



Capture Guide

Pro tips to a better capture

Get the most out of your next capture mission with pro tips from Trendspek's leading pilots

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Get the best Precision Reality Twins (PRT) from your capture with these top tips.

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Resolution guide

What to aim for?

How much detail can I see?

The amount of detail you can see in your Precision Reality Twin (PRT) is determined by its resolution. You can choose the resolution that suits your needs.

Resolution is a measurement of the surface distance of an individual pixel within the model, also commonly known as Ground Sample Distance (GSD)

How resolution affects Gigapixels?

Gigapixels (GP) is a measurement of the total amount of photo data that goes into producing your PRT.

One Gigapixel is equivalent to 1000 Megapixels (MP).

Higher resolutions = Higher number of Gigapixels

Gigapixels (GP) Calculation

$$\frac{\text{(Number of photos X Camera's Megapixel)}}{1000}$$

Example 250 photos X 45MP camera
divided by 1000 = 11.2 Gigapixels



1.5mm per pixel

1 Gigapixel per 125m²* of surface area



3mm per pixel

1 Gigapixel per 450m²* of surface area



5mm per pixel

1 Gigapixel per 1,200m²* of surface area

High resolution

- Highest level of detail and clarity
- Best suited to inspection purposes
- A higher number of photographs
- Higher specification camera and equipment needed
- 1.5 or 3mm resolution

Standard resolution

- Best suited for site overview or planning purposes
- Best for large sites when high detail is not needed
- Faster capture times
- Lower cost
- 5mm or 10mm resolution

*Surface area is an estimate only and can vary based on asset structure and capture technique. Estimates do not account for multiple passes or additional oblique imagery. We recommend using a flight planning application to get an accurate image count. Use the estimates as a guide only.

Camera selection

What is the difference?

Regardless of the camera, you can capture an asset at your targeted resolution, with the result being almost an identical number of pixels.

So what's the difference?

The larger-format sensors will produce superior image quality; the added benefit is:

- you can fly higher while achieving the same resolution compared to a smaller format camera,
- you capture more of the asset in one frame, meaning fewer overall photos,
- you need fewer flight lines making it significantly quicker to capture,
- flying higher often means there are fewer obstacles to avoid,
- there is less chance of having an incomplete model with a larger sensor camera.



Phase One iXM 100

165 images

4 min flight

100MP



DJI P1

340 images

8 min flight

45MP



Mavic 3

840 images

13 min flight

20MP

23m

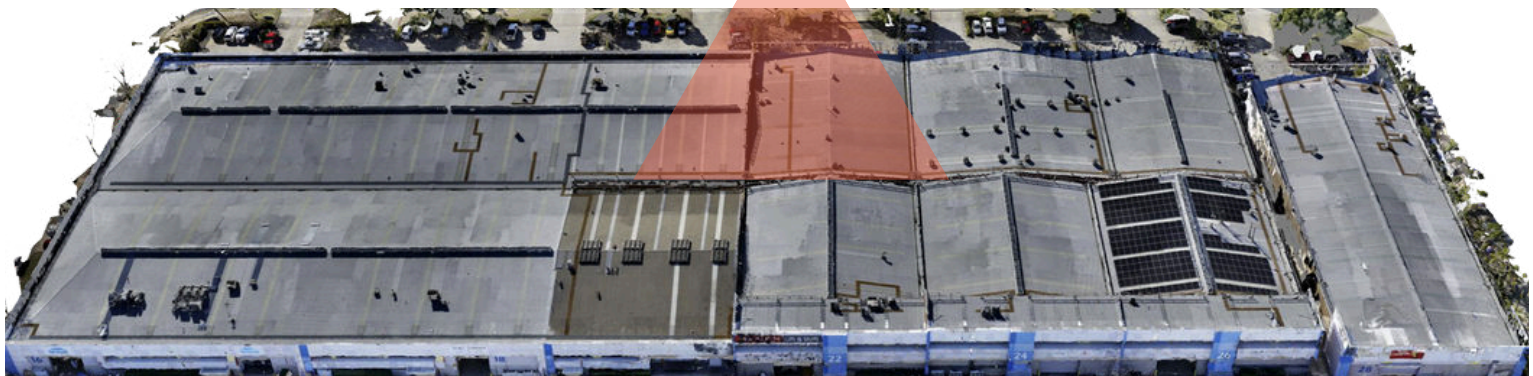
16m

7m

Estimates based on:

- covering 5000m² of a single surface (No obliques)
- flying at 3m/s
- 2mm per pixel resolution

= 15 GP




Camera settings

Exposure

The ideal lighting conditions typically occur on an overcast day resulting in minimal shadows.

We recommend auto exposure in aperture priority mode to keep the asset consistently light.

However, we have found that using centre-weighted metering is the most effective. Unlike standard exposure settings, centre weight attempts to give you the correct exposure for the centre of the frame.

 **PRO TIP: Don't worry when the sky or background is overexposed, It is a good thing when modelling, BUT ensure that the asset is NOT over or under exposed which can cause holes within the model.**

White balance

For consistency do not use automatic white balance (WB), This can lead to each photo being a different tint complicating the generation of the model. Select a manual White Balance to suit the lighting conditions.


 **PRO TIP: For multi-day captures, adjust the manual white balance to yield similar colour profiles throughout the capture by keeping reference photos from the previous day.**



Image ratio

It is good practice to use the camera's biggest pixel count, which is usually a ratio of 4:3 or 3:2. Avoid using video ratios which are typically 16:9 as it will not take advantage of all of the sensor's pixels.

