- *Gimbal pitch*: defines the pitch angle of the camera.
- *Radius*: defines the radius length of the orbit.
- *Height*: defines the height of the orbit.

Parameters	Red values interval	Orange values interval	Green values interval
Gimbal pitch	-	-90-(-61)° / -29-90°	-60-(-30)°
Radius	0-5 m	6-7 m	From 8 m above
Height	< 10 m	10-14 m	From 15 m above

Important Point: Red values prevent the start of the mission. Orange values do not block the start of the mission but are not recommended values. Green ones fall in the interval of the suggested values.

Point to Note: Changes to the radius value will be reflected in the estimate of the time needed to complete the mission, which can be read next to the mission type name.

Tap **Start mission**. The drone enters the *In mission* mode and the mission starts. An estimate of the time remaining until completion is displayed throughout the whole mission.

Cylinder mission

Define the point of interest center

An animated description will guide the user through the setting of the point of interest center.

1. In manual mode, place the drone on top of the structure/tower.
2. Ensuring that all the conditions below are satisfied, tap **Set**.
 - In the *Flight view*, the green target aims at the center of the structure/tower.
 - The *gimbal pitch* angle is -90° (looks nadir). To do so, use the controls or tap **Set to -90°**.
 - The *height* is higher than 10 m.
 - The *GPS signal* is strong enough. 6 satellites in view are at least needed to start the mission.

Define the properties of the mission

The following properties are editable on the right panel:

- *Light condition template selection*: extremely sunny, mostly sunny, mostly cloudy, and extremely cloudy. Those are loading predefined recommended white balance and exposure value according to the weather conditions: [General recommendations for exposure value and white balance](#). When expanding that section, white balance and exposure value are also customizable.
- *White balance*: it can be changed according to the weather conditions. White balance options are:
 -  **Automatic**: automatically optimizes the white balance.
 -  **Sunny**: optimizes the white balance for sunny weather conditions.
 -  **Cloudy**: optimizes the white balance for cloudy weather conditions.

- *Exposure value*: exposure value compensation whose values range from -3 to 3.

Mission Tip: Check out our [General recommendations for exposure value and white balance](#).

- *Mission settings*: a default value is applied to the following setting. When making edits to this value, tap **Restore** to replace the edited value with the default one.
- *Verticals*: number of vertical lines for the mission.
- *Front overlap*: define the image front overlap in the vertical line.
- *Minimum height*: defines the minimum height the drone should fly the mission. The value should be at least 10 m lower than the maximum height.
Tap **Set to current** to set the value to the current height of the drone.
- *Maximum height*: defines the maximum height the drone should fly the mission. The value should be at least 10 m higher than the minimum height.
Tap **Set to current** to set the value to the current height of the drone.
- *Point of interest height*: defines the height value of the orbit.
Tap **Set to current** to set the value to the current height of the drone.
- *Radius*: defines the radius length of the orbit. The minimum value is 8 m.

Point to Note: Changes to the above values will be reflected in the estimate of the time needed to complete the mission, which can be read next to the mission type name.

Tap **Start mission**. The drone enters the *In mission* mode and the mission starts. An estimate of the time remaining until completion is displayed throughout the whole mission.

Cell tower mission

Define the point of interest center

An animated description will guide the user through the setting of the point of interest center.

1. In manual mode, place the drone on top of the structure/tower.
2. Ensuring that all the conditions below are satisfied, tap **Next**.
 - In the *Flight view*, the green target aims at the center of the structure/tower.
 - The *gimbal pitch* angle is -90° (looks nadir). To do so, use the controls or tap **Set to -90°** .
 - The height is higher than 10 m.
 - The *GPS signal* is strong enough. 6 satellites in view are at least needed to start the mission.

Define the point of interest height

An animated description will guide the user through the setting of the point of interest height.

1. In manual mode, align the drone with the highest point of the tower.
2. Ensuring that all the conditions below are satisfied, tap **Next**.
 - In the *Flight view*, the green target aims at the top of the structure/tower.
 - The *gimbal pitch* angle is 0° (looks forward). To do so, use the controls or tap **Set to 0°** .
 - The height is higher than 10 m.
 - The *GPS signal* is strong enough. 6 satellites in view are at least needed to start the mission.

Fly sub-missions

Orbit, cylinder, single vertical line, and underneath orbit missions can be flown to efficiently scan cell towers and to successfully reconstruct the results. Detailed recommendations on how to scan cell towers can be found in [How to scan cell towers](#).

