



**TRIMBLE UNMANNED
AIRCRAFT SYSTEMS**
FOR SURVEYING AND MAPPING





TRIMBLE UAS AERIAL IMAGING SOLUTION:

INDUSTRY-LEADING UAS MAPPING SOLUTIONS FOR ALL YOUR APPLICATION NEEDS

TRIMBLE PRIDES ITSELF ON BEING A LEADER IN INNOVATION. BY SETTING NEW INDUSTRY STANDARDS TO IMPROVE OUR USERS' EFFICIENCIES AND DELIVERABLES, WE ARE PROUD TO PROVIDE EVEN MORE BREADTH AND DEPTH TO OUR PORTFOLIO BY OFFERING THE FIRST, AND ONLY, COMPLETE AERIAL IMAGING SOLUTION SPECIFICALLY DESIGNED FOR SURVEYORS AND GEOSPATIAL PROFESSIONALS.

WHY UAS AERIAL IMAGING?

Many surveying and mapping professionals across the world successfully use the Trimble UAS Aerial Imaging Solution for their applications because it is:

- A highly economic solution that enables aerial mapping, once reserved for the largest surveying & engineering firms, to be used by the masses
- A safe solution that enables surveying of rugged, hazardous, hard-to-reach or unhealthy areas without risking injury
- An efficient tool giving the ability to collect and process data faster than traditional terrestrial-based survey technology
- Designed to quickly plan a flight and collect data, allowing rapid response to your customers' needs
- An advanced technology that can easily be used to serve numerous professional markets and applications

BUILT FOR ALL YOUR APPLICATION NEEDS

Trimble UAS Aerial Imaging solutions are designed to drastically reduce time and cost to collect aerial data and guarantee the reliability you need for a range of applications including:

- Engineering & Surveying
- Mining
- Civil & Heavy Earthworks Construction
- Oil & Gas
- Environmental & Landfill
- Public Agencies
- Agriculture & Forestry

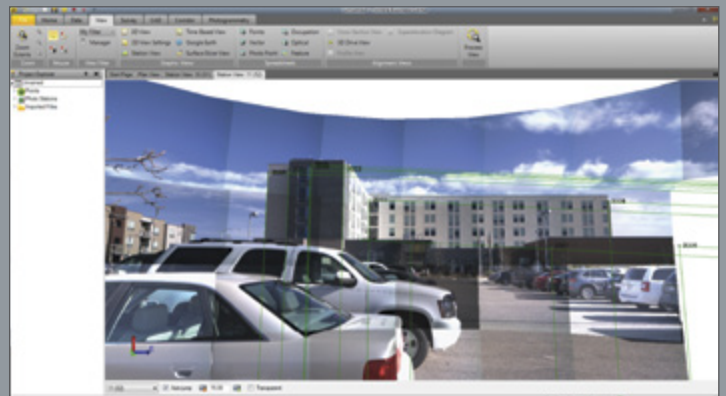
Within each of these industries, aerial imaging can be used to perform a variety of tasks and produce a range of deliverables. Trimble UAS Aerial Imaging solutions are being used to perform boundary & topographic surveys, site & route planning, progress monitoring, as-builts, volume determination, vegetation health and disaster analysis. From a single flight, operators are able to generate feature maps, topographic contours, 3D surface models, orthophotographs, and Normalized Difference Vegetation Index (NDVI) maps for vegetation.



TRIMBLE VISION: MEASURE WITH SPEED AND SAFETY

Deliverables collected with Trimble UAS can be combined with Trimble® VISION™ technology such as Trimble total stations and Trimble 3D laser scanners for a one-of-a-kind solution in the market. By combining data collected with Trimble's leading edge photogrammetry technology, such as the Trimble UX5 Aerial Imaging Rover, Trimble VX™ Spatial Station, and Trimble TX5 3D Laser Scanner, users can visualize their project from multiple perspectives, measure points within the images and create 3D models of the infrastructure and terrain.

Learn more about Trimble VISION technology at www.trimble.com/TrimbleVision



TRIMBLE UX5 AERIAL IMAGING ROVER



A NEW STANDARD IN MAPPING – NO MATTER WHAT THE JOB

ENGINEERED TO HELP MAPPING AND SURVEYING PROFESSIONALS WHO REQUIRE THE HIGHEST ACCURACY WORK MORE EFFICIENTLY, THE TRIMBLE UX5 SETS A NEW STANDARD IN MAPPING AND SURVEYING BY COMBINING A ROBUST AND HIGHLY USER-FRIENDLY SYSTEM WITH A CUSTOM-DESIGNED CAMERA THAT OFFERS THE MOST IMPRESSIVE DELIVERABLES. THE TRIMBLE UX5 KEEPS YOU PRODUCTIVE ALL DAY LONG – WHATEVER JOB YOU’RE WORKING ON.

