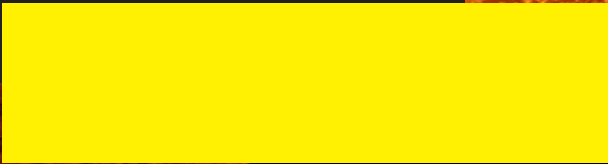




UAV Surveys Project Management and Monitoring

A proposed tool to aid your framework and help deliver excellence through the use of Drones, Mapping, Modelling, and Team integration online. Save cost, save time, and promote the 'correct behaviours'.



Overview Contents

UAV Surveys Project Management and Monitoring	1
What We Bring To The Table.	2
Calculation Making	4
A Different Perspective	5
Why Should You Work With UAV Surveys?	6
Why Should You Work With UAV Surveys? Cont...	7
Drone Data Analytics for Construction	8
Commercial Drones Are Revolutionising Work Sites	9
Know Your Project Status	10
See How Much Has Been Done And What's Left To Do	12
Monitor Site Productivity And Quality	13
Settle Disputes Easier Or Avoid Them Completely.	14
Track Progress Against Design	15
No Room For Abstraction	16
Ensure Safety On Your Site	17
Collaborate Using Immutable Truth	18
Work and Plan With Confidence	19
The Truth About Drone Law	20



Management & Monitor Service



What We Bring To The Table.

We've put together this overview to show how UAV Surveys can help you measure and manage your project sites. Whether you're new to drone surveying or are looking to scale up the drone work you're already doing, we hope to show how it can help you measure progress, productivity, quality, and cost on your projects. Here you can find substantial detail of how UAV Surveys delivers on those values for civil construction.

Due to its depth, power, and innovative nature this system and platform is definitely best demonstrated. However, we hope this document will go some of the way in explaining the concept and practise.

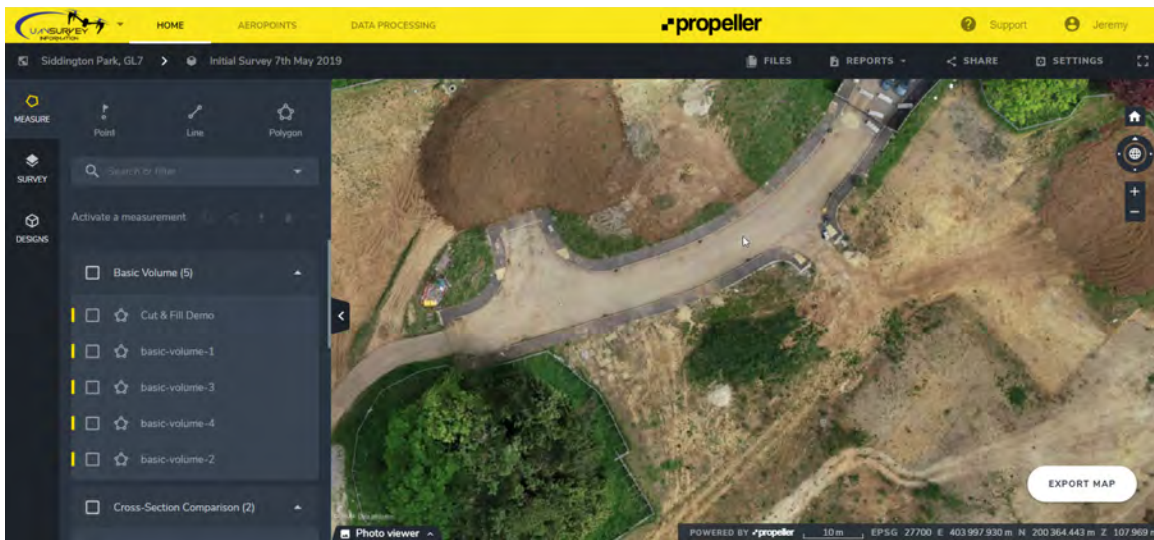
By the end of this document, you'll understand the means used to report how much work is done, how fast it's progressing, whether or not you're matching the plan, and if you're going to reach your goals on a project

UAV Surveys system can be used by both site personnel and the head office. The platform's flexibility allows you to present information to clients in multiple ways.

Adoption of our system allows you to do the following:

- Know your site's status
- Settle disputes easier or avoid them completely
- Track progress against design
- Ensure safety on your site
- Troubleshoot mobile plant operation
- Collaborate using immutable proof.
- Work and plan with confidence





Calculation Making

Our system allows you and your colleagues to do your own math using our interactive surveys, and 3D models. This is not in any way complicated as there are three main categories of calculation that can be made. Namely those that can be made using a point, a Line, or a polygon. Below is a breakdown of what can be measured in Each Category.

By drawing a point you can;

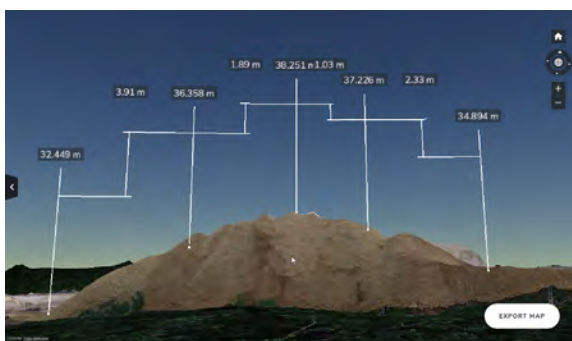
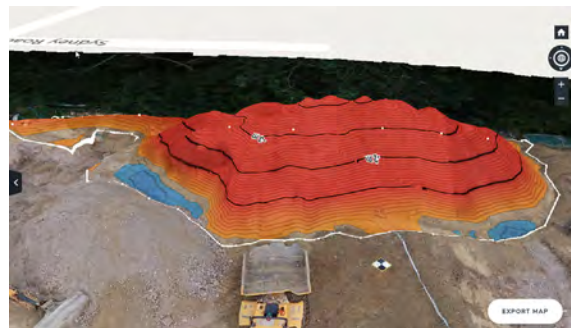
- Note an elevation point through history
- Bring attention to a point of interest (With notes)
- Log a safety concern, or Safety hazard. (With notes and Grid ref)

By drawing a Line you can;

- Berm Check
- Cross Section & Comparison
- Measure Distance
- Measure Elevation difference.
- Monitor Road Grade
- Measure slope angles.

