Capture guide

Surveying solar farms.

This is a guide to aid the collection of the highest quality data possible, when surveying solar farms using a UAV.

Before you start.

Before you fly, consider what you will be inspecting the solar farm for and what level of detail you need, to do so effectively.

The more detail required, the more data and the longer flight times.

If you are only looking for low detail faults, like module, string, combiner-boxes and inverters, you can afford to fly higher and generate less data.

Equipment.

- **Thermal Sensor/Camera**

  High resolution (640x512) and fully radiometric. Dual-sensor is ideal. GPS data must be saved as exif.

- **Lens for Thermal Sensor/Camera**

  13mm is perferred as any lower will cause distortion.

- **UAV/Drone**

  Built-in redundancy and long flight times are preferred. Remeber extra batteries.

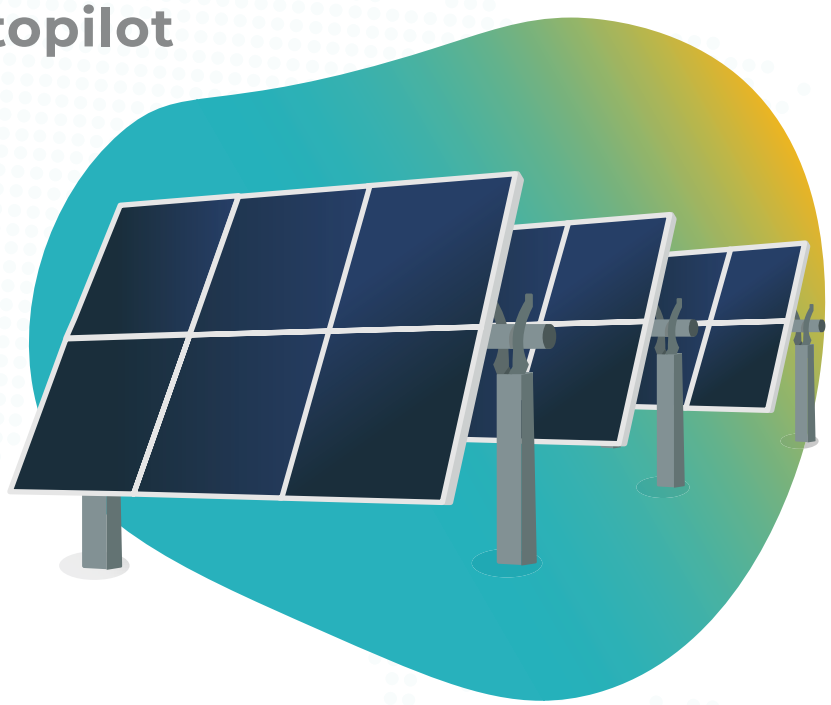
- **RGB Sensor/Camera**

- **Flight Controller/Autopilot**

- **Gimbal**

- **Irradiance meter**

- **Anemometer**



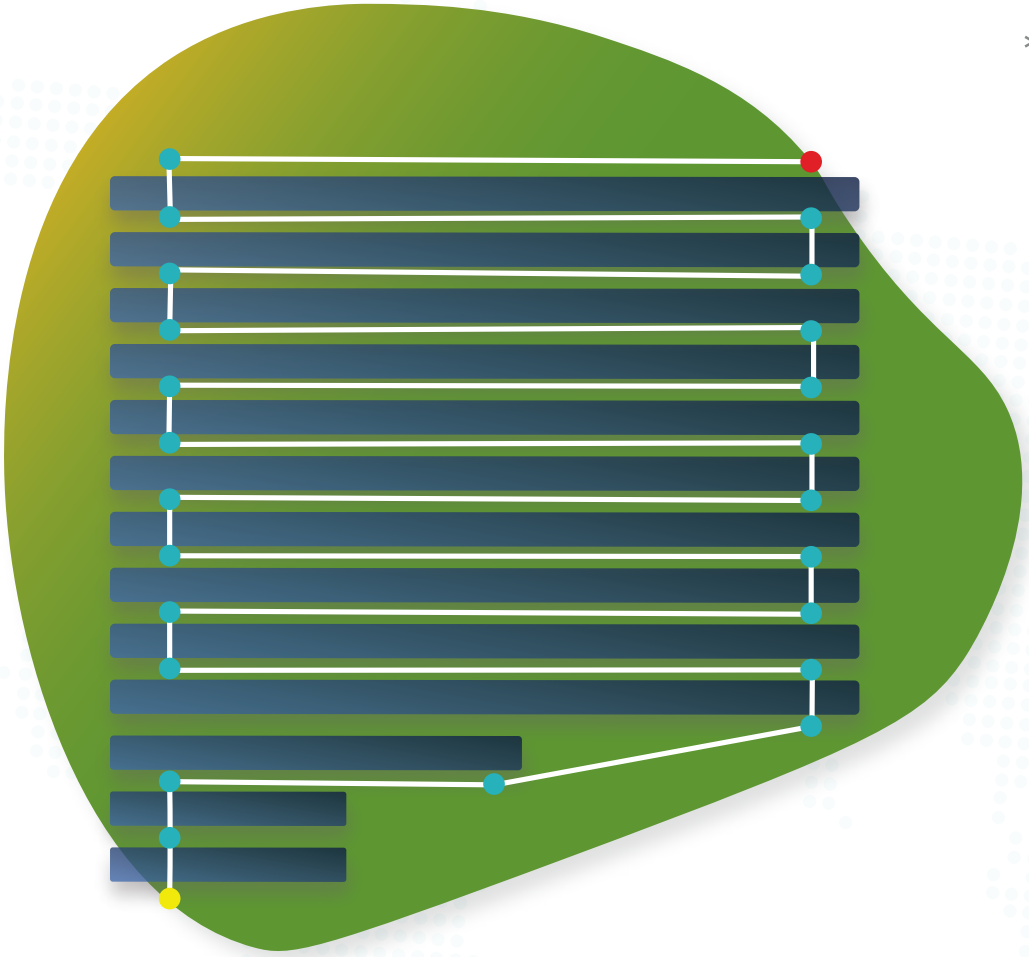
Planning.

You will need CAD drawings of the whole site for both flights planning and post processing.

We recommend using UGCS for flight-planning.

We suggest waypoints to ensure that flight-paths are parallel to rows of modules.
Flight-plans should spaced so the UAV captures the desired number of rows per sweep.

We strongly recommend planning a quick over-flight og the site. This data helps locate faults during post-processing.

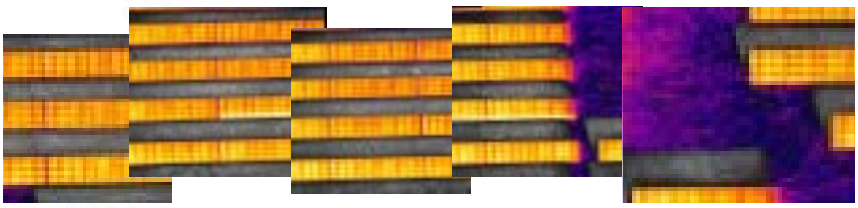


* Always start your routes on the edge of the farm.

On-site conditions.