WHY THE TRIMBLE UX5?

- Leading image acquisition quality and data accuracy
- All-terrain and all-weather performance
- Precise landings in confined spaces
- A durable and reliable solution for intensive use
- Fully automatic workflows for ease-of-use and safe operation



SMALL PLATFORM – HIGH IMAGE ACQUISITION QUALITY

The Trimble® UX5 Aerial Imaging solution uses the latest developments in the 'prosumer' camera market, ensuring optimal image quality along with maximum photogrammetric accuracy. The UX5 camera has - unlike a traditional compact camera - a large imaging sensor that captures very sharp, color-rich images, even in dark and cloudy conditions. The camera and its custom optics give the UX5 the ability to capture data down to an incredible 2.4 cm resolution.

WORKFLOWS ENSURING EASE-OF-USE

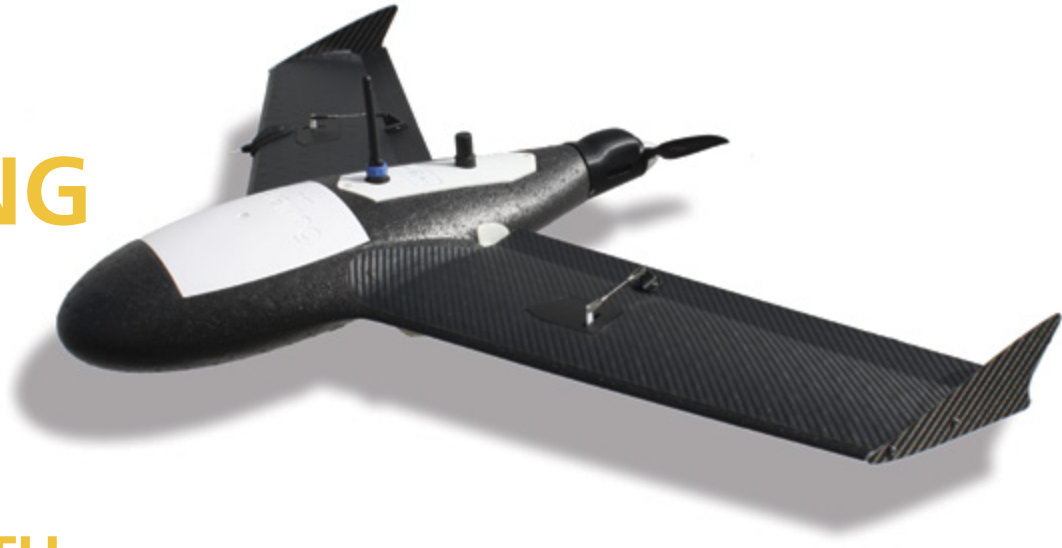
The all-new Trimble Access™ Aerial Imaging application runs on the Trimble Tablet rugged PC and allows users to plan their aerial missions, performing pre-flight checks and monitoring your flights - all with intuitive workflows that ensure reliable results. In the field, the operator is guided through the pre- and post-flight sequences with step-by-step digital checklists. Many of the Trimble UX5 checks are automatically verified by the software and do not require any interaction from the operator. The fast and intuitive workflow allows the Trimble UX5 to be ready to fly in less than 10 minutes ensuring minimal downtime.

MAXIMUM PERFORMANCE

To keep the Trimble UX5 users productive all day long even in harsh weather conditions, we have focused on a very robust design when engineering the system. Conditions such as heavy wind, light rain, heat and very cold temperatures are absolutely no challenge for the Trimble UX5 which makes it your dependable solution to gather quality data without compromising coverage.



