

**dji** ENTERPRISE

# UAV Solutions For Surveying and mapping



# About DJI Enterprise

Driven by a relentless pursuit of innovation, DJI has revolutionized the way people create and is now ushering in a new generation of work by helping people understand and adopt drone technology. Thus, came DJI Enterprise – a global team dedicated to fostering an ecosystem for businesses to empower individuals, enhance jobs and digitize operations. DJI’s drone technology and the DJI platform provide a new way for the surveying and mapping industry to optimize project management, streamline workflows, and minimize risks.

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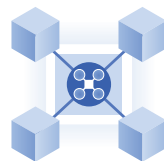
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# Drones in Architecture, Engineering, Construction, and Surveying

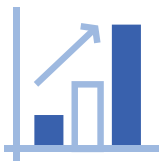
Drones are adaptable, accessible tools that are proving their value across every stage of architecture, engineering, construction, and surveying projects. Applied correctly, drone data solves the problems caused by information silos and increases site awareness, while improving safety and productivity across the board. From streamlining processes, to simplifying site management, to reducing overall project durations, drones are quickly establishing themselves as essential tools for surveying and construction operations.

Here are some of the ways drones are game changers for AEC and surveying professionals:



## Improved Collaboration

Drones can digitize complex projects and produce 3D models of your worksite which allow stakeholders to schedule, plan, and more easily work together.



## Efficiency Gains

Quickly capture aerial data of large worksites and replace tedious or time-consuming manual processes with drones.



## Powerful Data

Drone technology is constantly evolving. From navigable 3D models and thermal inspections to detailed orthomosaic maps, drones give access to highly valuable data.



## Compelling ROI

Drones and the data they capture lead to improved workplace efficiency, reduced downtime, fewer costly mistakes, and result in savings across a project's lifecycle.



## Enhanced Safety

Keep your team from harm's way and deploy drones to automate inspection tasks that otherwise would require working at height or in dangerous environments.



# Solutions for Surveying and mapping

## Drone Platforms



### PHANTOM 4 RTK

Upgrade your next mapping mission with the Phantom 4 RTK – DJI's most compact, accessible and accurate low altitude mapping solution.



RTK Module



1"COMS Sensor



GS RTK APP



TimeSync



DJI Cloud PPK  
Service\*



D-RTK 2 GNSS  
Mobile Station

### Specs

Diagonal Distance	350 mm
Weight	1391 g
Max Flight Time	Approx. 30 minutes
Max Speed	31 mph (50 kph) (P-mode) 36 mph (58 kph) (A-mode)
Max Service Ceiling Above Sea Level	6000 m
Max Wind Speed Resistance	10 m/s
Sensing System	Forward, Backward, Downward

Max Transmission Distance	7 km
Supported Remote Controller	Phantom 4 RTK Standard Remote Controller, SDK Remote Controller
Software Supported	DJI GS RTK (Built into the Standard Remote Controller) DJI Terra DJI GS Pro (SDK Remote Controller) DJI Pilot (SDK Remote Controller) Third Party Software (SDK Remote Controller)


\* The GS RTK app supports multiple planning modes including Photogrammetry (2D and 3D), Linear Flight Mission, Waypoint Flight, Terrain Awareness, and Block Segmentation. Users can control multiple aircraft in Block Segmentation.




# P4 MULTISPECTRAL

Gather precise plant-level data using the P4 Multispectral – a high-precision drone with a seamlessly integrated multi-spectral imaging system built for agriculture missions, environmental monitoring, and more.

  
Live NDVI View

  
5-Band Multispectral Imaging System

  
RTK Module

  
TimeSync


## Specs


Diagonal Distance (Propellers Excluded)	350mm	Filters	Blue (B): 450 nm ± 16 nm; Green (G): 560 nm ± 16 nm; Red (R): 650 nm ± 16 nm; Red edge (RE): 730 nm ± 16 nm; Near-infrared (NIR): 840 nm ± 26 nm
Takeoff Weight	1487g	Sensors	Six 1/2.9" CMOS, including one RGB sensor for visible light imaging and five monochrome sensors for multispectral imaging. Each Sensor: Effective pixels 2.08 MP (2.12 MP in total)
Max Flight Time	Approx. 27 minutes	Image Position Compensation	The relative positions of the centers of the six cameras' CMOS and the phase center of the onboard D-RTK antenna have been calibrated and are recorded in the EXIF data of each image.
Differential Data Format	RTCM 2.X/3.X	Mapping Software Supported	DJI Terra Third-party software
Max Ascent Speed	6 m/s (automatic flight); 5 m/s (manual control)	Flight Control Software	DJI Ground Station Pro (DJI GS Pro)
Max Service Ceiling Above Sea Level	19685 ft (6000 m)		
Operating Temperature	0° to 40°C (32° to 104° F)		
Max Transmission Distance	7 km		