By Drawing a polygon you can;

- Measure basic volumes (inc cut & fill)
- Earthworks progression monitor
- Stock Pile Analysis
- Surface Area
- Volume from lowest point.

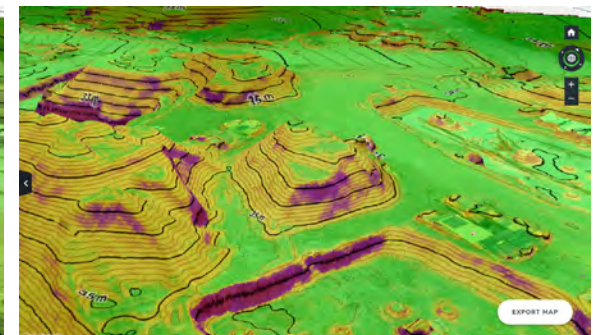
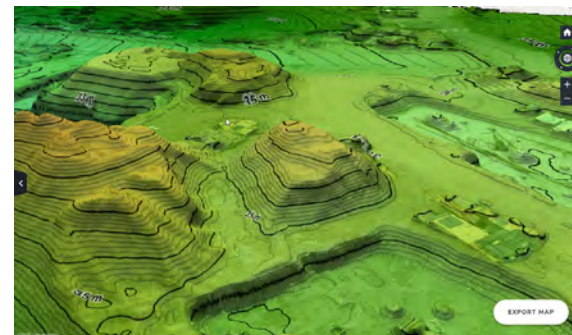
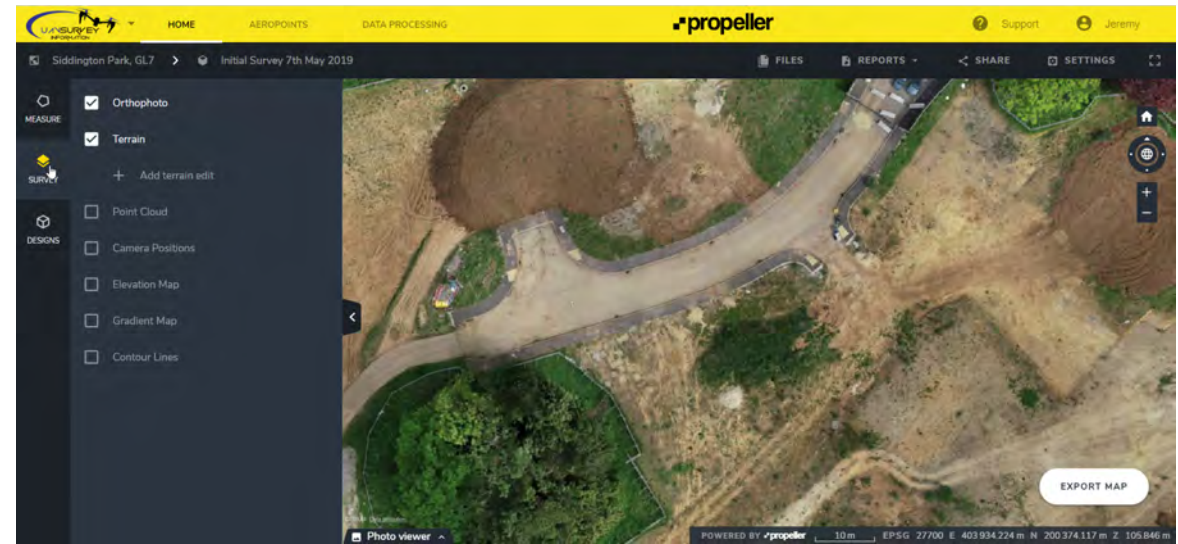
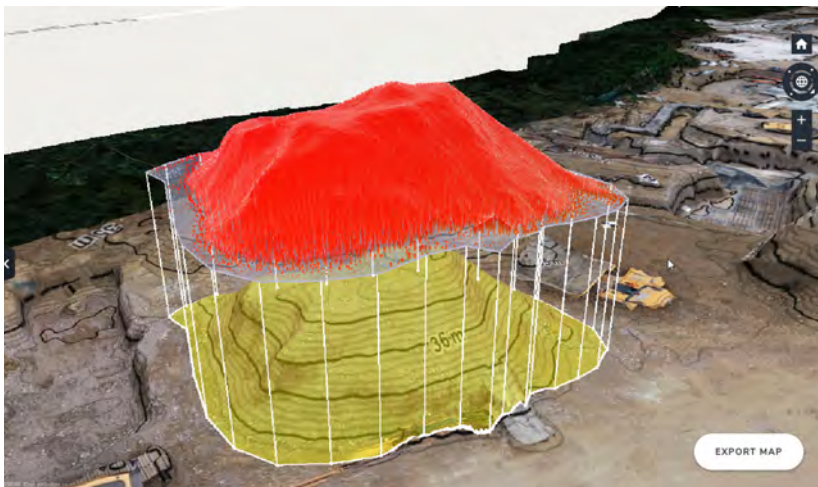


A Different Perspective

Drone Survey produces so many points of information on your site that it is possible to view it in a number of different ways. The point cloud allows you to see full 3Dimensional representation, but is not very useful for measuring. Bare Earth allows you to see and measure the ground in full 3d, but flattens infrastructure, trees, and vehicles so they don't impact on volume measurements. Elevation and gradient maps show height and elevation changes in incredible detail. Contour lines can be added and adjustment for quick reference.

All of these ground layers (formats) can be viewed, measured, exported, and used within CAD and BIM packages. DXF and CAD files can also be uploaded to your models as another layer to measure progress against.

There is so many features within our online tools to use and share, it is really best demonstrated... Something we are always very proud to do.



Why Should You Work With UAV Surveys?

Program delays are sometimes an issue.

UAV surveys want to offer a system that can help stamp out delay and stoppage. We do this by presenting an online management tool that provides full ground surveys, 3d interactive models, and the ability to measure anything you can see. When shared with interested parties the online platform insures any sign of disruption can be identified and acted on seamlessly. The evolution of any projects can be seen clearly through the use of an interactive time-line.

Project costs have at times been a concern.

