

Gathering21

Construction Innovations
for Future Generations

CitA

WELCOME

to virtually, the most important conference
in Irish Construction this year



5th CitA BIM Gathering Virtual Conference
21 - 23 September 2021



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Gathering21
Construction Innovations
for Future Generations

Drones in Construction

William Adams



Dr. Tara Brooks





5th CitA BIM Gathering Virtual Conference
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Tara Brooks

KTP:

“To engage new software technologies and processes on site to facilitate the implementation of BIM models in the open field environment.”



FELIX O'HARE
& CO LTD



QUEEN'S
UNIVERSITY
BELFAST



t.brooks@qub.ac.uk

Funding:



Innovate
UK

Gathering21
Construction Innovations
for Future Generations



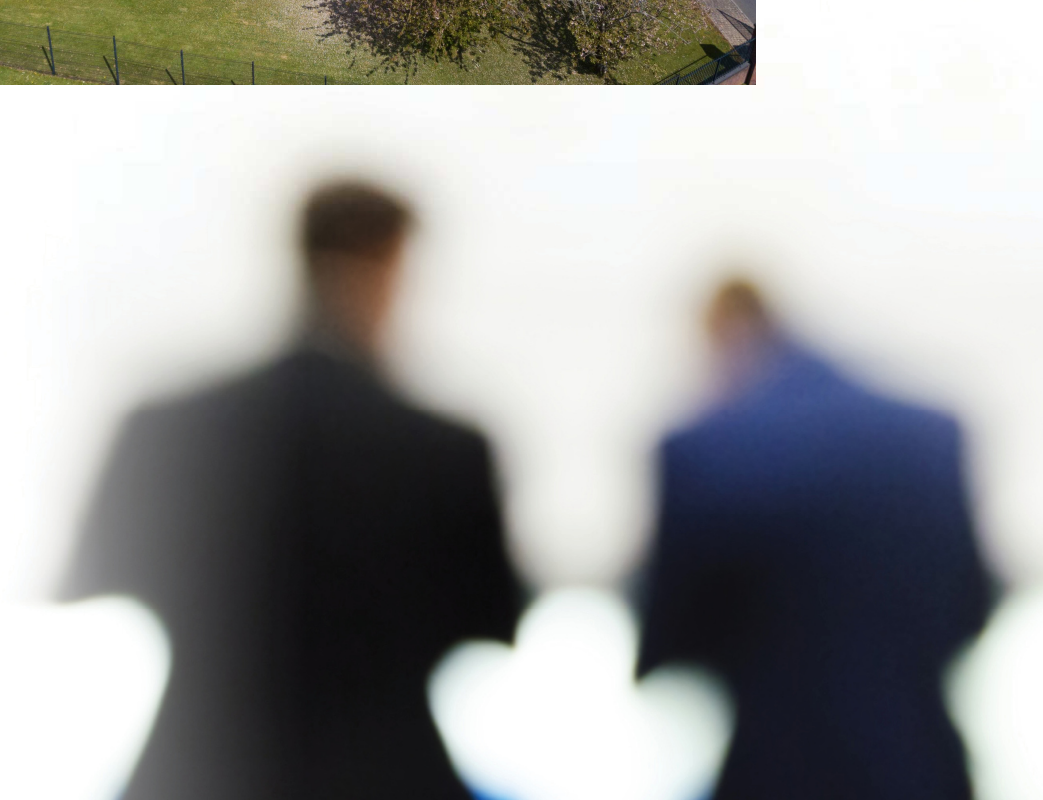
Introduction

Felix O'Hare & Co Ltd

- Based in Newry, Co. Down.
- Services include Pre-Construction, Construction, Design & Build, Fitout, and Maintenance.
- Projects including Education, Healthcare, Leisure, Industrial, Transport, and Conservation works.

Myself

- MSc Project Management & BIM & just over 2 years drone flying with Felix O'Hare & Co Ltd.

