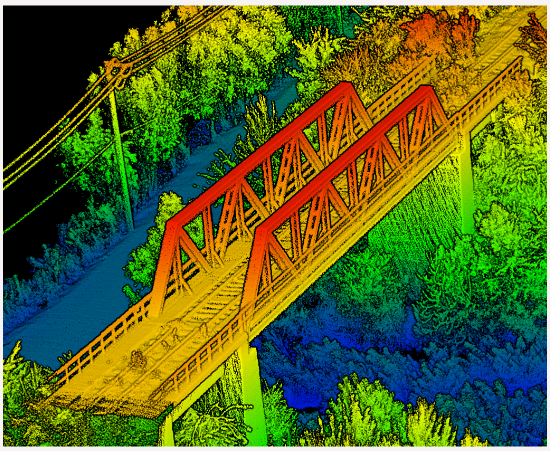
SOLUTION BRIEF

UAV mapping

BOOST YOUR BUSINESS WITH ACCURATE AND STREAMLINED GEOREFERENCING

Whether you're conducting UAV surveys on behalf of clients or for your own organisation, the quality of the data you generate is one of the most important indicators of success. Being able to generate high-quality surveys relies on robust and accurate localisation data; for UAV Mapping missions where flight time and battery life are important to manage, that accuracy needs to be provided with a low SWaP ratio solution.



In this solution brief, we'll be discussing the key localisation technologies available for UAV mapping missions, and answering key questions about developing a localisation solution for your mapping payload. We'll also show you how OXTS can help you get best-in-class localisation data for UAV Mapping, whether you're using LiDAR, photogrammetry, hyperspectral imaging, or something else.

UAV MAPPING LOCALISATION TECHNOLOGIES

There is a range of different technologies that can help you localise your UAV mapping survey data. In this section we'll discuss the use cases and benefits of each – and show you how OXTS can help you build your solution.

Ground control points

Ground Control Points (GCPs) are markers distributed across the space you are surveying. They're usually black and white or another pair of highly contrasting colours that make them easy to identify in your survey data. Each GCP is surveyed, giving it a precise position on the earth; from that, you can accurately georeference the rest of your survey data.

GCPs work relatively simply, which can be a benefit depending on your setup. However, they do need to be placed within the survey area, and surveyed themselves. Given that UAV survey missions can take place over enormous and sometimes diverse areas, setting up GCPs may be impractical – any errors with how they are placed or surveyed are also harder to rectify, and may require you to reconduct your survey. For drone surveys, where the area being surveyed is often relatively small or potentially indoors, GCPs aren't a viable solution either.

GNSS-aided Inertial Navigation System (GNSS/INS)

A GNSS/INS uses a combination of satellite data and inertial measurements to estimate its position on the earth. Installing a GNSS/INS in your mapping payload allows you to collect position data at every point of your mission, which can then be used to georeference your survey data. Using a GNSS/INS on a UAV can open up opportunities to map hard to reach, inaccessible, or dangerous areas, which by their nature, you wouldn't be able to get to with GCPs.

There are a few different methods of using a GNSS/INS to georeference survey data, and a few different types of GNSS/INS you can use.

Different methods of GNSS/INS localisation

Method 1:
Post-Process Kinematics (PPK)

PPK is a process that happens after the mission that applies various types of corrections to your localisation data to maximise its accuracy.

Method 2:
Real Time Kinematics (RTK)

RTK achieves a similar effect to PPK, but in real time. A GNSS/INS with RTK will give you more flexibility with where and how you can gather your data, however you may need to use correction services like NTRIP.

Different INS Technologies

Fibre Optic Gyroscope (FOG) INS

A FOG INS uses fibre optics to measure rotation. It's highly precise, and robust, but is also relatively large and expensive.

Micro Electromechanical System (MEMS) INS

MEMS INS technology is the most miniaturised INS technology on the market. Though the base accuracy and precision isn't as high as other technologies, they can be optimised and calibrated to deliver centimetre-level precision, and are much more affordable than FOG or RLG.

Ring Laser Gyroscope (RLG) INS

A RLG INS uses the same principles as a FOG INS, but uses lasers instead of fibre optics. RLG offers the best performance, but is extremely expensive and can't be miniaturised to the same level as a MEMS INS.

The OXTS GNSS/INS solution

OXTS GNSS/INS devices use a MEMS inertial measurement unit and two survey-grade GNSS receivers. Combined with careful calibration, sophisticated sensor fusion and an advanced navigation engine, they deliver FOG-level performance at MEMS pricing.

OXTS GNSS-aided Inertial Navigation Systems for UAV mapping.

xNAV650

xRED

Georeferencing tools

Once you have gathered your survey and localisation data, you will need to combine them using software tools to produce a fully georeferenced dataset. There are many tools out there, with varying degrees of precision and ease of use.

At this stage it's especially important to make sure that your sensor's coordinate frames are precisely aligned. The closer the alignment, the more accurate and clear your final result will be – especially if you're dealing with a LiDAR survey dataset.

OXTS Georeferencer

With OXTS Georeferencer you can quickly and easily combine localisation data from your GNSS/INS with raw LiDAR data to create georeferenced point clouds. You can also use our boresight calibration tool to precisely align your LiDAR and GNSS/INS for crystal clear point cloud data.

KEY CONSIDERATIONS

If you're not sure what type of solution is best for your work, the questions below should help you decide.

What area will you be surveying?
If you're surveying a relatively small and easily accessible area, GCPs might be appropriate. But if you're doing a large survey, or surveying a region where it would be difficult to place GCPs, a GNSS/INS would give you better results with less effort.

What type of airframe are you using?
Long-range UAVs that function like a conventional aeroplane don't have to handle SWaP constraints, but may require equipment that is protected against extreme environments. By contrast, quad-copter drones are unlikely to need ruggedised hardware, but will need a localisation solution that balances accuracy with SWaP constraints.

What level of precision do you need?
The precision offered by FOG or RLG systems is a little overkill for UAV mapping. A cheaper MEMS GNSS/INS will still deliver centimetre-level precision, at a fraction of the price.

What type of data are you gathering?
If you're conducting a LiDAR survey, accurate localisation data and precise calibration between your sensors is vital to produce a clear point cloud at the end.

What is your budget?
GCPs are arguably the cheapest localisation solution available, while a RLG INS is the most expensive. You need to balance the level of accuracy that delivers the right result for you, with the price that allows you to remain commercially competitive.

BUILD A BEST IN CLASS UAV SURVEYING PAYLOAD

You have a wide range of options available for gathering localisation data for georeferencing survey data. In our experience supporting a wide range of surveyors with their localisation challenges, a MEMS GNSS/INS offers the best balance of accuracy, robustness, ease of use, and affordability. The GNSS/INS allows you to create a self-contained surveying payload that can be deployed anywhere, any time, without relying on infrastructure like GCPs.

To learn more about how to get accurate and robust localisation for UAV mapping, and to discover how OXTS technology can help you, visit our application page on our website.

To learn more about what OXTS can offer UAV mapping professionals, visit our website