Project budget and fiscal responsibility are important to all members of any project. With our interactive three dimensional mapping it is possible to measure volumes, distance, cross sections & elevations. It is possible to gain estimates and costs through a few simple clicks. E.g. cut and fill calculation is achieved in around 3 minutes.

The use of third party contractors, and designers brings risk of disputes.

By having continually updated information, deviation from original design can be spotted immediately. CAD surfaces, and CAD line based layers can be added to show progress against the plan and are visible on any of the 3d models we provide. This will help avoid any disputes or disagreements before mistakes become serious, irreversible, and costly.

Health and safety is important to my organisation.

With full high resolution top down maps of your projects you and your teams are able to see exactly what is on the ground. From this unique perspective health and safety risks can be clearly identified, and notations passed throughout the workforce instantly, and unambiguously. Inventory of hardware, raw materials and aggregates can also be closely monitored and audited.

We are keen to see our projects be on time and on budget.

Although the system we provide is useful for monitoring (carrots & sticks) it is also something you can share with your chosen teams to aid productivity, reducing carbon footprint, and be seen to help productivity in almost every area of design, planning and groundwork. This helps cement the relationships between contractors, and allows you to provide tools and innovations to strengthen your partnerships. All of this should help assure the success of the current framework.

No contractual obligation between chosen designer, consultants and contractors brings a risk to us.

It is very clear that most companies wants to create an atmosphere of cohesion and good will amongst its chosen contractors, designers, etc. However, it is inevitable that at times the interests, and commitments of each will be in conflict. Our system gives such clear representation of your project that conflicts can be predicted, shared and resolved before they become disputes. With our company being totally independent within the process the data would be viewed as impartial by all users of the system.

Why Should You Work With UAV Surveys? Cont...

Quality of work is an important element to contractor selection.

If a picture is worth a thousand words, then a shareable 3d interactive model with analytic suite speaks volumes. UAV Surveys online platform allows you to view all parts of your projects, zoom in, pan around, walk through and check on quality whenever and as often as you like. As your projects evolve you can see if any quality aspects are being lost or are falling behind.

We have agreed KPIs throughout any project life cycle

Akin to quality monitoring a three dimensional analytical models of your site from start to finish will allow all parties to monitor progress against agreed KPIs. What is more, the data has been provided by an independent company with 'no axe to grind', and the data is fact. Any likelihood of missing a KPI can be picked up early, and should a contractor continually miss KPIs the data is clear and immutable providing an unprecedented level of proof.

Our clients and /or investors need to be kept in the loop on our projects.

With our system in place you would be able to improve productivity of your teams, but also report to your clients in a way that is visually stimulating and unambiguous. This can help get your working relationships through innovation, high visibility, and independently sourced data. You get to choose how much you share and when by reducing the viewing rights of client members. Or you can chose only to show the highlights of your work in a face to face demonstration using your 3d models and analytic data.

We enjoy working with well organised and up and coming companies.

UAV Surveys is a small innovative up and coming company. With an office in Wales, and another in England we are able and willing to travel to any site. Our surveys, modelling, and analytical data would benefit you, your suppliers, contractors, and clients. We would be fiercely independent in nature when it comes to your chosen teams, so everything you are given in the way of mapping is not tainted by bias, or even underlying knowledge of your projects. You would be dealing with a maximum of two people and due to our size and infrastructure we can be flexible in when and where we are deployed.

We are always looking for innovation within our approach to projects.

Construction companies can benefit greatly from innovative approaches to compliment their project frameworks. Drones (UAVs) are taking the construction industry by storm. Coupled with a robust online management system (No software required) there is very little which can be more innovative than taking hundreds of photos from 120ft in the air, and producing 3d models, orthomosaics, and analytical data to share across your teams and clients. This approach reduces cost, increases visibility, and helps avoid delays and disputes whilst reducing health and safety risk. It is Eco friendly and aids open communication and transparency between partners.

Drone Data Analytics for Construction

We're going to break down how UAV Surveys can streamline work flows to save time and money by closing the information gap between all parties involved in your projects.

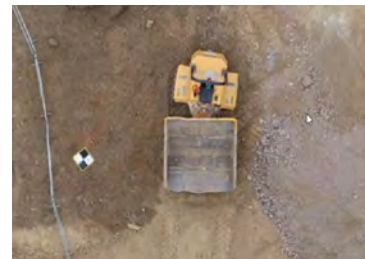
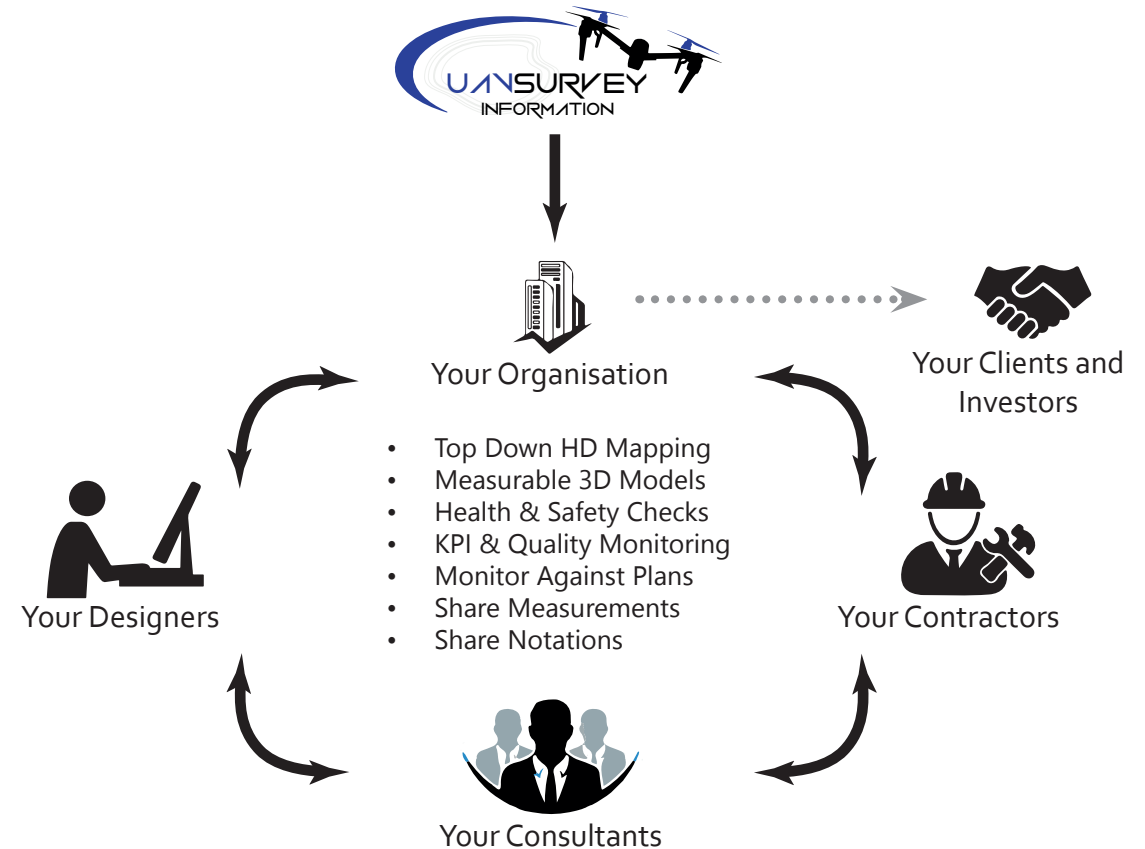
As per the adjoining illustration, we at UAV Surveys would be delivering impartial, independent survey data. Within the data are interactive 3d models of your work-sites where anything can be measured and shared. Full HD imagery through photogrammetry ensures sites can be viewed from the top down and any other conceivable angle.