Focus

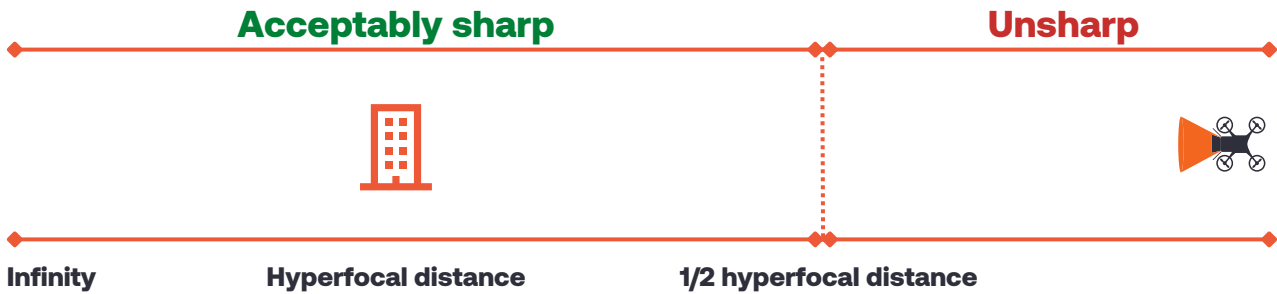
Unfocused images reduce the quality of your model, frequently occurring for entire flight lines. There are several methods of setting focus.

We recommend the following options:

- Try using "AF Assistant" before a mission if using a DJI drone,
- Manually set the focus on the ground using your offset distance. Focus your drone on an object (a wall or similar) and once set, switch to manual focus.
- For non-DJI drones, try using Hyperfocal distance for setting focus. Don't forget that the aperture will affect the distance.

💡 PRO TIP: Always check that your images are in focus before leaving the site.

If you do have imagery that is out of focus or has motion blurring, it is best to omit these from your upload.





Flight planning tips

Transition photos

One of the most significant issues we encounter is a lack of transitional imagery which leads to incomplete or fragmented corners or tower structures.

PRO TIP: For intricate or detail-heavy assets, consider increasing the amount of transition shots.

- Aim for a minimum of one image per 30 degrees when transitioning around corners or;
- For structures like towers, consider capturing orbital imagery every 10 degrees.
- If mixing distances try to include a "transition" distance and avoid going from far to really close.

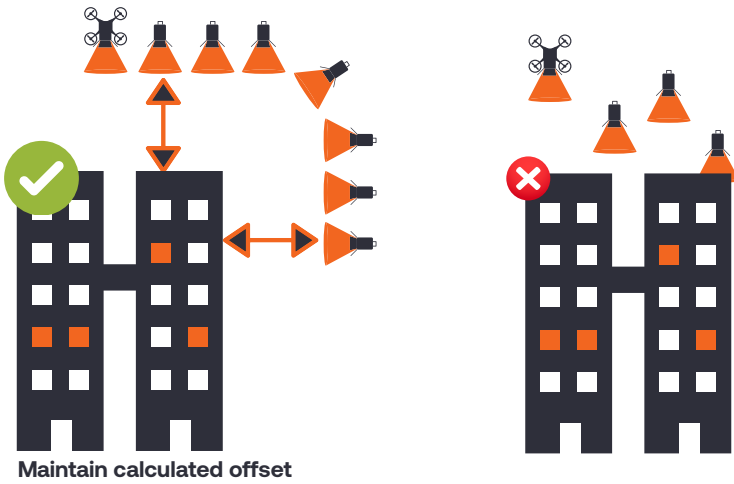


Target resolution

When targeting a specific resolution or Ground Sample Distance (GSD), ensure accuracy when calculating the offset distance and adhere to it, closely.

The camera and lens combination will determine your offset distance.

PRO TIP: Ensure the offset distance is from the asset. For instance, a 10m offset from a roof means you will need to fly to the height of the roof and then add your offset distance above roof height.



Overlap

Did you know that too much or too little overlap can cause a model to fail digital reconstruction?

Often in the processing phase, we reduce the number of images used, as this can provide optimal 3D models. If you are unsure urge slightly on the higher side. (80/80)



CALCULATE: Try our offset calculator for different drone types.

[Online calculator](#)



Ground Control Points (GCP)

For the purpose of asset inspections and reporting, GCP's are typically not required as the relative (internal) accuracy of a 3D models is a function of the resolution and quality of the capture.

Where can ground control points help?

If there are additional requirements for interoperability between multiple platforms, datasets or requirements for enhanced/verifiable global accuracy, then GCPs can be used.

(Global accuracy relates to its physical position on the globe)

Ideally, GCP data points are exported in WGS84 for streamlined processing.

As an alternative, consider using RTK or PPK-equipped drones that can corrected to local CORS stations.

In-flight tips

Position data

For consistent positioning data, we recommend PPK/RTK capable drones that automatically log image positions. For non-PPK/RTK drones, you may opt to hot-swap batteries (if able) to minimise GPS errors induced when power cycling.

NOTE: We have seen GPS errors of upward of 50m in elevation after cycling the power of a drone.

If you are NOT using PPK/RTK or hot-swapping batteries, after each battery swap, we recommend capturing a photo from a common take-off position and naming each file to reflect it.. (e.g., DJI_0001-ground-shot!) which will enable us to calibrate the Z-axis when modelling.

💡 PRO TIP: The larger the asset or the more detailed your capture (less than 1mm per pixel), the more critical PPK/RTK becomes, to the point where we wouldn't recommend a non-RTK/PPK drone. This ensures that each image has superior metadata, increasing the model output quality.



Flight speed

There are several items to consider when selecting a flight speed:

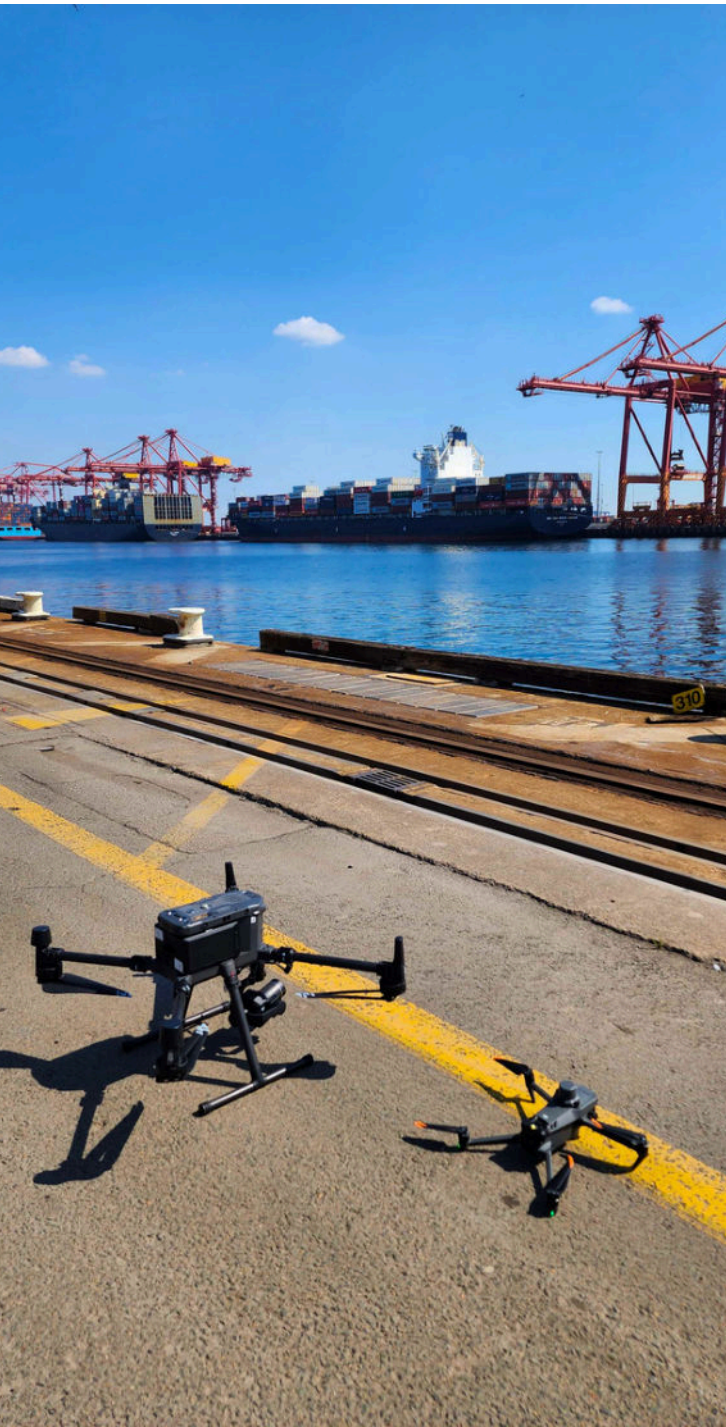
- It is essential to minimise "Motion Blur". We recommend less than half a pixel,
- Consider the camera's ability to achieve continuous shots. How often can your camera trigger a photo continuously?
- Know your camera settings. We recommend using aperture priority mode, an ISO not above 800 (before the image becomes noisy) and the fastest shutter speed you can achieve.

💡 PRO TIP: Normally, a lens is the sharpest between an aperture of f 5.6 and f 11. Aim to shoot in aperture priority mode

Avoid reflections

Wonder why reflective surfaces such as windows don't model well? That is because the software is trying to model the reflections (which keep changing) as well as the subject. This is the same with water, puddles and reflective surfaces like polished stainless steel.

💡 PRO TIP: Wait until water puddles have dried if modelling after rain.



Capturing mobile plant assets or other moving structures?

It is critical that the structure does not move during the capture. This includes its physical location, but also the position of ancillaries such as crane booms.

For subsequent repeat captures of the same asset, a different physical location is acceptable.


Post-flight tips

Validate the capture

It is best practice to review the data collected prior to leaving the site, including:

- Capture coverage
- Images are focused, well-balanced exposure and have a consistent white balance.

Build a checklist to action at the end of the capture, or use the one supplied below.

 **Trendspek's Capture Analysis tool enables on-site identification of any data gaps in real-time by displaying the camera positions in 3D, making it easier to recapture any missing data promptly.**

It also enables you to view imagery for correct focus, exposure and white balance.


Structure your data

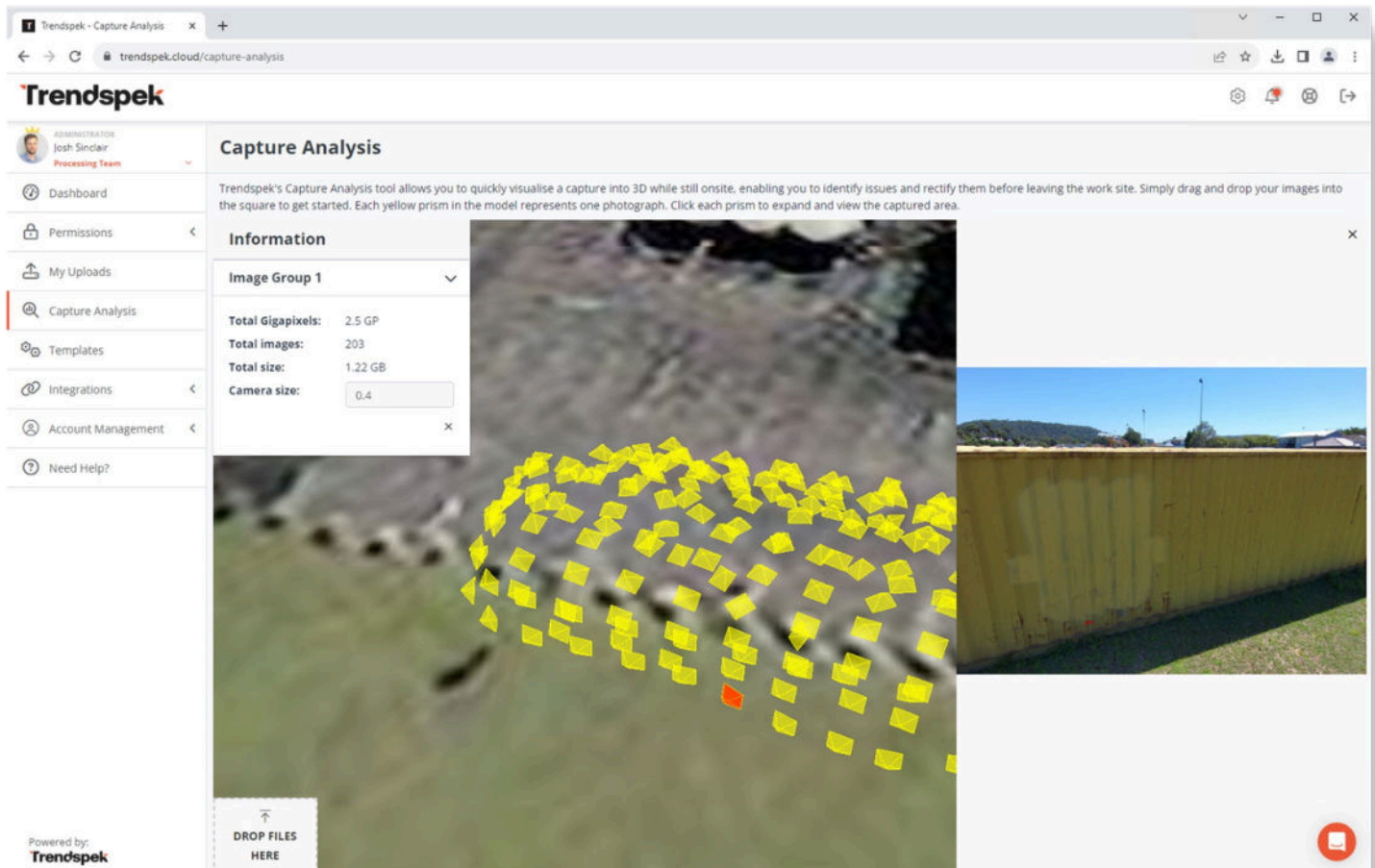
When capturing large datasets (Thousands of images) for processing, it's important to understand how images are grouped together.