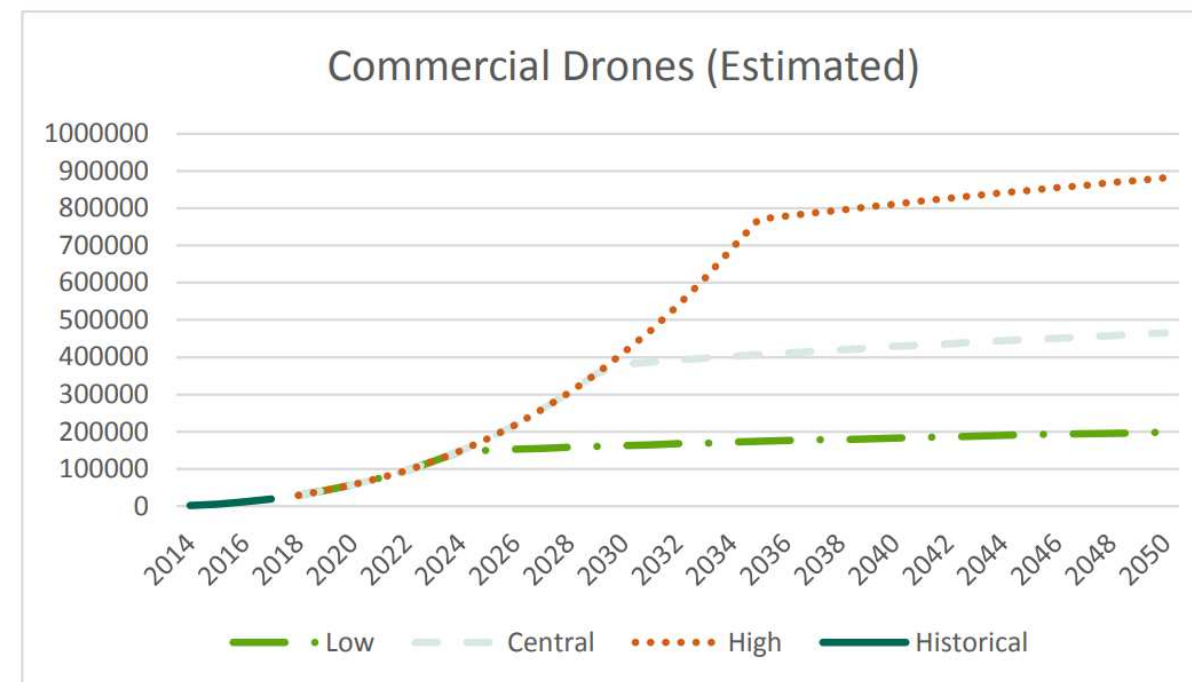




Adoption of Drones

Drone Market Trends

- Barclays - 2018 = €3.6 billion
2023 = €36 billion
Cost Savings = €85 billion



(Department for Transport, 2018)

Table 2: Estimated number of drones in UK skies in 2030, by sector

Sector	Estimated number of drones in 2030
UK wide	76,233
Public and Defence, Health, Education and other services	27,521
Agriculture, Mining, Gas and Electricity	25,732
Transport and Logistics	11,008
Construction and Manufacturing	4,816
Technology, Media and Telecommunications	4,541
Financial, Insurance, Professional and Administrative Services	2,514