# MATRICE 300 RTK

The Matrice 300 RTK is DJI's latest commercial drone platform that takes inspiration from modern aviation systems. Offering up to 55 minutes of flight time, advanced AI capabilities, 6 Directional Sensing & Positioning and more, the M300 RTK sets a whole new standard by combining intelligence with high-performance and unrivaled reliability.

  
15 km Max Transmission<sup>1</sup>

  
55-min Max Flight Time<sup>2</sup>

  
6 Directional Sensing & Positioning

  
Primary Flight Display

  
IP45 Rating

  
-20°C to 50°C Operating Temperature

## Specs

Dimensions	Unfolded, propellers excluded : 810×670×430 mm (L×W×H) Folded, propellers and landing gears included : 430 × 420 × 430 mm (L×W×H)	Service Ceiling Above Sea Level	5000 m (with 2110 propellers, takeoff weight ≤ 7 kg) / 7000 m (with 2195 propellers, takeoff weight ≤ 7 kg)
Diagonal Wheelbase	895 mm	Supported DJI Gimbals	Zenmuse XT2/XT S/Z30/H20/H20T
Max Takeoff Weight	9000 g	Supported Gimbal Configurations	Single Downward Gimbal, Dual Downward Gimbals, Single Upward Gimbal, Upward and Downward Gimbals, Triple Gimbals
Max Descent Speed (tilt)	7 m/s	Ingress Protection Rating	IP45
Max Ascent Speed/Max Descent Speed (vertical)	6 m/s; 5 m/s	GNSS	GPS+GLONASS+BeiDou+Galileo
Max Wind Resistance	15 m/s	Operating Temperature	-20°C to 50°C (-4°F to 122°F)


\* [1]Unobstructed, free of interference, when FCC compliant. Maximum flight range specification is a proxy for radio link strength and resilience. Always fly your drone within visual line of sight unless otherwise permitted.  
[2] Actual flight time may vary because of the environment and payload configurations.

Payload




DJI L1


The Zenmuse L1 integrates a Livox Lidar module, a high-accuracy IMU, and a camera with a 1-inch CMOS on a 3-axis stabilized gimbal. When used with Matrice 300 RTK and DJI Terra, the L1 forms a complete solution that gives you real-time 3D data throughout the day, efficiently capturing the details of complex structures and delivering highly accurate reconstructed models.




Integrates a Lidar module, an RGB camera, and a high-accuracy IMU




High Efficiency  
2 km<sup>2</sup> covered in a single flight <sup>[1]</sup>



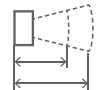
High Accuracy  
Vertical Accuracy: 5 cm /  
Horizontal Accuracy: 10 cm <sup>[2]</sup>




Point Rate:  
240,000 pts/s




Supports 3 Returns <sup>[3]</sup>



Detection Range: 450 m  
(80% reflectivity, 0 klx)



IP44 Ingress  
Protection Level



-20°C to 50°C Operating  
Temperature

Specs

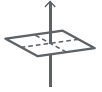
Dimensions	152 × 110 × 169 mm	System Accuracy	Horizontal: 10 cm @ 50 m; Vertical: 5 cm @ 50 m
Weight	Approx. 900 g	FOV	Repetitive line scan: 70.4° × 4.5° ; Non-repetitive scan: 70.4° × 77.2°
IP Rating	IP44	Yaw Accuracy	Real-time: 0.18° , Post-processing: 0.08°
Supported Aircraft	Matrice 300 RTK	Pitch / Roll Accuracy	Real-time: 0.03° , Post-processing: 0.025°
Detection Range	450 m @ 80% reflectivity, 0 klx; 190 m @ 10% reflectivity, 100 klx	Sensor Size	1 inch
Point Rate	Single return: 240,000 pts/s; Multiple return: 480,000 pts/s	Effective Pixels	20 MP

\* [1] Over 30 minutes, at a speed of 10m/s, a flight altitude of 100 m, with a side overlap rate of 20%, point cloud density > 200 points/m2.  
[2] Flight altitude: 50 m  
[3] In operations with two or three returns, the point rate is 480,000 pts/s




DJI P1

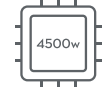
Efficiency through Flexible Full-frame Photogrammetry.