This is more important when capturing non-georeferenced images, in poor GPS environments or using multiple drone/camera models.


Consider changing the prefix of the image file name in the camera settings to match sections of the capture/asset. (Example "Span_1_001.jpg, Span_2_001.jpg)

This will enable better processing and outputs.

 **PRO TIP: If uploading images to Trendspek, you can upload folders of images broken into asset sections in a single upload. Directly add notes to relay the capture method to the processing QA team.**

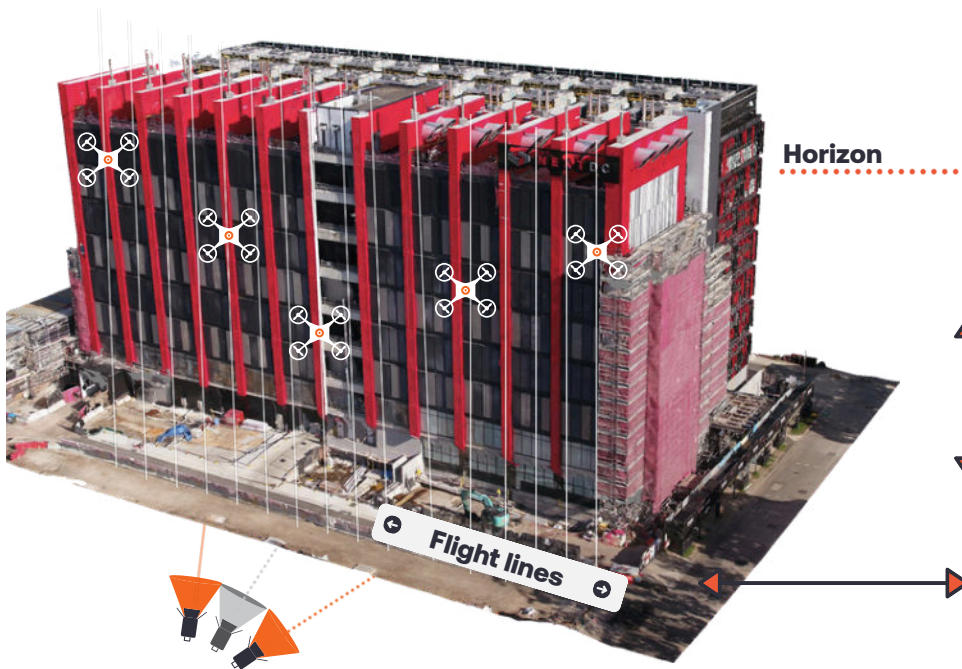




 **PRO TIP: Overcast days are the best days to capture**



Facade capture tips



← Side Profile

Consider flying flight lines with the camera slightly tilted up, with the alternate flight line having the camera tilted down, thus enabling a better render of your 3D model.

Height change between each photo should equate to 75% overlap

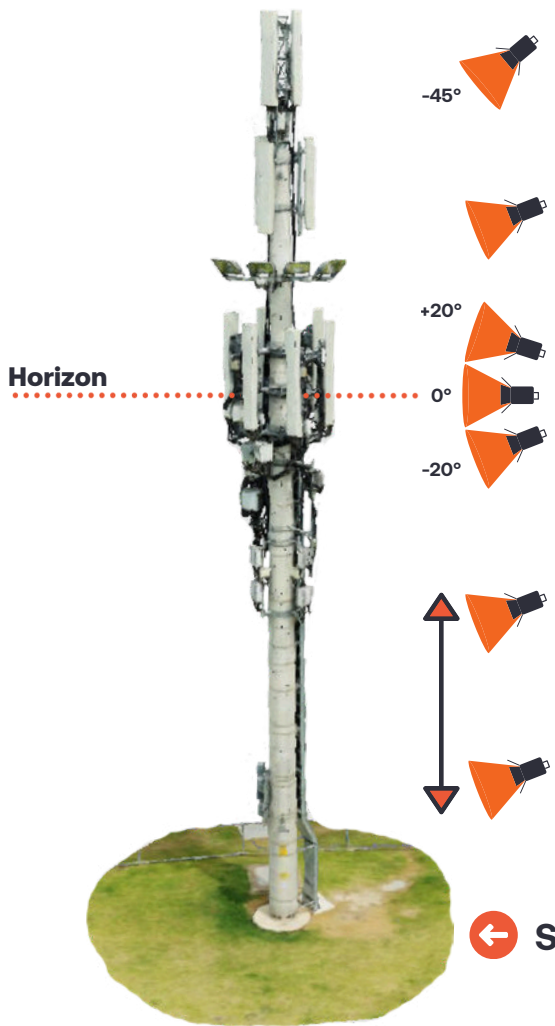
The flight distance from the facade should be calculated based on the camera, lens and target resolution.