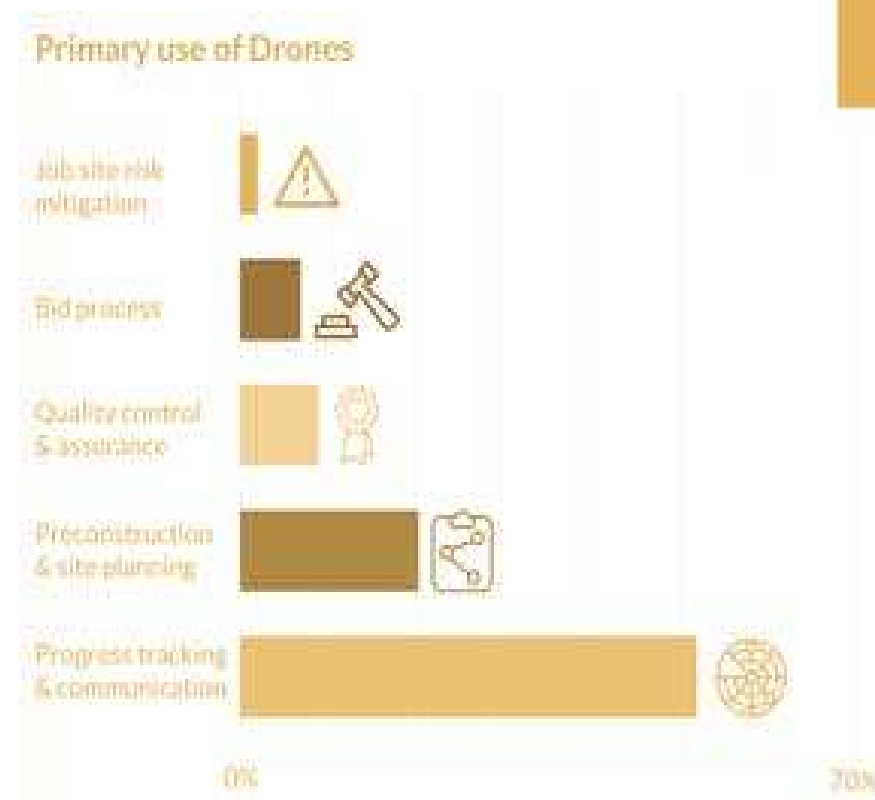
(PWC, 2018)



Adoption of Drones

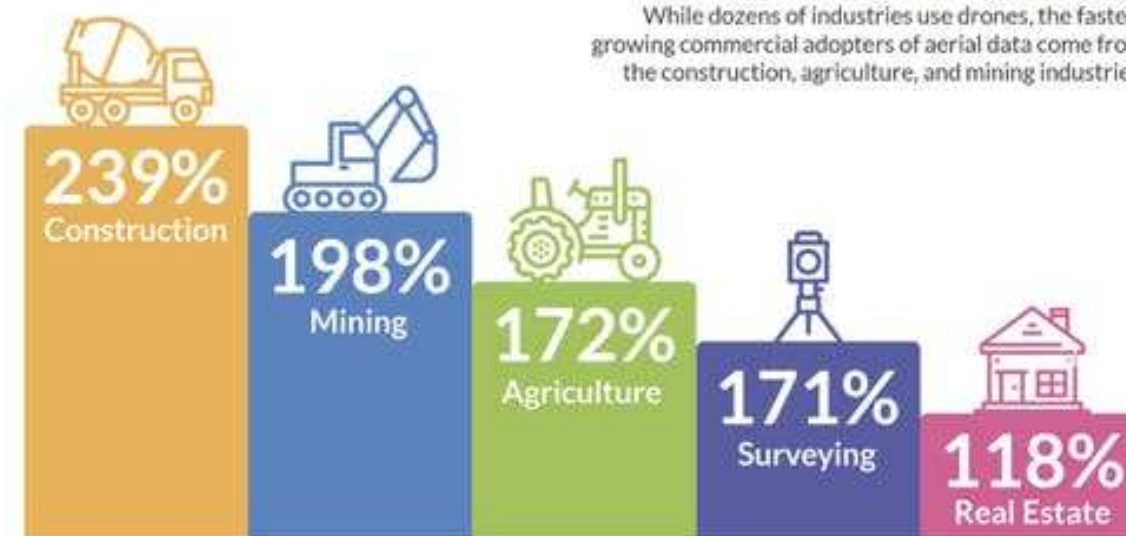
Construction Industry Adoption

- NBS - Annual growth of 58%.



Growth in Industry Adoption (YoY)

While dozens of industries use drones, the fastest growing commercial adopters of aerial data come from the construction, agriculture, and mining industries.



(Dronedeploy, 2018)





Types of Drones in Construction

Multi-Rotor Drones

- Precision flying.
- Can accommodate a higher pay load.
- 20-35 min Flight time.