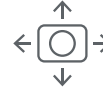
Accuracy without  
GCPs 3 cm h  
horizontally / 5 cm  
vertically <sup>[1]</sup>




High Efficiency  
3 km2 covered in a  
single flight <sup>[2]</sup>




45 MP Full-frame  
Sensor



3-axis Stabilized  
Gimbal Smart  
Oblique Capture



Global Mechanical  
Shutter <sup>[3]</sup> Shutter  
Speed 1/2000  
Seconds



TimeSync  
2.0  
-synchronization  
at the microsecond  
level

Specs

Dimensions	198×166×129 mm	Shutter Speed	Mechanical Shutter Speed: 1/2000*-1 s Electronic Shutter Speed: 1/8000-1 s *Aperature value no larger than f/5.6
Weight	Approx. 800 g	Aperture Range	f/2.8-f/16
IP Rating	IP44	ISO Range	Photo: 100-25600 Video: 100-25600
Supported Aircraft	Matrice 300 RTK	Supported Lenses	DJI DL 24mm F2.8 LS ASPH(ENTERPRISE) (with lens hood and balancing ring/filter), FOV 84° DJI DL 35mm F2.8 LS ASPH(ENTERPRISE) (with lens hood and balancing ring/filter), FOV 63.5° DJI DL 50mm F2.8 LS ASPH(ENTERPRISE) (with lens hood and balancing ring/filter), FOV 46.8°
Absolute Accuracy	Horizontal: 3 cm, Vertical: 5 cm * * Using Mapping Mission at a GSD of 3 cm and flight speed of 15 m/s, with an 75% front overlap rate and a 55% side overlap rate.	Video Resolution	16:9 (1920×1080) 16:9 (3840×2160)* *Only 35mm lens supportedw
Sensor	Sensor size (Still): 35.9×24 mm (Full frame) Sensor size (Max video recording area): 34×19 mm	Stabilized System	3-axis (tilt, roll, pan)
Effective Pixels	45MP		
Pixel size	4.4 μm		
Minimum photo interval	0.7 s		

\* [1] Using Mapping Mission at a GSD of 3 cm, with an 75% front overlap rate and a 55% side overlap rate.  
[2] At a GSD of 3 cm, with an 75% front overlap rate and a 55% side overlap rate.  
[3] The global shutter is achieved with a central leaf shutter.



Accessory



Software

# D-RTK 2 MOBILE STATION

D-RTK 2 Mobile Station is DJI's upgraded high-precision GNSS receiver that supports all major global satellite navigation systems, providing real-time differential corrections that generate centimeter-level positioning data for improved relative accuracy.

## Specs

GNSS Frequency	Simultaneously receive: GPS: L1 C/A, L2, L5 BEIDOU: B1, B2, B3 GLONASS: F1, F2 Galileo: E1, E5A, E5B
Positioning Accuracy	Single Point Horizontal: 1.5 m(RMS) Vertical: 3.0 m(RMS) RTK Horizontal: 1 cm+ 1 ppm(RMS) Vertical: 2 cm+ 1 ppm(RMS)
Positioning Update Rate	1 Hz, 2 Hz, 5 Hz, 10 Hz and 20 Hz
Differential Data Format	RTCM 2.X/3.X
IP Rating	IP65
Operating Temperature	4° to 131° F (-20° to 55° C)
Other Function	Support 5 Phantom4 RTK remote controllers at the same time

# DJI TERRA



## Mission Planning

Create waypoint, area, oblique, and corridor mission plans to fit your workflow needs. You can also plan a mission using an imported model or save the current flight routes for future missions.

### 2D Maps

#### Real-time 2D Mapping

Quickly generate a 2D orthomosaic of the selected area in real-time. Not only is this ideal for creating detailed flight paths in remote areas but it's also useful for time-sensitive missions that require quick decision-making on site.