It would be entirely up to your organisation whom you share this interactive resource with. However, we would suggest you share all aspects with your contractors, designers, and consultants, as it would become a highly valuable shared resource. All parties contributing to the same data sets will help avoid delays, stoppages, disputes, and misunderstandings. A resource provided by you to aid everyone.

Being that the data reaches you first you are also able to use it to report to other interested parties and /or Clients, choosing what they see, but giving enough information to help build a positive picture of progress.

The benefits of sharing an interactive project management system would be;

- Your own monitoring of a project, and its progress.
- Ability to report progress to other interested parties.
- Providing a platform for your chosen suppliers to share information.
- Promote interaction between your workforce.
- Accurate survey data for your contractors to calculate all aspects of work.
- Unbroken communication between site and designers comparing progress to plan.
- Ability to walk the site with your team through video conferencing (Eco Friendly)
- Monitor site evolution and progress through a detailed time line.
- Use innovation to reduce cost, time, and avoiding conflict whilst reducing delays.



Top Down HD



Bare Earth / Infra Flat



3D Point Cloud

Commercial Drones Are Revolutionising Work Sites

It's a fact: surveying is an irreplaceable part of construction, but it can be time-consuming, costly, and sluggish overall; Further more, depending on your operations, infrequent. Design conformance is a big deal, and you want to know as soon as possible if you're outside of design. Same goes for progress tracking and quality assurance.

Advances in technology have made the drone an affordable tool for work sites. While a drone may seem like a fancy piece of equipment, drones have become no more unusual than a GPS rover, but just as vital.

UAV Surveys have all of the required licences, and certification to carry out commercial flights just about anywhere within the UK. Our pilots are all PFCO holders, and the company is covered by hefty public liability insurance.

You can usually survey an entire site in less than half a day, depending on area and the drones we are using. Our flight paths become uniformed so all data sets correlate at every re-visit. The only change visible in your surveys are the evolutions taking place on the ground.

We have several Drone types and make sure the best is selected for each flight, and scenario. Our 'Ground Control System' is cutting edge and brings accuracy akin to traditional means but without the time, expense, and professional estimation.



Know Your Project Status

Accessed from the browser on your device, the UAV Surveys platform uses photogrammetry methods and our software to stitch the images together. This involves pinning the images to the ground control positions, then with powerful machines our in house data experts analyse all the raw photos, find overlaps and common points in images and make a 3D reconstruction of the terrain.

Thanks to ground control points (GCPs) and a known coordinate system (local calibration or otherwise), your data is accurate. This means you can measure from the visual representation on your web browser. Know your site's progress and productivity in a few clicks by reviewing the site time line and checking the physical site against your design.





Laying one of our
10 Ground Control
Points (GCPs)

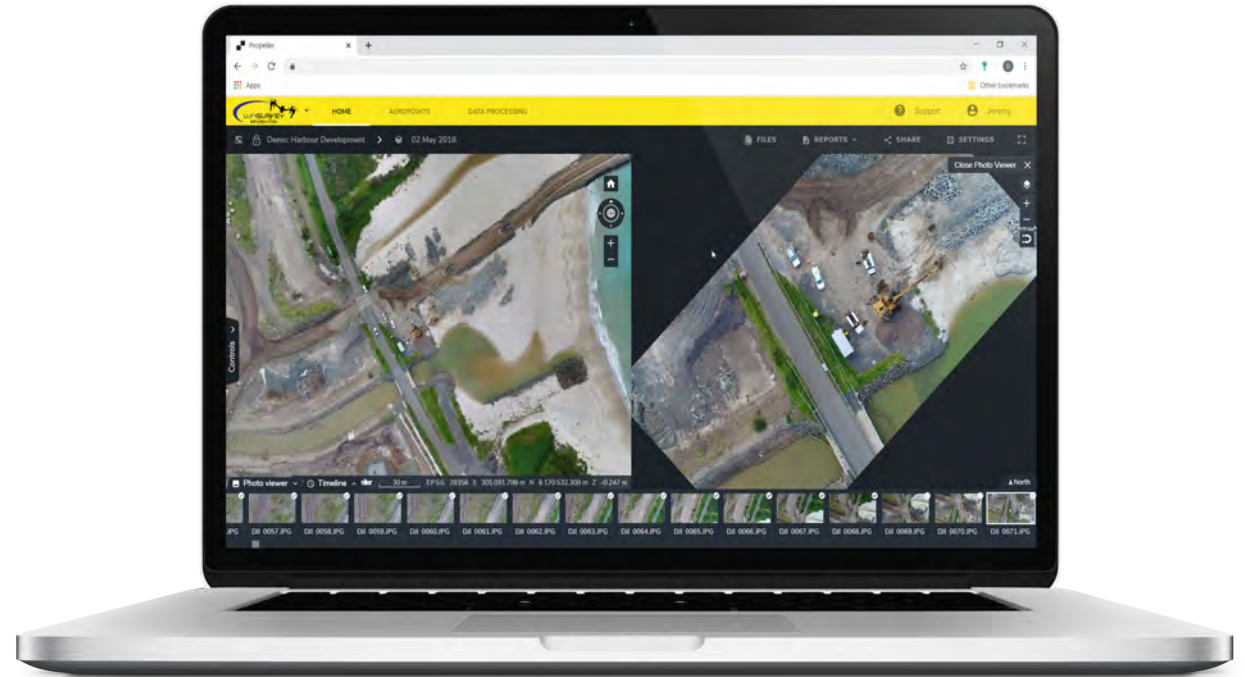
AeroPoints are the world's first smart ground control solution, purpose-built for drone operations. Featuring a solar panel, battery, GPS, and WiFi inside each fully sealed, rugged, lightweight unit, AeroPoints make capturing accurate data simple and highly effective.