Fixed Wing Drones

- Greater stability in higher winds.
- Better Flight time – up to 5km² in 90minutes.
- Cannot remain stationary.





Types of Drones in Construction

Multi-Rotor Drones

- Precision flying.
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Fixed Wing Drones

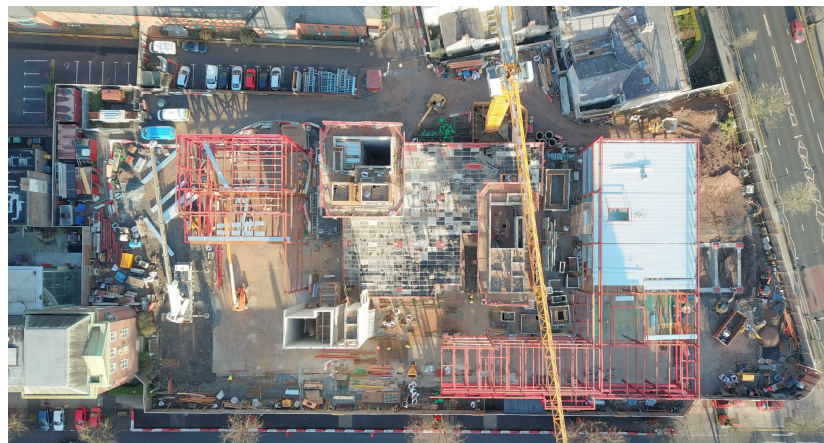
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Benefits of Drones in Construction