#### 2D Reconstruction

Generate high resolution orthomosaics, enabling you to get detailed and accurate measurement results for all your critical projects.

#### 2D Multispectral Reconstruction<sup>1</sup>

Process multispectral images to generate vegetation indices like NDVI and NDRE, gathering actionable insights that improve crop yields and help manage vegetation.

### 3D Models

#### Real-time 3D Point Cloud<sup>2</sup>

When efficiency is key, a 3D point cloud of the mapped area can be quickly rendered and visualized based on DJI's advanced algorithm, to display the area and meet the need for accurate measurement.

#### 3D Reconstruction

Get sharp and realistic representations of your surroundings throughout various industrial applications, be it accident reconstruction, tracking progress on major construction projects and more.

<sup>1</sup> [1] Supported aircraft: P4 Multispectral  
<sup>2</sup> [2] Feature only available when using the Phantom 4 RTK, Phantom 4 Pro V2.0, and Phantom 4 Pro + V2.0

# DJI GS PRO



DJI GS Pro is an iPad app designed to enhance drone operations. Conduct automated flight missions, manage flight data on the cloud, and collaborate across projects to efficiently run your drone program.

## Flight Planning

### 3D Map Area:

Generate efficient flight missions with custom flight zone and camera parameter settings.

### 3D Map POI:

Simply choose the subject and set a distance between it and the aircraft. DJI GS Pro will then provide relevant parameters including speed and time required to circuit the structure. Images captured can be exported into 3D reconstruction software to create accurate 3D models of the entire structure.

### Tap and Go Waypoint Flight:

Users can set waypoints and relevant parameters, define waypoint actions, then start flying with a tap.

## Operation Management

### Fleet and Pilot Management:

Manage pilots and drones through the creation of teams and optimize workflow by designating roles with different permissions.

### Flight Data Management:

Back up flight data securely on the cloud, giving missions higher reliability and accuracy.

### Project Management:

Improve the efficiency of your drone operations by tracking individual projects and streamlining the project management process.

# DJI PILOT APP



DJI Pilot is a robust App developed specifically for enterprise users to unleash the power of their DJI drones. With development made specifically for each Enterprise drone platform, DJI Pilot optimizes your flight capability for peak performance.

## Mapping Solutions



Portable Mapping Solution Without GCPs

Aircraft	Phantom 4 RTK
Payloads	Integrated camera
Apps/Software Supported	Flight Control: <ul style="list-style-type: none"><li>• GS RTK</li><li>• DJI Terra</li><li>• GS Pro</li><li>• DJI Pilot with third-party mapping and photogrammetry software</li></ul>
Training	DJI Flight Simulator

Full-frame Photogrammetry Solution Without GCPs

Aircraft	Matrice 300 RTK
Payloads	DJI P1
Flight Control Apps/Software Supported	DJI Pilot
Data Processing Apps/Software Supported	DJI Terra