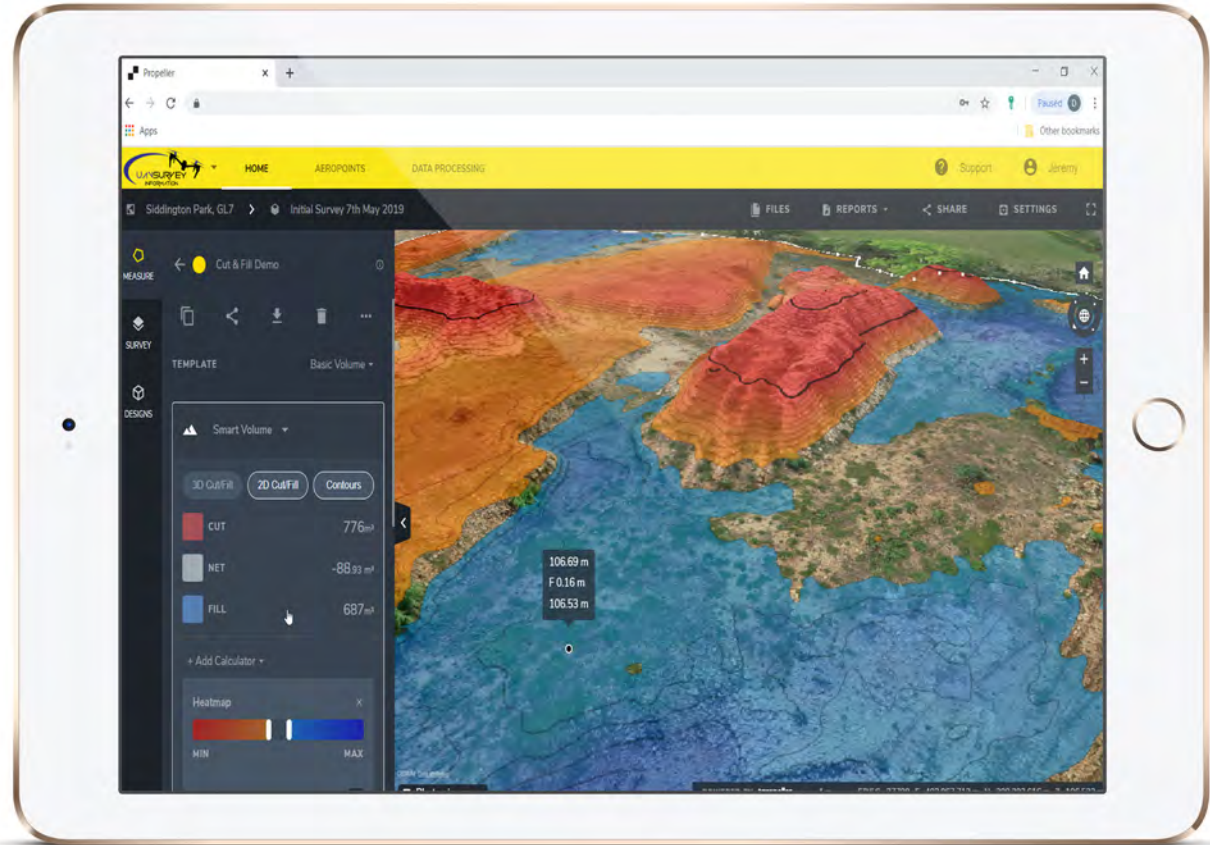
See How Much Has Been Done And What's Left To Do

Using the easy-to-navigate interface takes minutes to master. You can check site volumes in seconds—and then track changes over time with our reports and time line features.

Similarly, volume measurements are quick and simple to complete. With additional calculators, you can take the guesswork out of your measurements. You can easily see and measure what has been moved, so you can quickly understand the status and how much of a particular job has been completed, and how much still needs to be done.

While we'll be talking more in-depth about safety later, it's important to note that drone surveying enables you to monitor your projects more closely. With frequent surveys and easy grade checks, you can keep track of performance.





Monitor Site Productivity And Quality

Of course, knowing how you're faring against design is the main goal. The UAV Surveys Platform allows for uploads of design surfaces and line-work. This gives you an overlay on the 3D site survey, which instantly highlights how you're progressing and if your work is to specification. It takes the guesswork and abstraction out of the process, and lets you have a visual conversation with your teams.

With more regular progress and productivity tracking, you can spot problems before they become expensive. Think of it as the difference between pro-action rather than reaction.

Traditionally, by the time information gets to you about a mistake, it's all you can do to just put out fires and maybe start work over. But because drones are more cost effective and efficient, we fly as frequently as you want to gather data, thus closing the information gap between you and your site. Results are delivered within days.