Progress Monitoring

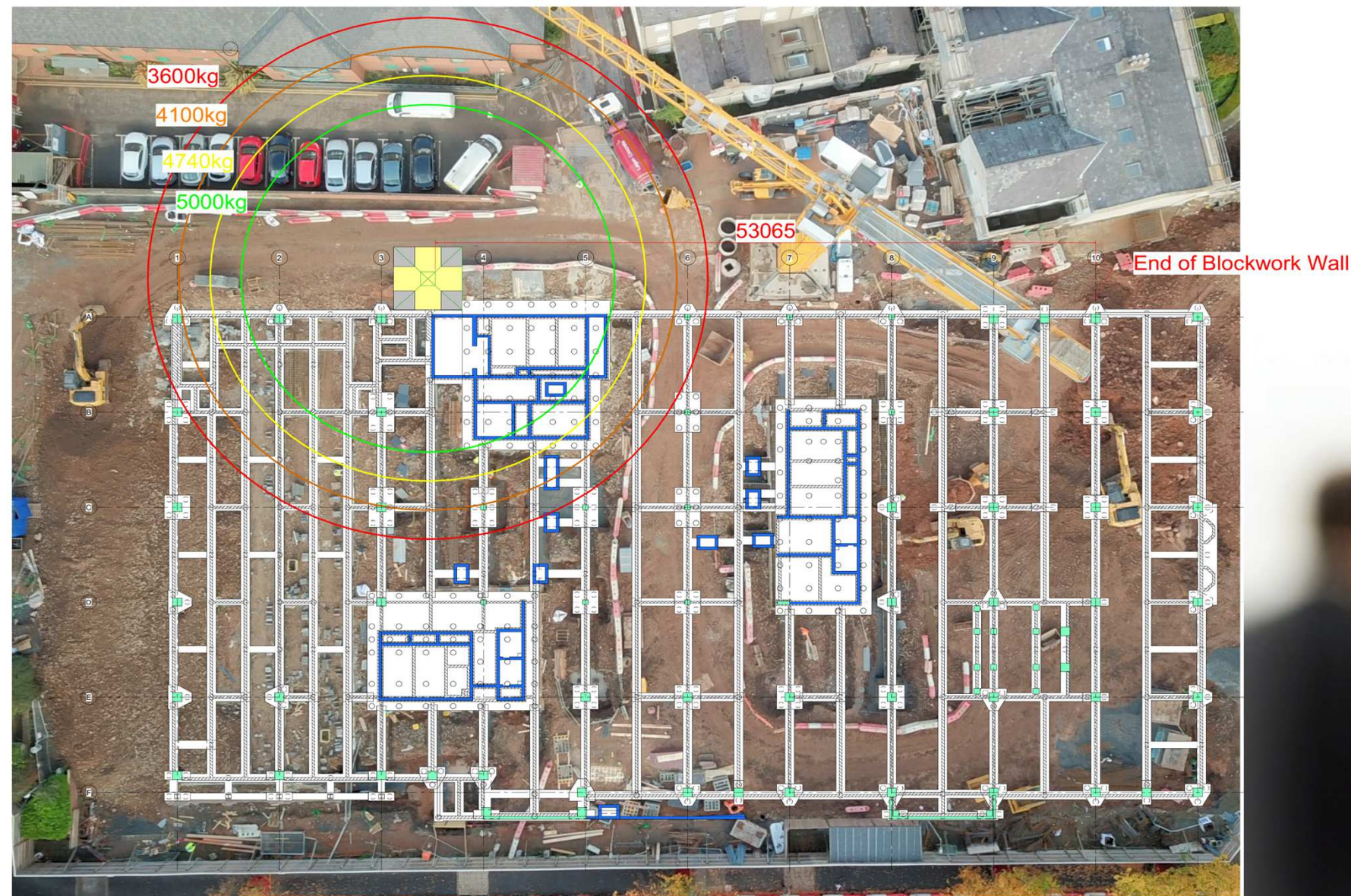




Benefits of Drones in Construction

Logistics Planning

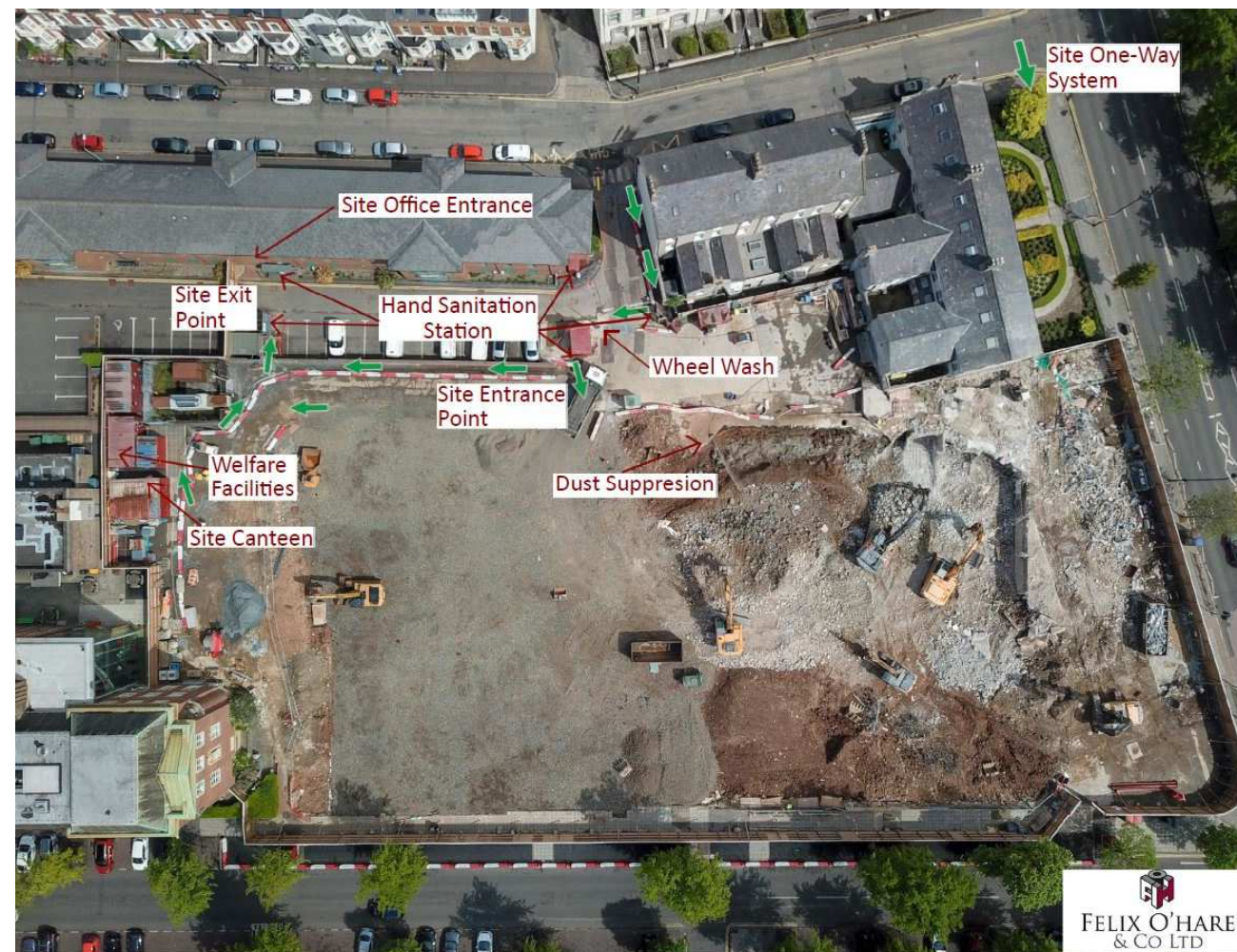
Health, Safety & Security.