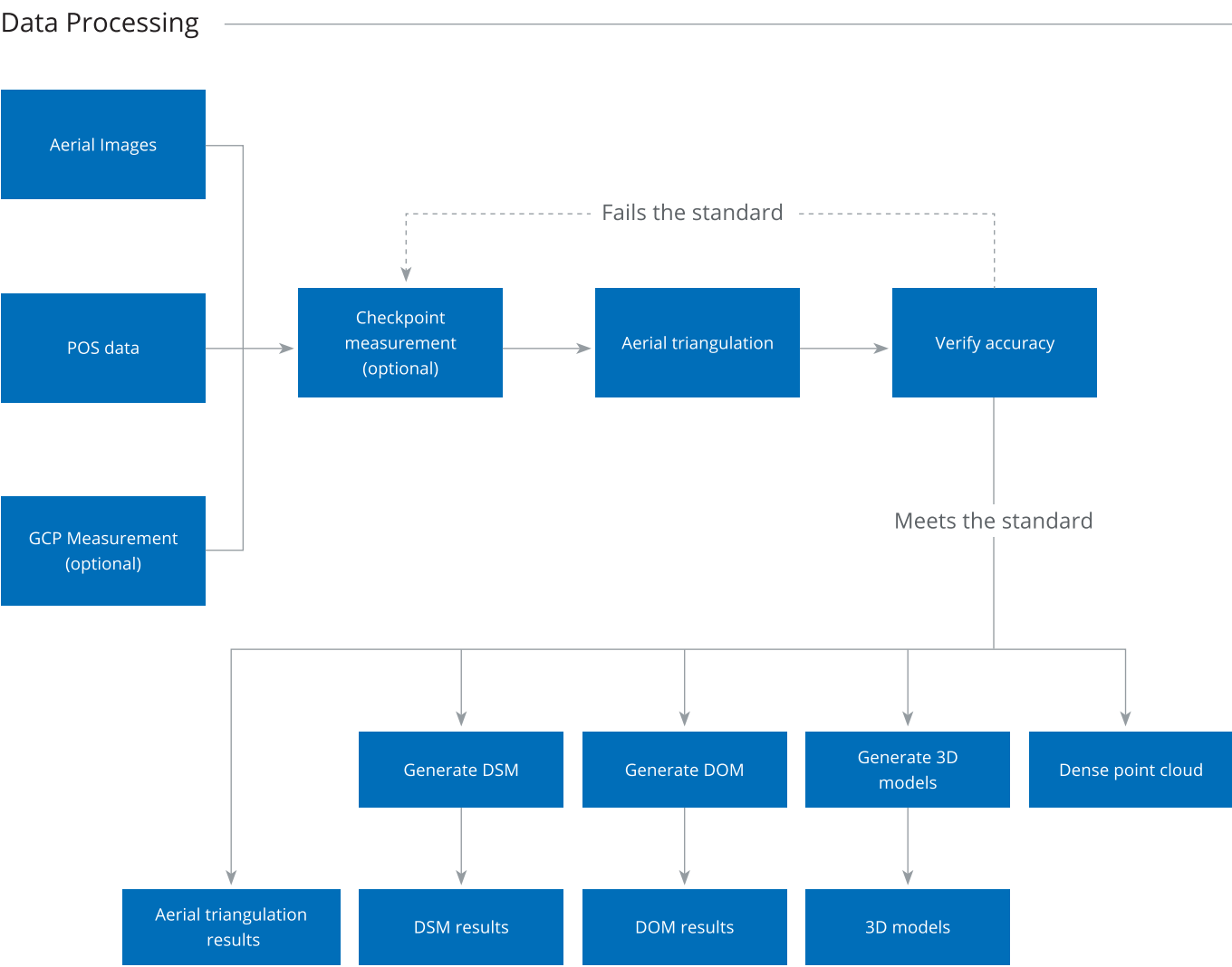
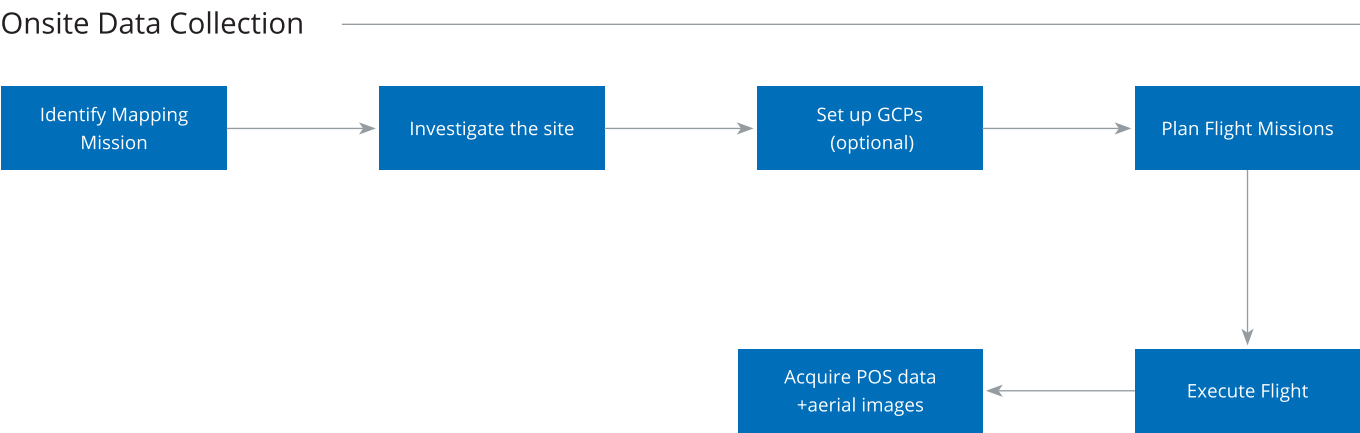
Versatile Lidar Solution

