How to Optimize Your Ground Control Point Placement

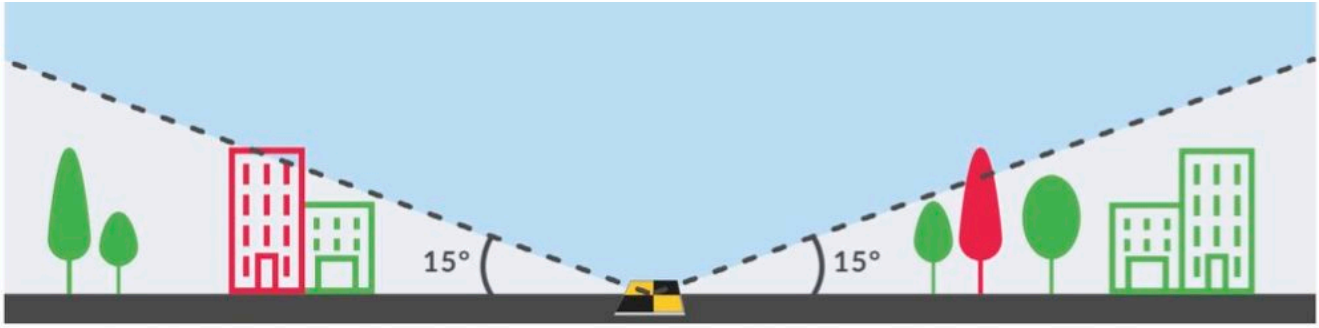
Ground control is the most important element of drone surveying because it ensures accuracy. RTK- or PPK-enabled drones are great in the air, but their accuracy does not automatically translate to the same accuracy on solid ground. Essentially, ground control points (GCPs) reduce the margin of error from a scale of meters to centimeters.

AeroPoints are smart GCPs that you can place around your site to capture vital ground control data. We sell them in sets of ten for better accuracy and to save time on surveying. But the big question is: where should you put them?

The basics of ground control placement

Think about pinning down the *whole* survey of your site, like weighing down a tarp over an object. If you don't have weights (GCPs) evenly spaced all around the edge, your whole tarp will will get distorted. Clustered weights will drag the tarp towards a single area. You also need a few weights in the middle to hold the tarp taut and flat (no "air bubbles"), so no part slips off or gets dragged up in the wind.

Keep in mind possible line-of-sight obstructions when planning placement. Set down all of your GCPs in clear view of the sky. Avoid putting them under trees, near fences, or any other obstacles.



Important: AeroPoints (and/or AeroStencil marks) should have an unobstructed view of the sky in every direction above a 15° angle.

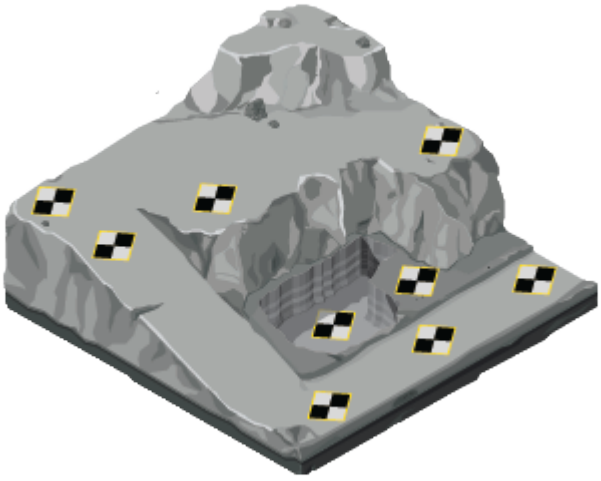
Commonly asked questions about ground control

Should I put more AeroPoints in spots I need the most accuracy?

The short answer is no. The long answer is *really no*—not only does it not increase accuracy, but it can corrupt the accuracy of your entire survey.

Let’s dive into an example to show how this works.

It’s reasonable to think that the *more* AeroPoints in one spot means even better precision. This image is how you might set up a site with that idea in mind.



But this common misconception leads to very frustrating results.

Notice that the markers are not surrounding the entire site; there aren’t any on the tallest

point; and some of the GCPs are clustered together around important sections. Also, only nine AeroPoints have been used.

The sections with poor GCP coverage actually pull the sections with good coverage out of place, rendering the entire model unusable. Since this survey can't be properly corrected, it leads to inaccuracy. This means having to refly the site (if possible), and potentially missing the opportunity to capture the site in this present state.

What is the best placement?

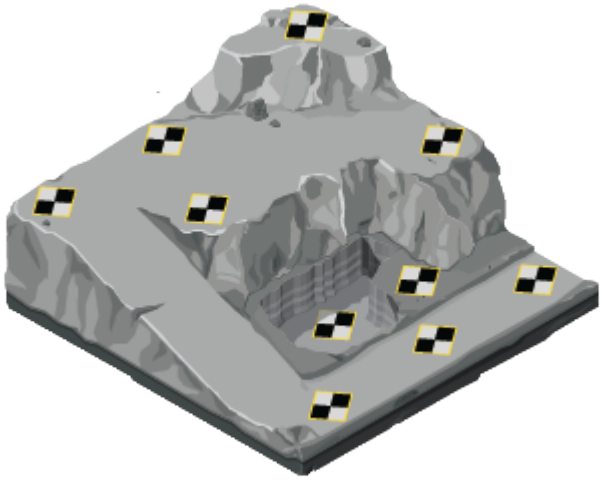
What you need is an optimal geometry of the GCPs **across the entire surveyed area**.

This is crucial, much more so than the number in a particular location. Placing them closer together in one spot doesn't saturate their accuracy. Think of doing a site calibration, you cover your whole site, not just the "important" parts.

Essentially, you want to create a shape bounding your site and distribute GCPs throughout the middle as equitably as possible—try to hit the lowest and highest elevations. If you have a giant "air bubble" in the middle and no AeroPoint on it, it'll be very hard to "pin down" the survey photos to that area.

What's a good example of ground control point placement?

Here's the same site again, but now with GCPs distributed with optimal geometry.



Notice that you can connect the dots and draw a shape around the whole site without taking your pencil off the paper—and the middle is covered. All ten AeroPoints are used

Naturally, you'll need different configurations depending on the shape of your worksite.

When planning placement, just remember the AeroPoints need to be placed around the perimeter and throughout the middle. You don’t want the imaginary tarp you’re anchoring down to wrinkle too much, or worse, flap in the wind. Those cases would make your survey data highly inaccurate or even unusable.

Refresh and test your GCP know-how

We’ve put together a little quiz to help refresh your knowledge. It just takes a few minutes. [Find it here](#).

Keep reading:

[Ground Control Tips: 6 Ways of Using Your AeroPoints](#)

[How to Use AeroPoints to Survey a Large Site](#)

[7 Questions to Ask a Drone Software Vendor Before You Buy](#)