Benefits of Drones in Construction

Health, Safety & Security.

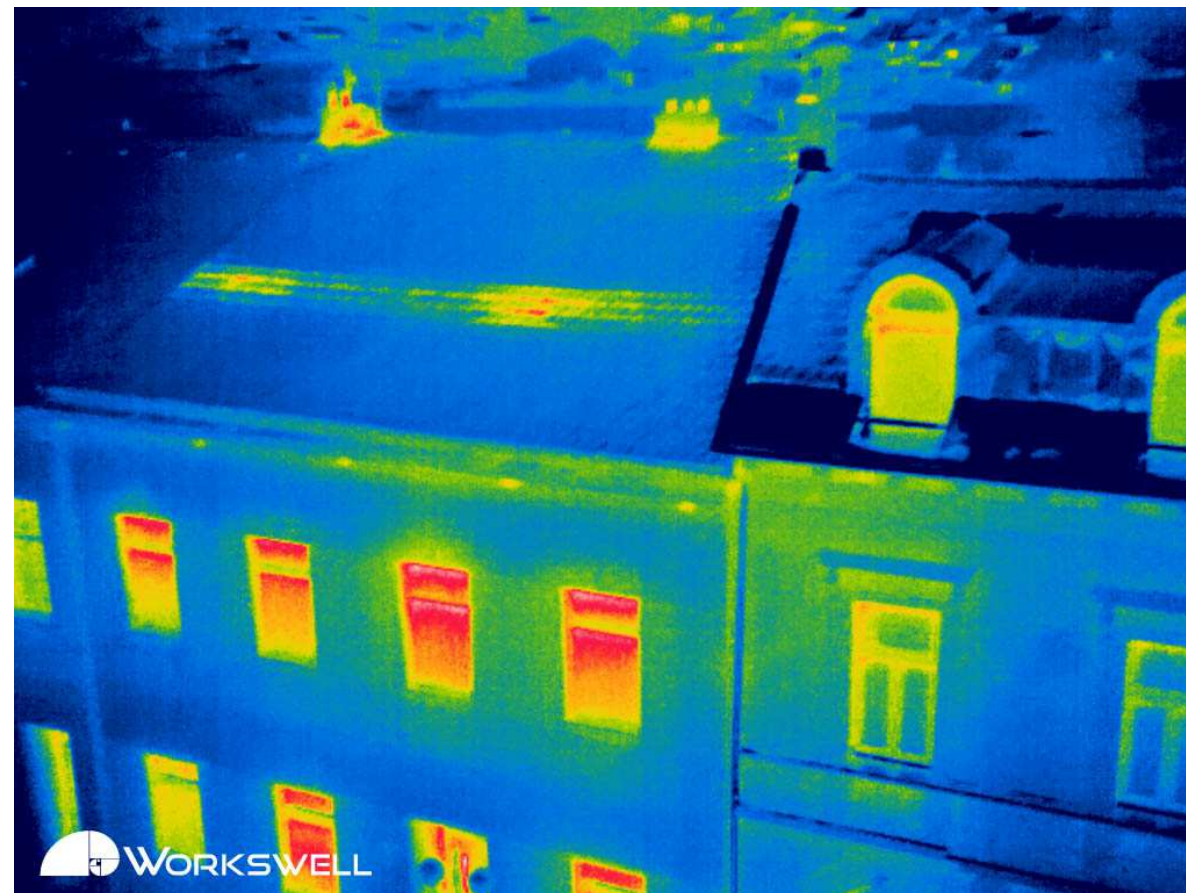




Benefits of Drones in Construction