Aircraft	Matrice 300 RTK
Payloads	DJI L1
Flight Control Apps/Software Supported	DJI Pilot
Data Processing Apps/Software Supported	DJI Terra

Multispectral Imaging Solution

Aircraft	P4 Multispectral
Payloads	Integrated multispectral camera array
Flight Control Apps/Software Supported	DJI GS Pro
Data Processing Apps/Software Supported	DJI Terra

Aerial Mapping Workflows



# Use Cases



## 01

### Drones in structure inspection

#### Historical preservation of Karatsu Castle with Toppen Co., Ltd

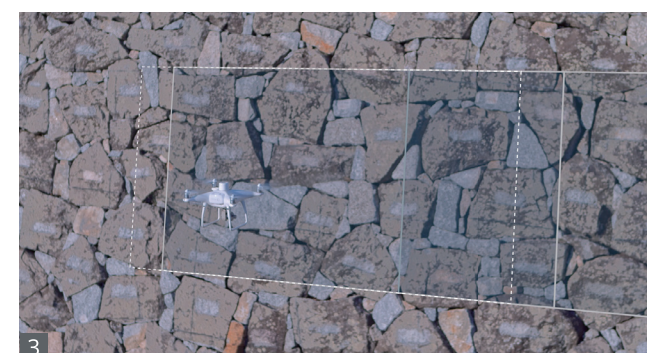
Historic preservation is very important in Japan. However, the country is prone to natural disasters that often damage ancient buildings. One such structure is Karatsu Castle in Japan's Saga Prefecture. The original stone walls that make up the castle tower are buckling due to the effects of water seepage caused by earthquakes and heavy rains. Toppen, a local printing technology company, have been tasked to create a high-resolution 3D model to both honor and preserve the castle. They selected DJI's Phantom 4 RTK as an all-in-one drone mapping solution, utilizing DJI Terra; mapping software that transforms real-world buildings into digital assets.

#### Work Challenges

1. The damage to the stone walls means that mapping, and the subsequent preservation, is extremely urgent.
2. Traditional techniques are inadequate and incredibly accurate maps and models are required.

#### Drone Advantages

1. The DJI Phantom 4 RTK is a compact, affordable and accurate low-altitude mapping solution.
2. DJI Terra supports oblique mission planning which covers any possible gaps in the model.
3. Terra is very efficient, requiring only 1GB RAM to process 400 images from the P4 RTK.
4. This efficiency means that work takes minutes and not hours - vital for the urgency of the project.



1. Karatsu Castle beside Karatsu Bay.
2. Toppen engineers survey the walls of the castle.
3. The DJI Phantom 4 RTK uses its 20-megapixel CMOS sensor to map the castle.
4. The castle rendered into an accurate 3D model.
5. Capturing precise 3D models of the stones will help maintain the structure of the wall.

# 02

## Drones in infrastructure construction

### Infrastructure and construction project management with Strabag

The German Federal Ministry of Transport intends to invest €270 billion by 2030 due to a considerable increase in traffic. STRABAG, a construction group with 9,100 construction projects across Europe, has been engaged to construct and renovate around 600 km of highways. Drones have been used on sites to make surveying missions faster. However, existing drone solutions can mean the placement of up to 40 ground control points (GCP) per square kilometer, which is a lengthy undertaking. So, STRABAG is using the new DJI Phantom 4 RTK which records position, altitude and other data onto each photo and uses the RTK positioning module that potentially reduces the required amount of GCPs to 0.