↑ Face on Profile

With intricately detailed facades, consider completing an extra flight/s with the camera either panned to the left and/or right instead of directly facing the facade.

i If including top-down components such as roofs or hardstands, don't forget to include transition shots as discussed above.

Tower capture tips



The top of the tower should have the camera tilted down by 45 degrees to the horizon.

NOTE: This could be included in the antenna mount group orbits.



Antenna mounts and equipment should ideally consist of 3 passes. One with the camera angled up 20 degrees (or upwards before the propeller comes into view), one looking at the horizon and one looking downwards by 20 degrees to the horizon.



Height change between each orbit should equate to 75% overlap



← Side Profile

Focus

Focus is incredibly important for telco tower captures. Do not use Auto Focus. Focussing at the hyperfocal distance is preferred, however, if this is not possible you may choose to use autofocus once on the tower from your offset distance before switching to manual focus.

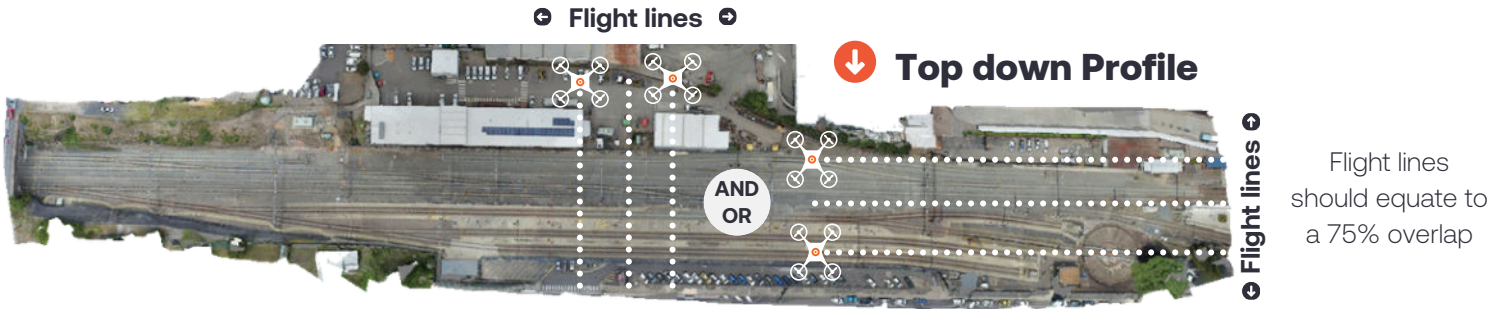
When capturing a tower, it is usually best to fly multiple orbits around the tower. You should aim for no more than 10 degrees of change between each image of a single orbit. This translates to 36 images per orbit



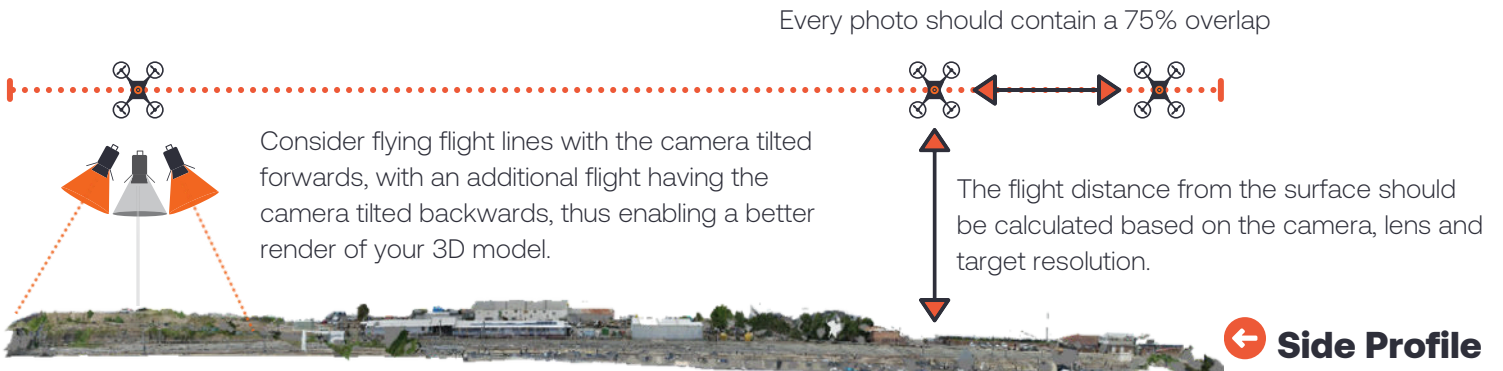
The flight distance from the tower should be calculated based on the camera, lens and target resolution.