QA & QC

- Thermal imaging

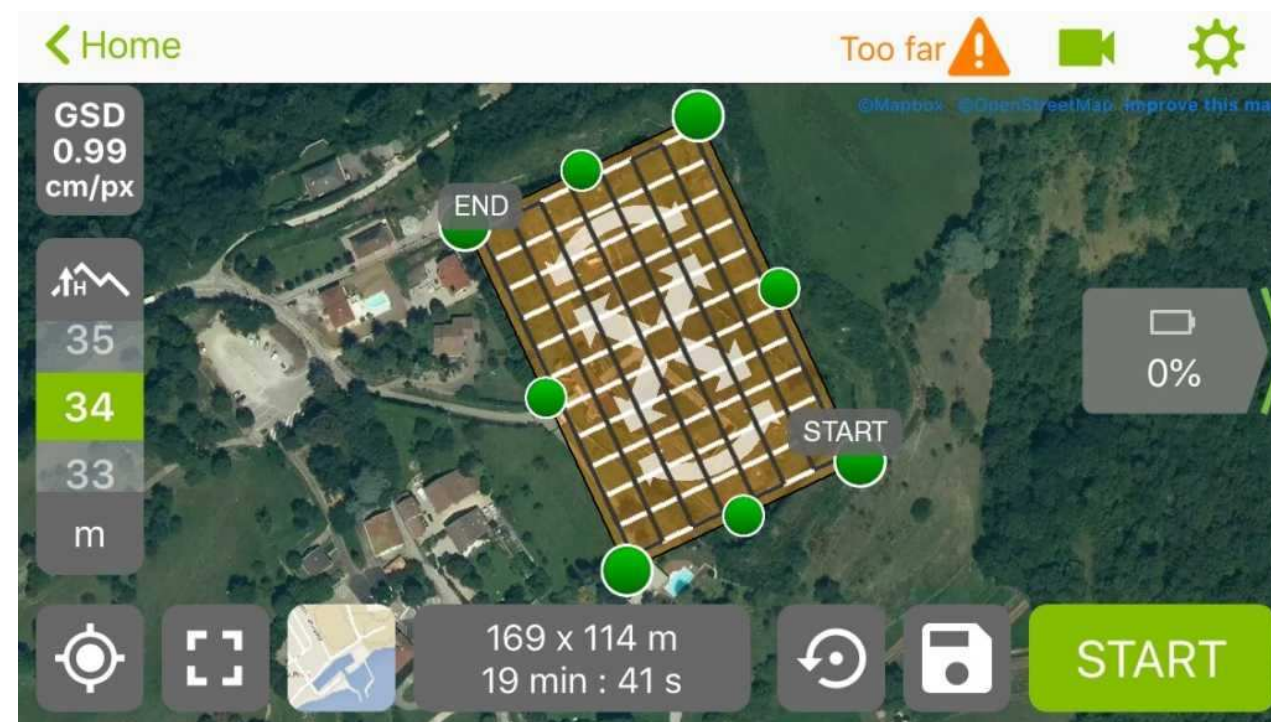
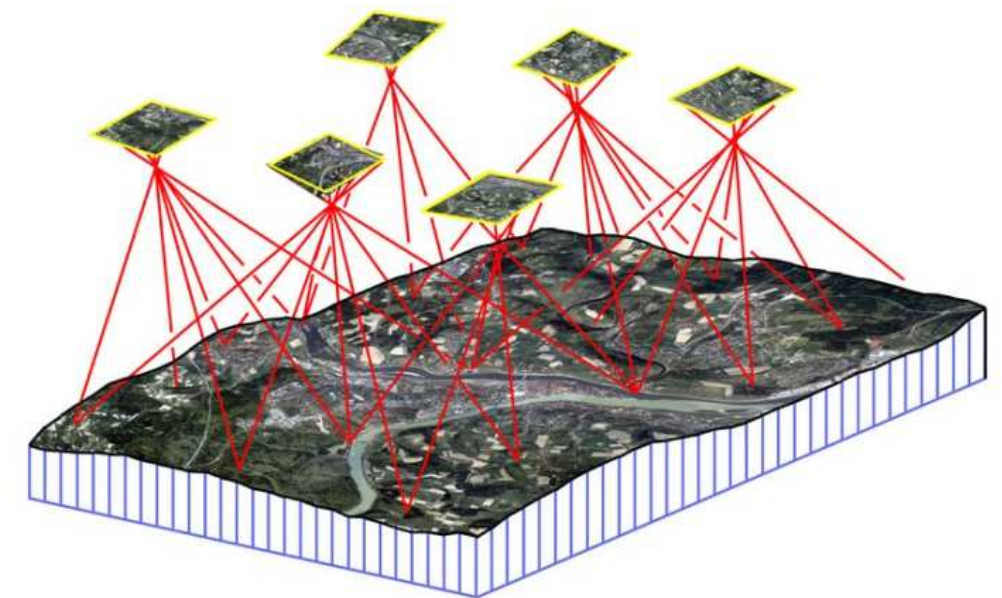