In general, we recommend flying:

- One orbit sub-mission per cluster of antennas.
- One cylinder sub-mission with many verticals or many single vertical missions according to the type of tower.
- One underneath orbit sub-mission per cluster of antennas.

The references that are set at the beginning of the Cell tower mission are used by default by all the sub-missions. Select one of the available sub-missions and tap **Next**.

After one type of sub-mission is completed, another type of sub-mission or another sub-mission of the same type can be performed.

Point to Note: The point of interest center and height references can be reset if needed at the cell tower submission selection stage.

Orbit submission – Sub-Mission 1

Define the properties of the mission

The following property is editable on the right panel:

- *Light condition template selection:* extremely sunny, mostly sunny, mostly cloudy, and extremely cloudy. Those are loading predefined recommended white balance and exposure value according to the weather conditions: [General recommendations for exposure value and white balance](#). When expanding that section, white balance and exposure value are also customizable.
- *White balance:* it can be changed according to the weather conditions. White balance options are:
 -  **Automatic:** automatically optimizes the white balance.
 -  **Sunny:** optimizes the white balance for sunny weather conditions.
 -  **Cloudy:** optimizes the white balance for cloudy weather conditions.
- *Exposure value:* exposure value compensation whose values range from -3 to 3.

Mission Tip: Check out our [General recommendations for exposure value and white balance](#).

- *Mission settings:* a default value is applied to the following setting. When making edits to this value, tap **Restore** to replace the edited value with the default one.
- *Images per orbit:* defines the number of images per orbit.

Rather than choosing parameters in the panel, values such as gimbal pitch, radius, and height are based on the video feed on the screen, so from the current drone position, which is manually adjusted with the drone's controller.

- *Gimbal pitch:* defines the pitch angle of the camera. This angle must have a negative value.

- *Radius*: defines the radius length of the orbit.
- *Height*: defines the height value of the orbit.

Parameters Red values interval Orange values interval Green values interval

Gimbal pitch	-	-90-(-61)° / -29-90°	-60-(-30)°
Radius	0-5 m	6-7 m	From 8 m above
Height	< 10 m	10-14 m	From 15 m above

Important Point to Note: Red values prevent the start of the mission. Orange values do not block the start of the mission but are not recommended values. Green ones fall in the interval of the suggested values.

Point to Note: Changes to the radius value will be reflected in the estimate of the time needed to complete the mission, which can be read next to the mission type name.

Tap **Start mission**. The drone enters the *In mission* mode and the sub-mission starts. An estimate of the time remaining until completion is displayed throughout the whole mission.

Cylinder submission – Sub-Mission 2

Define the properties of the mission

The following properties are editable on the right panel:

- *Light condition template selection*: extremely sunny, mostly sunny, mostly cloudy, and extremely cloudy. Those are loading predefined recommended white balance and exposure value according to the weather conditions: [General recommendations for exposure value and white balance](#). When expanding that section, white balance and exposure value are also customizable.
- *White balance*: it can be changed according to the weather conditions. White balance options are:
 -  **Automatic**: automatically optimizes the white balance.
 -  **Sunny**: optimizes the white balance for sunny weather conditions.
 -  **Cloudy**: optimizes the white balance for cloudy weather conditions.
- *Exposure value*: exposure value compensation whose values range from -3 to 3.

Mission Tip: Check out our [General recommendations for exposure value and white balance](#).

- *Mission settings*: a default value is applied to the following setting. When making edits to this value, tap **Restore** to replace the edited value with the default one.
- *Verticals*: number of vertical lines for the mission.
- *Front overlap*: define the image front overlap in the vertical line.

- *Minimum height*: defines the minimum height the drone should fly the mission. The value should be at least 10 m lower than the maximum height, calculated as the point of interest height value + the radius.
Tap **Set to current** to set the value to the current height of the drone.
- *Radius*: defines the radius length of the orbit. The minimum and recommended value is 8 m. Tap **Set to current** to set the value to the current distance of the drone with respect to the tower centerline.

Point to Note: The gimbal pitch varies during the flight and is controlled by the mission in order to take the most suitable acquisition set.

Point to Note: Changes to the above values will be reflected in the estimate of the time needed to complete the mission, which can be read next to the mission type name.

Tap **Start mission**. The drone enters the *In mission* mode and the sub-mission starts. An estimate of the time remaining until completion is displayed throughout the whole mission.