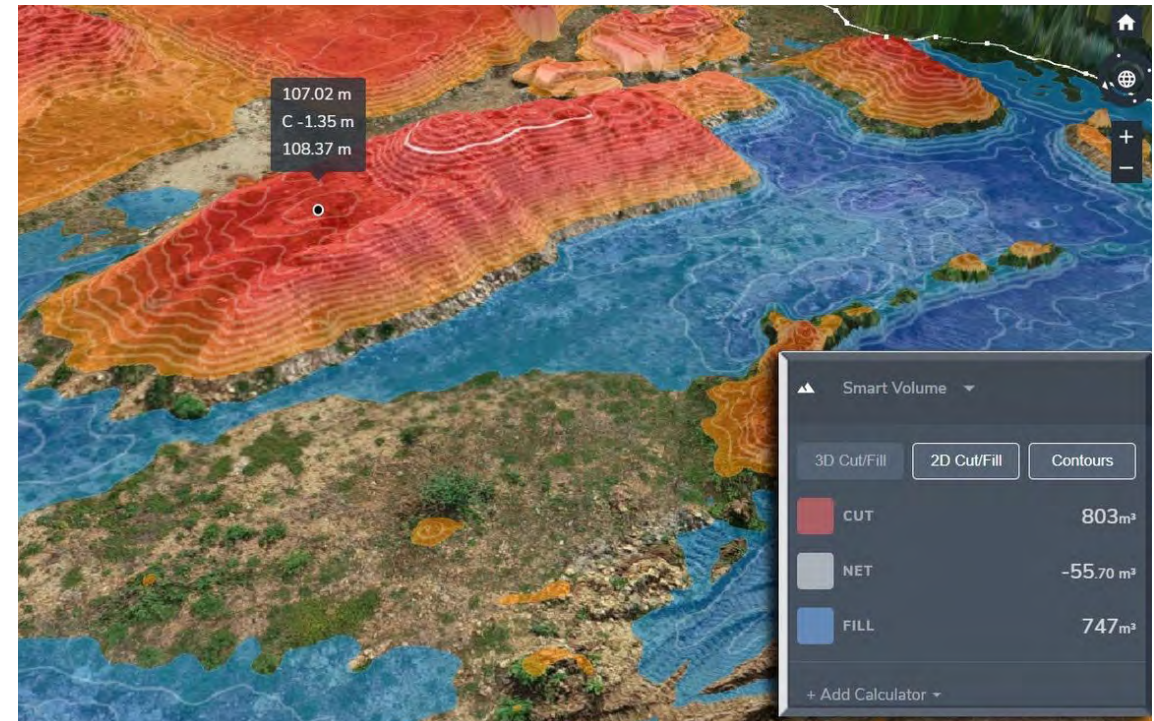
Settle Disputes Easier Or Avoid Them Completely.

Since drone surveys can be completed more frequently, you have a visual, detailed account of what went where and when. UAV Surveys time line tool allows you to slide between survey dates from one flyover to the next viewing progression and changes in a cross-section view. Month on Month progression monitoring brings many benefits not only to you as the ring master, but to your contractors through tighter planning and controls. Recent examples of this are:

- We have been tasked by a Welsh based construction company to prove that ground clearance costs were being undersold in the first instance to gain the work, and then costs inflated beyond the competition once the work was won. With our UAV Survey it was proven that almost half of a crush pile was conveniently missed by the ground clearance companies surveyor. Our client was able to correct this behaviour before it became very costly.
- On a site in Wiltshire, our Drone surveys proved pivotal in estimations of cost. A work site had been started and then abandoned before going up for a new tender process. With less than a week before a bid had to be placed, we surveyed 12 acres in a matter of hours, delivered our survey in 2 days, and they produced cut and fill reports and estimates in 5 minutes of receiving the data. Needless to say being able to prove the cost to the client instead of a blind bid, won them a £35,000,000 contract.

Having a paper trail and easy-to-understand visuals enable you to settle disputes if they come up and troubleshoot problems as they happen to avoid legal complications or fines.

Further, with UAV Surveys simple sharing and permissions options you enable transparency between you, your team, and other stakeholders. Avoid mistakes and misunderstandings by working from a single online resource, and independently sourced data... An immutable truth.