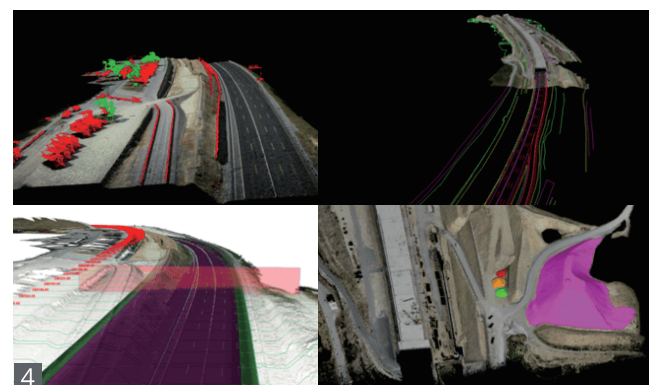
#### Work Challenges

1. Germany is a main transit country for millions of people across Europe with many highways needing repair.
2. Hundreds of miles of totally new highways are also required.
3. Construction needs to be accurately and quickly planned and tracked during progress.

#### Drone Advantages

1. Digital terrain models created from drone data provide a higher point density.
2. Using the RTK positioning module drastically reduces the required amount of GCPs.
3. Surveyors can achieve an increase in accuracy and save at least 75% in GCP set-up time.

1. A drone assisting in highway construction planning.
2. The remote control has an integrated flight planning app.
3. A detailed 3D model of a highway construction site.
4. Phantom 4 RTK image data can be used to create a variety of deliverables.



# 03

## Drones in construction management

### Improving worksite safety and efficiency with Hensel Phelps

Construction companies are utilising drone innovation in large and often complex projects. Hensel Phelps, one of the largest general contractors and construction managers in the United States, is one such business and has witnessed unprecedented growth in productivity with its in-house drone program. Traditionally, aerial photographers would be hired at great expense with disappointing results from basic camera equipment. Exterior inspections of buildings would also require costly scaffolding and could take weeks. Employing drones means that flying, analysis, and data processing can be done in a matter of hours. They allow access to accurate, up-to-date and detailed visual data and mean companies gain project visibility at an unparalleled level.

#### Work Challenges

1. Traditional methods have proved costly and time consuming.
2. The construction manager needs to keep multiple teams, especially offsite stakeholders, informed about every level of site progress.

#### Drone Advantages

1. Drone data can be used for a variety of purposes including site planning, site inspection, building inspection, and safety surveillance.
2. Site progress can be captured and the photos sent to project owners. This speeds up the process of getting budget approval from investors and financial institutions.
3. Safety protocols are easy to adhere to as drones are equipped with obstacle detection and collision avoidance sensors.



1. A drone being operated onsite in Pensacola.
2. DJI drones are equipped with obstacle detection and collision avoidance sensors.
3. The DJI Phantom 4 RTK provides enhanced site surveying efficiency and accuracy.

# 04

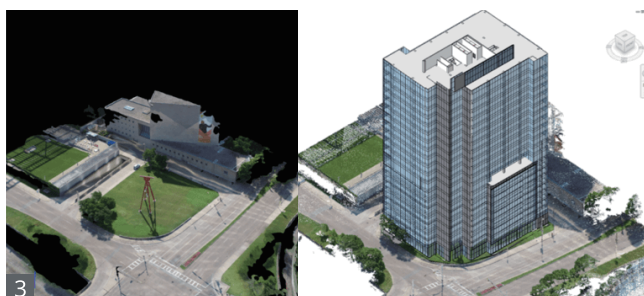
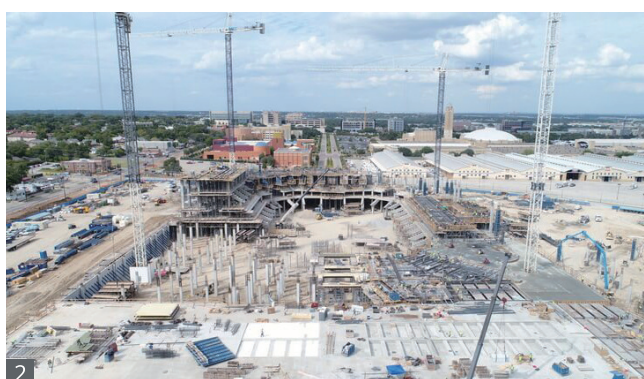
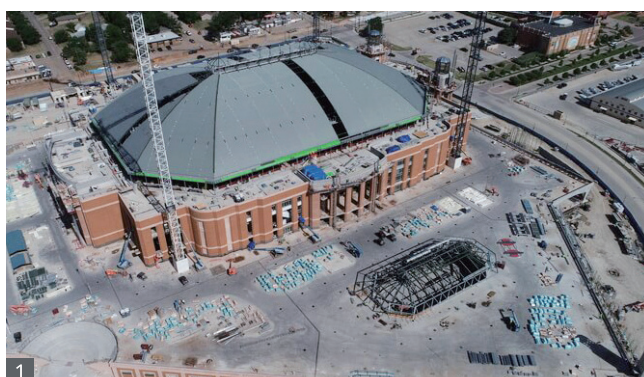
## Drones in construction management