↓ Top-down Profile

Linear asset capture tips

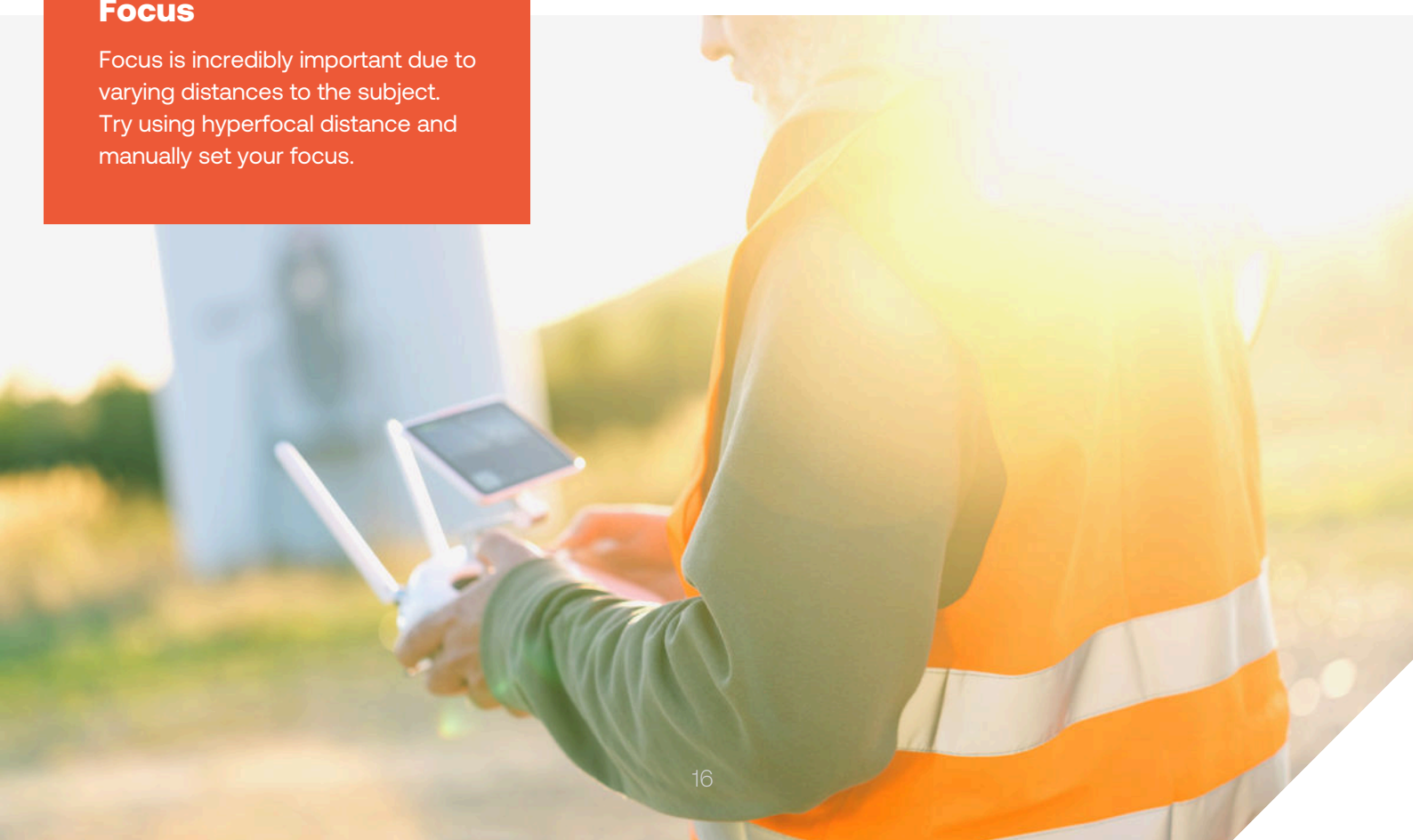


i You can combine both flight line methods and do a "cross" pattern. We suggest flying with the camera angled slightly forward.



Focus

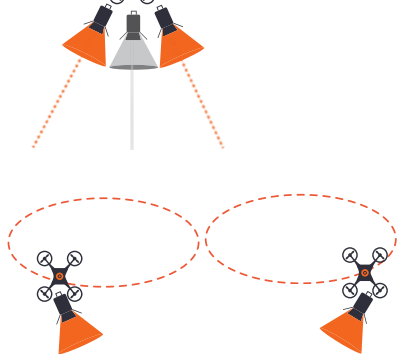
Focus is incredibly important due to varying distances to the subject. Try using hyperfocal distance and manually set your focus.





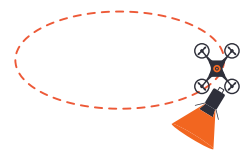
Mixed resolutions

↓ High level site capture (Lower resolution)



↘ Transition capture

When combining lower resolution imagery that has been captured from a distance with highly detailed imagery of specific assets captured from close to the asset, it is essential to add transitional imagery such as a mid-level orbit to assist in aligning the two captures.



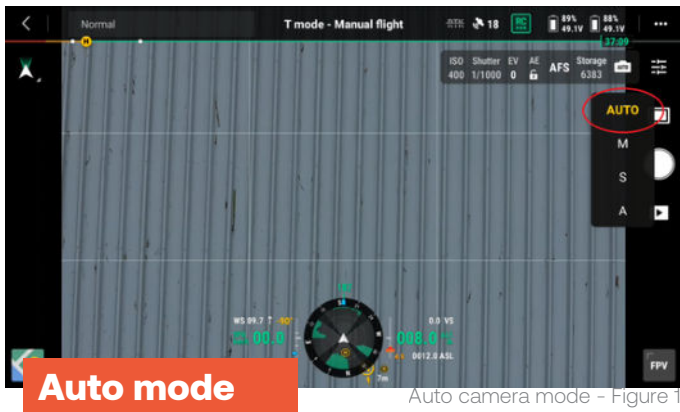
← Close up asset capture (Higher resolution)

i See "Transition" in the capture guide for tips on how to transition around an asset



DJI P1 Settings

Recommended settings for manual flight missions

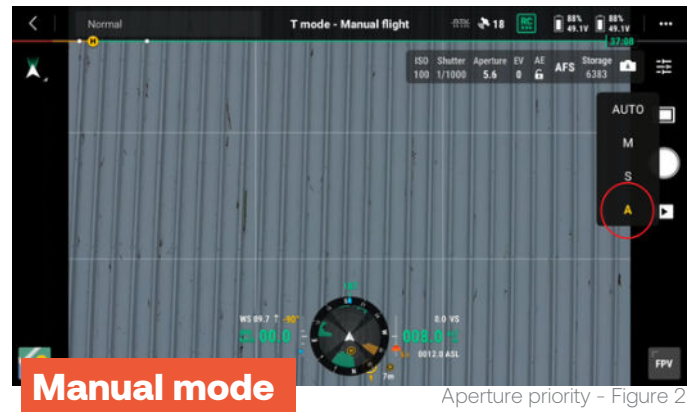


Auto mode

Auto camera mode - Figure 1

To be used when the exposure varies too much (telco towers).

NOTE: The subject must stay in the middle of the frame otherwise, the exposure will shift.