TRIMBLE GATEWING X100

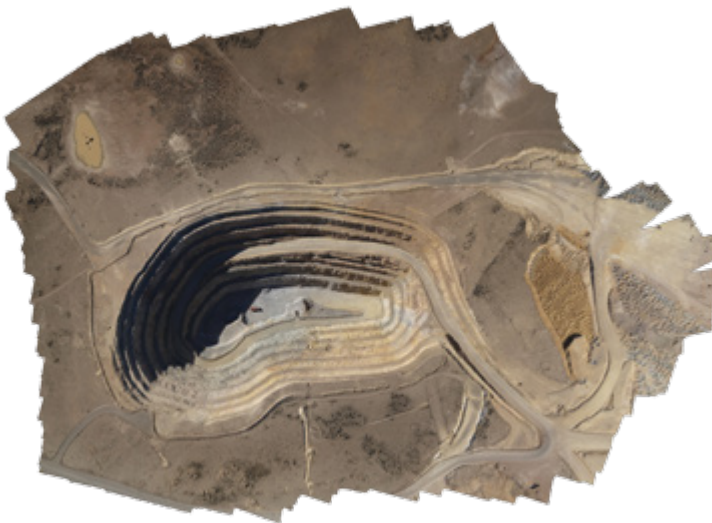


MAP YOUR PROJECTS WITH CONFIDENCE

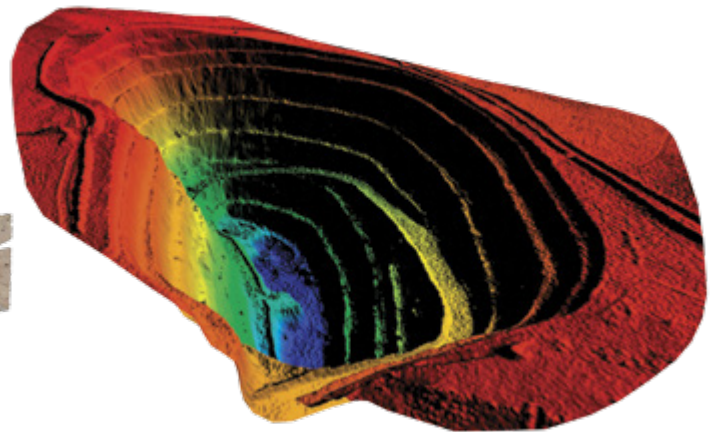
THE TRIMBLE GATEWING X100 IS DESIGNED FOR MAPPING AND SURVEYING PROFESSIONALS LOOKING FOR A RELIABLE AND STRAIGHTFORWARD MAPPING SOLUTION THAT PERFORMS UNDER EVEN THE TOUGHEST CONDITIONS. THIS SYSTEM OFFERS AN ADVANCED SOLUTION FOR EVERYDAY MAPPING PROJECTS.

KEY FEATURES INCLUDE:

- Automatic fail-safe routines and user controlled fail-safe commands
- Maximum performance in bad weather conditions (up to 65 kmh (40 mph) wind and light rain)
- Pixel resolution (GSD) up to 3.3 cm (1.3 in)



Orthophoto open mine



Digital Surface Model open mine

POWERFUL DELIVERABLES WITH TRIMBLE BUSINESS CENTER PHOTOGRAMMETRY MODULE



STATE-OF-THE-ART IMAGE PROCESSING TECHNOLOGY

Aerial image data collected with the Trimble UX5 and Trimble Gatewing X100 UAS can now be processed into powerful deliverables with the Trimble Business Center (TBC) Photogrammetry module.

Based on advanced Inpho technology, the photogrammetry module provides a stable and reliable photogrammetric system delivering excellent results without requiring specialized photogrammetry knowledge or experience.

The TBC photogrammetry module works seamlessly with TBC standard and advanced survey modules, making possible to process complete mapping projects including aerial imagery, Trimble VISION imagery, GNSS and total station observations.

ADJUST AERIAL PHOTO STATIONS

The aerial triangulation process adjusts the aerial photo stations, automatically finding matching tie points in overlapping images to correct their relative positions and orientations. Ground control points can easily be registered to correct the absolute position and scale of the photo stations.

MEASURE PHOTOGRAMMETRY POINTS

TBC's "virtual telescope" intersects points from multiple aerial photo stations and/or terrestrial Trimble VISION photo stations, to enable measurement of discrete points. Accurately and efficiently measure the locations of features including buildings' corners, tree-tops, and utilities.