### 3D modeling and progress monitoring in stadium construction with Beck Group

Dickies Arena, a new cultural landmark in Fort Worth, is a multi-purpose facility that costs \$540 million. The Beck Group, general contractor of the facility, decided to utilise the latest drone technology to keep the project on track. DJI drones aided the process throughout construction, acting as enhanced platforms for BIM, 3D mapping, progress monitoring, documentation, and inspection tasks. The drones greatly reduced operating times whilst optimizing workflows throughout the construction phase.

#### Work Challenges

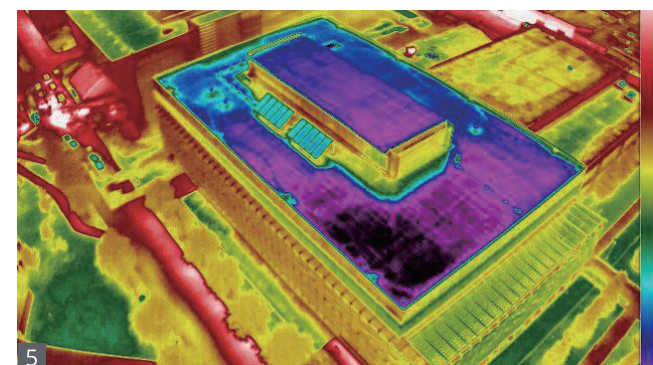
1. A 14,000 multipurpose arena is a complex construction project.
2. Being able to detect a problem early is essential in order to save the time and resources that would otherwise have to be spent on remedy or rework.



#### Drone Advantages

1. Aerial footage from drones help streamline project management, meaning construction crews only take a few days to complete comprehensive site mapping using DJI drones.
2. Having a drone to monitor progress on a daily basis ensures project teams are aware of real-time advancements, setbacks and potential risks, allowing them to make informed decisions based on a comprehensive set of tracking data.

1. Dickies Arena is a 14,000-seat multipurpose arena, located within the Will Rogers Memorial Center in Fort Worth, Texas.
2. Dickies Arena construction in numbers.
3. DJI drones allowed the construction crews to complete comprehensive site mapping in just a few days.
4. Site planning with photogrammetry.
5. Thermal inspection visualization.



# 05

## Drones as a surveying solution

### Deploying drone surveying solutions for increased safety, speed and scalability

Surveying dangerous sites entails several safety risks for the workers who are involved. That's why Altametriz, an SNCF company, deployed a drone surveying solution using the DJI Matrice 300 RTK and Zenmuse P1 camera at one of their test sites around a railway track. Not only were they able to eliminate any potential risks associated with moving GCPs around and over the railway tracks. The whole operation also took a mere 20 minutes as opposed to more than three hours using traditional methods. As a result, Altametriz generated an incredibly detailed 3D map of their test site in significantly less time than before while being able to operate their equipment from a safe distance to any potential hazards.

#### Work Challenges

1. Moving around the railway tracks entails significant safety risks for the surveying personnel
2. Traditional techniques are very time consuming during the setup phase
3. It is nearly impossible to efficiently survey larger sites using GCPs

#### Drone Advantages

1. The DJI Matrice 300 RTK is a professional drone equipped with state of the art navigation and positioning systems
2. The DJI Matrice 300 RTK supports oblique mission planning for automatic imaging and flight routes
3. The Zenmuse P1 takes images with an incredibly high resolution utilizing its full-frame sensor



1. Traditional surveying and mapping alternatives usually need two to three people as opposed to just one drone operator which leads to significant cost savings.
2. The DJI Matrice 300 RTK is easily transported in its case. Deployment only takes a few minutes.
3. Surveying operations often involve significant safety risks for workers. Using the DJI drone surveying and mapping solution, they no longer need to move around the railway tracks.



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