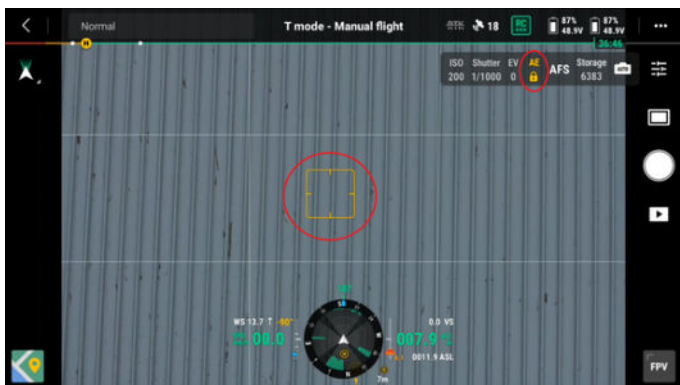
Manual mode

Aperture priority - Figure 2

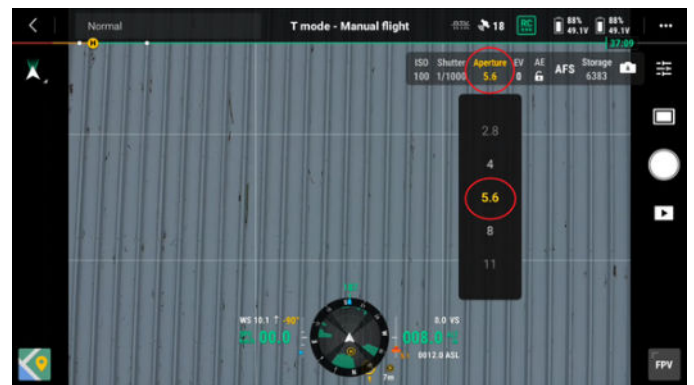
To be used when lighting conditions are optimum, and the exposure on the subject's surface is consistent.

Utilise Aperture mode (Figure 2) to maintain correct exposure:

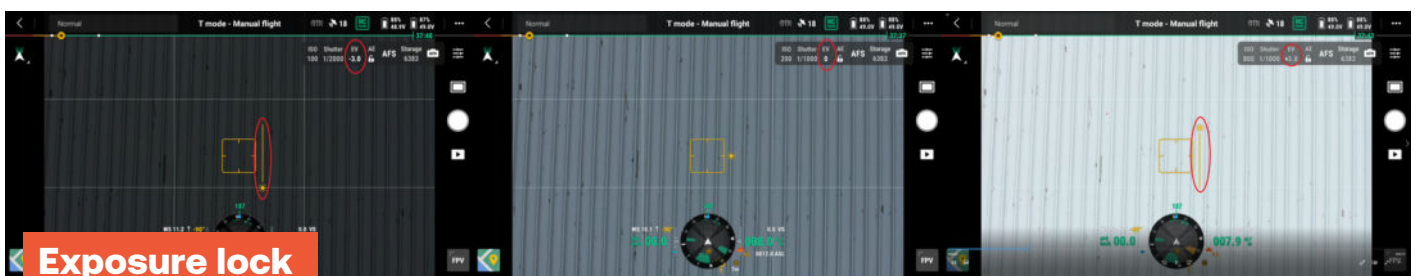
- F 5.6-8, (Figure 4) or lenses sharpest focal point.
- Shutter speed to be 1/500th or faster.
- ISO to be utilised from 100-800



Exposure lock, Tap target structure, tap AE lock icon- Figure 3



Recommended aperture (lenses sharpest point)- Figure 4

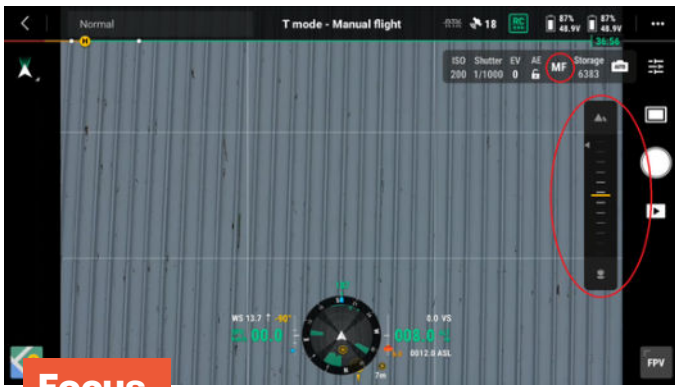


Exposure lock

EV -3.0 - 0.0 - +3.0 - Figure 5

Frame the subject in the middle of the screen, tap the screen to set the exposure, and utilise the Exposure lock (AE icon on the top right of the DJI pilot 2 app Figure 3).

You can manually fine-tune the exposure using the EV button (from +3 to -3 "stops") to make it brighter or darker (Figure 5). The AE lock will then hold that exposure target and adjust it as lighting changes. Ensure that you monitor and adjust exposure inflight as needed.



Focus

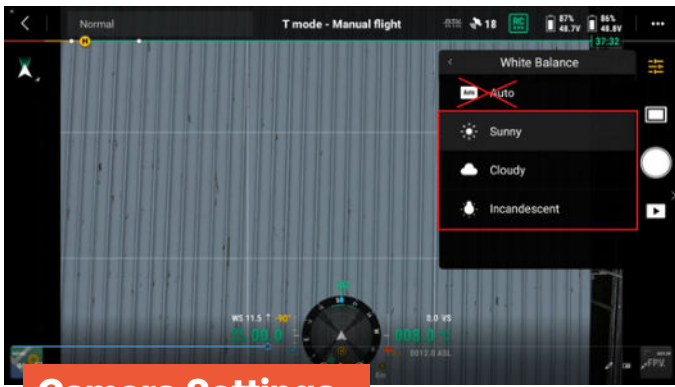
Figure 6



Adjusting focus - Figure 7

Use autofocus on the surface, once focused, switch to manual focus. Tap AFS (autofocus system) to switch to manual to avoid the imagery changing focus mid-flight. (Figure 6)

Don't forget to re-set the focus if you change your focus point or the offset distance.