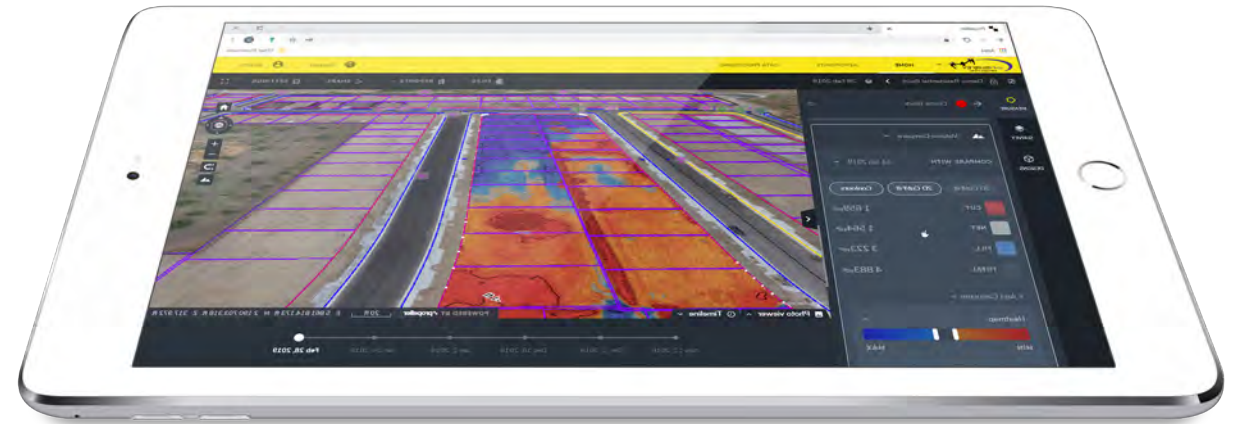
Track Progress Against Design

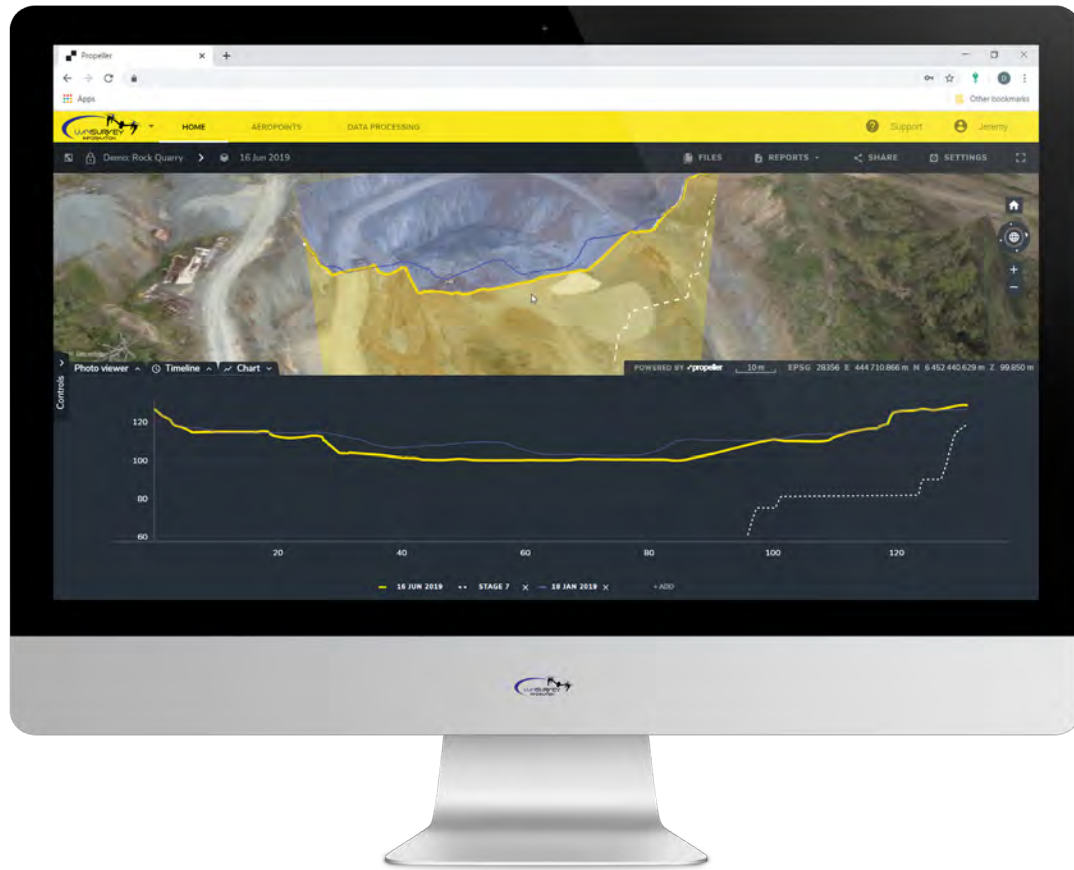
Regularly checking your site against design goes a long way, but it's difficult to generate those comparisons quickly with traditional methods. Spotting a problem before it becomes expensive is ideal, but is not typically a part of the status quo. UAV Surveys wants to change that.

Shareable, version-controlled 3D site surveys resolves many issues. With UAV Surveys, you can have an unlimited number of view-only users and a designated number of admins—all working off the same, up-to-date information. Uploaded design surfaces can be viewed at any time against any survey captured for that project.

With the ability to Download our data in a BIM, and CAD friendly format, a line or surface layer can be injected into the survey data. Unprecedented planning, monitoring, and communication levels are the result.

This removes the conversation barriers that arise when you use drawings or visual inspections to gauge where you are against design.





No Room For Abstraction

A trained engineer might have no problem visualizing the plan in their mind, but if you want to brief one of your team members—or your client—it's best practise to take abstraction out of the conversation.

Using the 3D site survey, not only can you “walk” someone through different areas, you can also turn on the design overlay (also in 3D), and show them how the site today compares to the final schematic

In the past spotting mistakes has been a costly process due to the errors not being picked up in good time. An example of this is the case of drainage pipework under the M4 during an infrastructure upgrade. Due to the multi layered, two dimensional nature of the surveyors drawings, a mistaken reading of the plans resulted in the drainage pipes being laid up hill. Such a mistake meant extra time, and a lot of money had to be spent before water-flow could be restored.

Although this happened many years ago (drone technology was yet to emerge) it proves that fundamental mistakes can and do happen. Had our services been employed the error would have been picked up before groundwork had progressed too far reducing the fallout, or more likely preventing the issue altogether.

Ensure Safety On Your Site



The first priority on any site is safety. From everyday safety plans to inspections to traffic management, safety is in everything you do. However, these things take time and resources to get right, and they are mandatory. The UAV Surveys platform allows you to trim time and man hours off these tasks, thanks to that easy-to-navigate and shareable 3D survey. Because the surveys are accurate and up-to-date, the need for in-person inspections are decreased, or sometimes eliminated.



For example, you could provide the inspector with view-only access, and they could visually inspect your site from miles away on any browser-enabled device.

With the line tool, you can quickly measure access roads to ensure they meet safety standards. Short- and long-term traffic management can be streamlined with accurate, bird's eye visuals of assets, past vehicle movement, and existing roads.



And, of course, we can't underestimate the value of accurate and up-to-date site maps. Both the orthophoto and individual shots are accessible and downloadable from our platform. Use them however you like: display a site photo in the office, use it to map out that day's route with your team and/or visitors, etc.

Collaborate Using Immutable Truth

Everyone reports to somebody. Collaboration and reporting should be painless, but it's often anything but. Also collaboration challenges span the entire life of any project. At each stage, ensuring the right parties have the information to understand a project's needs and complete their work on time, on budget, and to specification is critical to success. Check too if estimates are correct, measure progress quantities, and accurately compare the initial survey to the actual initial site status.

Because our platform is a browser-based tool, instead of traditional desktop software, it means that anyone with an internet browser can use it without installing complicated programs. Personnel back at the main office at the edge of the site—or miles away—can see the same information and share measurements and notes with the whole team.

Further, it houses everything in the same place: your present and past surveys; your designs and any iterations; your notes; your reports; and, of course, all your files in the formats you require. This makes access and collaboration, whether with the head office or your on-site team, painless.