Wind speed needs to be below **28Km/h** or **7.5m/s** or **17mph**, not only for the sake of your drone and camera, but excessive wind has an obvious cooling effect on the modules and may give you misleading results.

Check if the solar farm has recently been cleaned and the grass has been cut.
Excessive dirt or foliage on the modules will cause lots of hotspots to appear and will result in vast amounts of extra work to analyse.



Before the drone takes off, make sure the thermal camera has had enough time to calibrate and warm up.

Set FFC to auto, choose your palette (we recommend greyscale). Tune your level and span and keep it fixed in manual mode.

As you start to fly, raise or lower your gimbal very gently to make sure you are framing the correct rows.

Flying.

The sensors should remain facing the modules throughout the entire flight, keeping the rows well framed and paralell.

Height is very dependent on the type of sensor lens you are using and level of detail you are trying to collect. Either calculate or test the best height for your requirements.

example a 640 x 512 thermal camera with a 13mm lens flying at 150feet AGL will have a 'foot print' of 38M x 30M which could be enough to capture 3 rows.

The speed of the flight should be set very slow, to avoid motion blur, particularly at low levels. Aim for a speed which allows for approximately a 20% overlap.

Glare from the sun reflecting off the solar modules can be a problem.
Generally, plan to survey in the morning and in the afternoon when the sun is not too high, but be prepared to adjust your flight plan on the day to suit the best time.
Moving the drone a few meters and adjusting the camera angle a few degrees can be enough to avoid the majority of glare.