Camera Settings

Figure 8

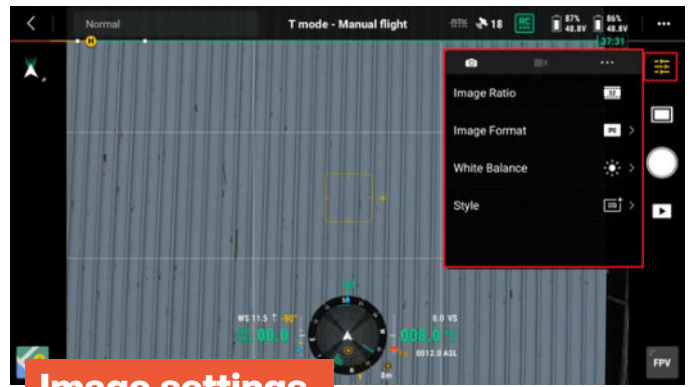


Image settings

Figure 9

It is always recommended to avoid using Auto White Balance and use the appropriate manual white balance according to the time of day or onsite conditions. For example, using "Sunny" during a sunny day. (Figure 8)

Suggested image settings include: (Figure 9)

- Use a 3:2 ratio
- Use .JPG unless you plan on bulk editing the image output
- Use STD style



Bulk photo editing

In the event you are required to capture an asset in poor lighting conditions, it is highly recommended that you run the images through bulk photo editing software to balance the exposure prior to uploading.

What can I edit?

Trendspek suggests only editing settings such as:

- Highlights (Bring them down)
- Shadows (Boost them up)
- Vibrance (Only slightly)
- White Balance

If you have not used a preset or manual White Balance (WB), we suggest you adjust the WB, so it is consistent across all photos.

💡 PRO TIP: Bright whites and dark shadows are the most common cause of missing information (holes) within a Reality Twin. It is suggested these be edited prior to upload.

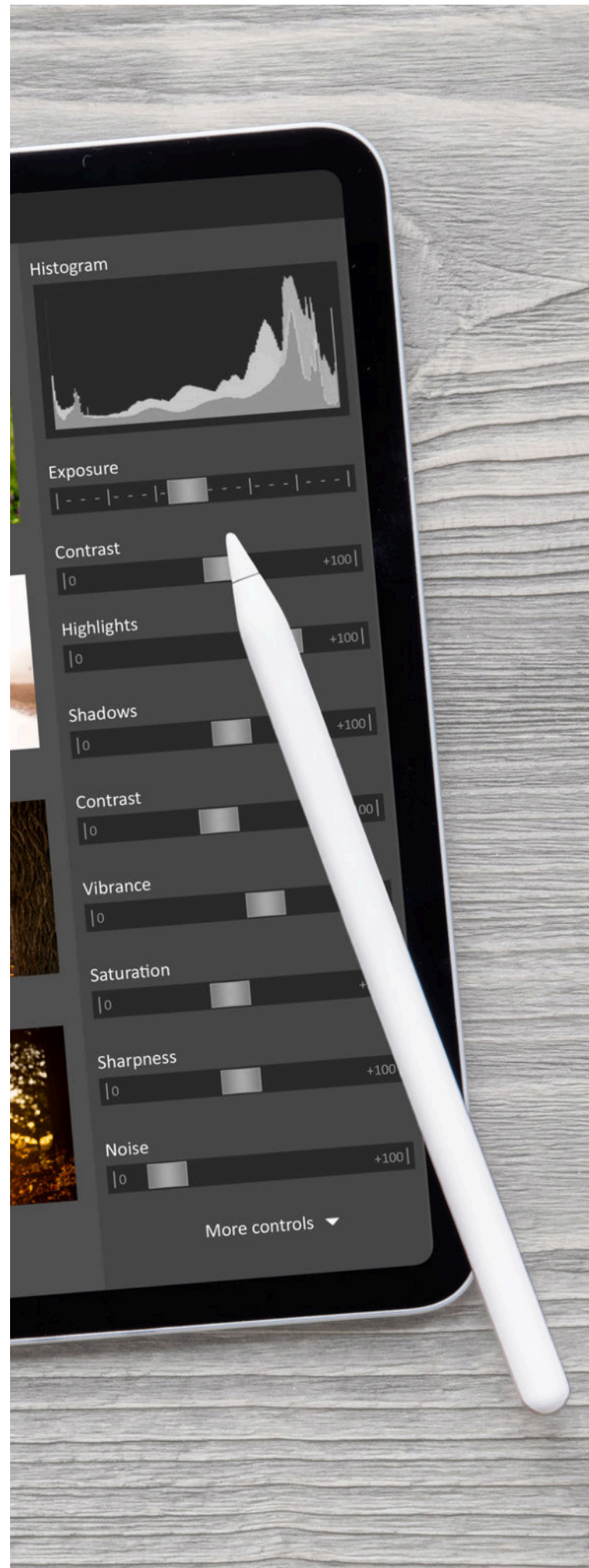
What do I NOT edit?

Once you have uploaded your imagery, Trendspek will read the metadata of each image to detect attributes such as lens type, camera type, GPS position and a host of other information needed to generate a Precision Reality Twin.

Ensure that you do not:

- Remove the Metadata
- Crop an image
- Apply any distortion filters or lens corrections

💡 PRO TIP: Double-check that you do not change any of the geometry of the image and the meta data is included.


















Capture checklist

-  Asset
-  Camera/Lens
-  Target Resolution
-  Offset distance



Pre-flight checklist

-  The capture plan includes the correct overlap of _____/_____ and transition imagery
-  Flight speed planned at _____ m/p/s
-  Image ration set (4:3 or 3:2)
-  Target shutter speed of 1/_____ using a fixed aperture of **f** _____
-  Offset distance / Height above asset set
-  Focus set
-  White balance set

Post-flight checklist

-  Validate capture coverage
-  Images are in focus without motion blur
-  Exposure is balanced correctly (No "blown-out" whites on the asset)
-  Images have a consistent white balance
-  Sufficient transitional imagery was captured (nadir to oblique)
-  Sufficient overlap was captured

Upload checklist

-  Do you need to bulk edit the photo output?
-  Is your computers "sleep" mode turned off for the upload?

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