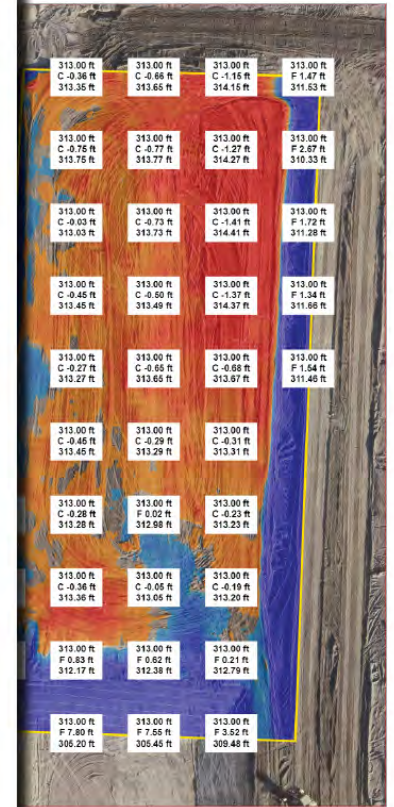
On occasion not every person on your site needs, or should, know what's happening everywhere. UAV Surveys has no limits on the number of view-only users you can share your site with, making it simple and cost effective to give everyone the best collaboration solution available. You can set permissions for different teams or individuals, as you see fit.

Additionally, we have readable, ready-to-go reports in both CSV and PDF that can be generated, printed, or emailed. These tools, along with our platform can help mitigate delays due to inclement weather, accidents, bad estimates, and more. With UAV Surveys, you can close the information gap between you and your site.



Basic Volume (polygon)						
Area	Area	Volume	From	To	Reference Level Volume	Reference Level Volume
Id	Id	Id	Id	Id	Id	Id
A	basic	basic	24 Jan 2019	reference	1 626.29 yd³	682.282 yd³
	volume	volume		level		944.003 yd³

FROM DATASET	24 Jan 2019
TO DATASET	reference level
REFERENCE LEVEL VOLUME	FILL
	1 626.29 yd³
REFERENCE LEVEL VOLUME	NET
	682.282 yd³
REFERENCE LEVEL VOLUME	CUT
	944.003 yd³



Work and Plan With Confidence

Measuring and managing your site with drone data analytics saves on time, money, and mistakes. As we've seen, the UAV Surveys platform gives you the power to see the status of your site in minutes, measure volumes with a few clicks, troubleshoot frequently, and, with rock solid data and a time line for the life of your site, resolve disputes should they arise.

Further more, you can streamline work flows related to safety planning and inspections, collaboration and planning, and day-to-day operations all from the browser on your device. Cut down on commute time and cost by having a recent visual of your site with you wherever you are. Reduce site visits and your carbon footprint. Use your models through video conferencing, and increase productivity through transparency, and promote the correct behaviours within your teams.

“ UAV Surveys gives us the ability to compare ground field work to construction models quickly and accurately, this enables us to have more efficient and effective coordination meetings. ”

“ They go out and fly a site in just a few hours, and without me having to lift a finger they have uploaded the data for me to use and share. It simplified everything that we do. ”

“ Instead of calling me every time they need a volume, the Project Managers can log on to the platform and get it themselves without waiting. ”



The Truth About Drone Law

Are you unknowingly breaking the law?

What is a PFCO?

A Permission for Commercial Operation (PFCO) is the legal document you need to operate a drone commercially in UK airspace. Until August 2016 this was known as a Permission for Aerial Work (PFAW).

What is the Law?

Small unmanned aircraft are now widely available for commercial use. More popularly known as drones, just like many other devices, they can cause injury or damage if they are not used responsibly and so are subject to specific safety rules relating to the way they are operated, which are underpinned by UK law.

The regulations are contained within the Air Navigation Order 2016 (ANO 2016) and there are some specific additional steps that must be taken if a drone is being flown for commercial operations...

Without a PFCO commercial use of drones is Illegal.

The UK Law uses the following term to define commercial use... Using data obtained using a UAV for 'remuneration or other valuable consideration.' But what does that mean?

It means the following;

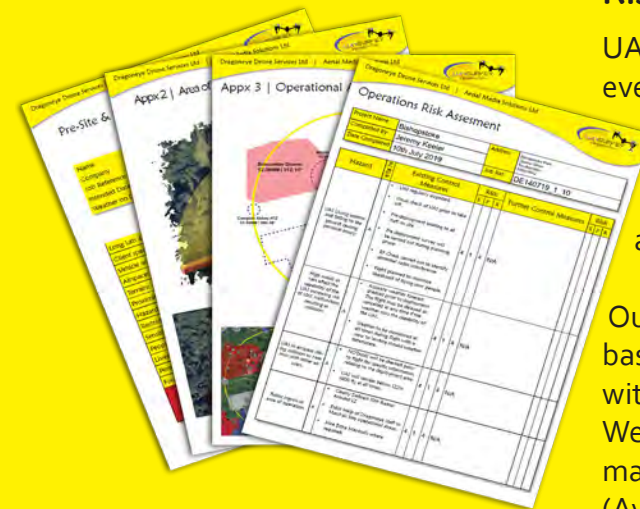
- Images, Video and / or data being used to monitor progress.
- Images, Video and / or data being used to plan operations.
- Images, video and / or data being used to view, or communicate about your site.

Any use of a drone and its data to help your commercial organisation in any way is classed as commercial use, and is **ILLEGAL** without a PFCO.

How the professional and legal companies operate

All PFCO Operators are required to do the following to ensure your organisation remains legally compliant when using our services and skills.

- Undergo extensive training covering regulation, airspace, first aid, and more.
- Pass an exam meant for commercial pilots laid out by the CAA.
- Pass a very demanding flight exam that proves our ability to fly legally and responsibly.
- Create a working operations manual agreed with the CAA detailing our operational procedures (updated and re-evaluated annually & available on request).
- Hold public Liability Insurance to cover our operations.
- Create Risk assessments for every single commercial flight.
- Log all battery usage and charging cycles
- Maintain our drones, and log all maintenance schedules.
- Pose no risk to Public or Property.



Risk Assessments & Ops Manuals

UAV Surveys provide a risk assessment for every site we survey, and commercial flight we undertake. If we didn't do this we would not be covered by our specialist Drone based public liability insurance and couldn't operate.

Our assessments take airspace, and ground based risk into account, and tie in neatly with your own Health and Safety policies. We also operate under a strict operations manual which has been agreed by the CAA. (Available on Request). Every Pilot working for us is fully PFCO Trained and qualified to fly commercially.