CREATE 3D POINT CLOUDS

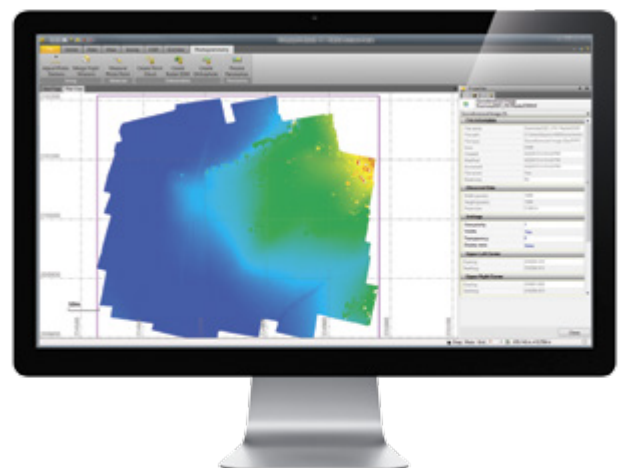
Automatically create 3D point clouds from adjusted photo stations. The fully automatic process adapts parameters to guarantee precision, providing extremely detailed and accurate results at a speed of about 3 sec. per image with about 1-2 pixels height accuracy.

CREATE DIGITAL SURFACE MODELS

3D digital surface models are created automatically from adjusted photo stations. A raster DSM created from the generated point cloud is refined using sophisticated interpolation routines, noise filtering, edge modeling and outlier detection to achieve rich detail within surface models.

CREATE DIGITAL ORTHOPHOTOGRAPHS

Automatically create ortho-rectified, georeferenced mosaics from adjusted photo stations. Rigid "True-Ortho" rectification combined with outstanding geometric feature-based seamline-finding and radiometric balancing result in perfect looking seamless ortho-mosaics. Radiometric single image corrections as well image group corrections are applied for perfect homogeneous colors and intensity, ready for GIS use.



SPECIFICATIONS

	ITEM	TRIMBLE UX5	TRIMBLE GATEWING X100
Hardware	Type	Fixed wing	Fixed wing
	Weight	2.5 kg (5.51 lb)	2 kg (4.41 lb)
	Wing span	1 m (3.28 ft)	1 m (3.28 ft)
	Wing area	34 dm ²	23 dm ²
	Dimensions	100 cm x 65 cm x 10 cm (39.37 in x 25.59 in x 4.13 in)	100 cm x 60 cm x 10 cm (39.37 in x 23.62 in x 4.13 in)
	Material	EPP foam; Carbon frame structure; Composite elements	EPP foam; Carbon frame structure
	Propulsion	Electric pusher propeller; brushless 700 W motor	Electric pusher propeller; brushless 250 W motor
	Battery	14.8 V, 6000 mAh	11.1 V, 8000 mAh
Software	Project management	✓	✗
	Mission planning	Multiple flights	Single flight
	Automated pre-flight checks	✓	✗
	Automatic take off, flight, and landing	✓	✓
	Autonomous camera triggering	✓	✓
	Automated fail-safe routines	✓	✓
	User-controlled fail-safe commands	✓	✓
	Automated post-flight checks	✓	✗
Operation	Endurance ¹	50 minutes	45 minutes
	Range ¹	60 km (37.28 mi)	53 km (32.93 mi)
	Cruise speed	80 kmh (49.71 mph)	80 kmh (49.71 mph)
	Maximum ceiling ²	5,000 m (16,404 ft)	2,500 m (8,202 ft)
	Pre-flight system setup time	5 minutes	15 minutes
	Take off type	Catapult launch	Catapult launch
	Take off angle	30 degrees	15 degrees
	Landing type	Belly landing	Belly landing
	Landing angle	14 degrees	6 degrees
	Recommend landing spacing (LxW) ³	50 m x 30 m (164 ft x 98.43 ft)	150 m x 30 m (492 ft x 98.43 ft)
	Weather limit	65 kmh (40.39 mph) and light rain	65 kmh (40.39 mph) and light rain
	Communication and control frequency	2.4 GHz	2.4 GHz
	Communication and control range	Up to 5 km (3.11 mi)	Up to 5 km (3.11 mi)
Acquisition Performance	Resolution (GSD)	2.4 cm to 24 cm (0.95 in x 9.45 in)	3.3 cm to 25 cm (1.30 in x 9.84 in)
	Height above take-off location (AGL)	75 m to 750 m (246 ft x 2,460 ft)	100 m to 750 m (328.1 ft x 2,460 ft)
	Coverage	See datasheet coverage table	See datasheet coverage table

1 ISO standard atmosphere conditions.

2 Recommended; UX5 not tested above 2,500 m (8,202 ft)

3 In head wind conditions.

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