Single vertical submission – Sub-Mission 3

Define the properties of the mission

The following properties are editable on the right panel:

- *Light condition template selection*: extremely sunny, mostly sunny, mostly cloudy, and extremely cloudy. Those are loading predefined recommended white balance and exposure value according to the weather conditions: [General recommendations for exposure value and white balance](#). When expanding that section, white balance and exposure value are also customizable.
- *White balance*: it can be changed according to the weather conditions. White balance options are:
 -  **Automatic**: automatically optimizes the white balance.
 -  **Sunny**: optimizes the white balance for sunny weather conditions.
 -  **Cloudy**: optimizes the white balance for cloudy weather conditions.
- *Exposure value*: exposure value compensation whose values range from -3 to 3.

Mission Tip: Check out our [General recommendations for exposure value and white balance](#).

- *Mission settings*: a default value is applied to the following setting. When making edits to this value, tap **Restore** to replace the edited value with the default one.
- *Front overlap*: define the image front overlap in the vertical line.
- *Minimum height*: defines the minimum height the drone should fly the mission. The value should be at least 10 m lower than the maximum height, calculated as the point of interest height value + the radius.
Tap **Set to current** to set the value to the current height of the drone.
- *Radius*: defines the distance between the POI center and the single vertical. The minimum and recommended value is 8 m. Tap **Set to current** to set the value to the current distance of the drone with respect to the tower centerline.

Point to Note: The gimbal pitch varies during the flight and is controlled by the mission in order to take the most suitable acquisition set.

Point to Note: Changes to the above values will be reflected in the estimate of the time needed to complete the mission, which can be read next to the mission type name.

Tap **Start mission**. The drone enters the *In mission* mode and the sub-mission starts. An estimate of the time remaining until completion is displayed throughout the whole mission.

Underneath orbit submission – Sub-Mission 4

Define the properties of the mission

The following property is editable on the right panel:

- *Light condition template selection:* extremely sunny, mostly sunny, mostly cloudy, and extremely cloudy. Those are loading predefined recommended white balance and exposure value according to the weather conditions: [General recommendations for exposure value and white balance](#). When expanding that section, white balance and exposure value are also customizable.
- *White balance:* it can be changed according to the weather conditions. White balance options are:
 -  **Automatic:** automatically optimizes the white balance.
 -  **Sunny:** optimizes the white balance for sunny weather conditions.
 -  **Cloudy:** optimizes the white balance for cloudy weather conditions.
- *Exposure value:* exposure value compensation whose values range from -3 to 3.

Mission Tip: Check out our [General recommendations for exposure value and white balance](#).

- *Mission settings:* a default value is applied to the following setting. When making edits to this value, tap **Restore** to replace the edited value with the default one.
- *Images per orbit:* defines the number of images per orbit.

Rather than choosing parameters in the panel, values such as gimbal pitch, radius, and height are based on the video feed on the screen, so from the current drone position, which is manually adjusted with the drone's controller.

- *Gimbal pitch:* defines the pitch angle of the camera. This angle must have a positive value.
- *Radius:* defines the radius length of the orbit.
- *Height:* defines the height value of the orbit.

Parameters	Red values interval	Orange values interval	Green values interval
Gimbal pitch	-	< 0°	0-90°
Radius	0-5 m	6-7 m	From 8 m above
Height	< 10 m	10-14 m	From 15 m above

Important Point to Note: Red values prevent the start of the mission. Orange values do not block the start of the mission but are not recommended values. Green ones fall in the interval of the suggested values.

Point to Note: Changes to the radius value will be reflected in the estimate of the time needed to complete the mission, which can be read next to the mission type name.

Tap **Start mission**. The drone enters the *In mission* mode and the sub-mission starts. An estimate of the time remaining until completion is displayed throughout the whole mission.

Pause, resume or cancel the mission

When in mission mode, the mission can be paused, resumed or cancelled from the application.

- Tap  to pause the mission. After the mission is paused, the drone hovers and the manual mode is entered.
- Tap  to resume the mission. The drone will perform the pre-flight checks and fly to the first waypoint that was not reached before clicking *pause*.

Important Point to Note:

Cylinder mission: When resuming the mission, the drone will first vertically ascend to the safety altitude that is higher than the structure height and, only after that, it will move to the first waypoint that was not captured. The structure height is defined during mission planning.

Orbits and single vertical: A warning popup is displayed at the mission resume. The drone will first ascend/descend directly to a height equal to the last reached waypoint, then fly towards it. To avoid collision risks, be sure there are no obstacles on the flight route.

- Tap  to cancel the mission. A popup will ask for confirmation to cancel the mission. A canceled mission cannot be resumed.


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