Benefits of Drones in Construction

Photogrammetry

- Automated flight of overlapping images to be stitched together and create tie points.
- DroneDeploy, Pix4D, Litchi.





Benefits of Drones in Construction

Photogrammetry

- Providers within the Construction Industry





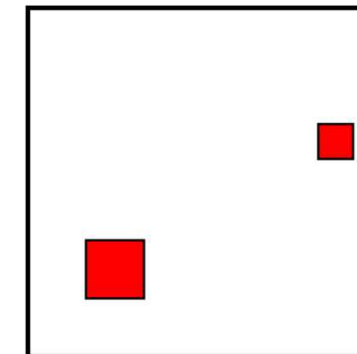
Benefits of Drones in Construction

Photogrammetry

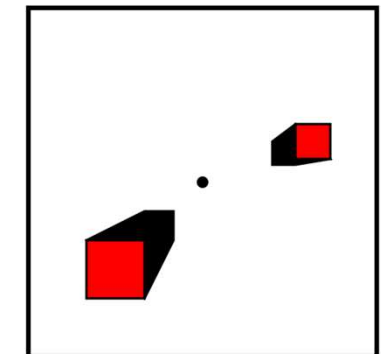
- Orthorectified Images



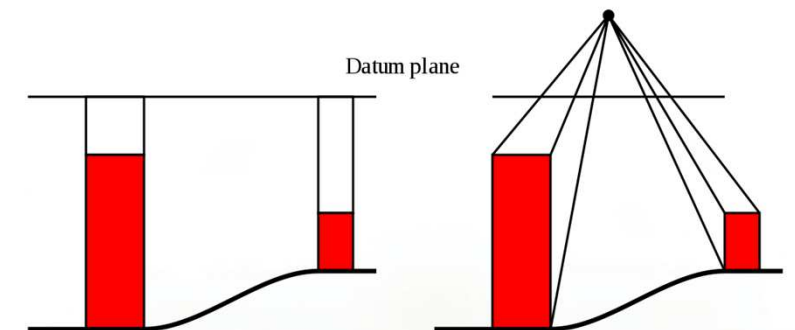
Orthographic view



Perspective view



Datum plane

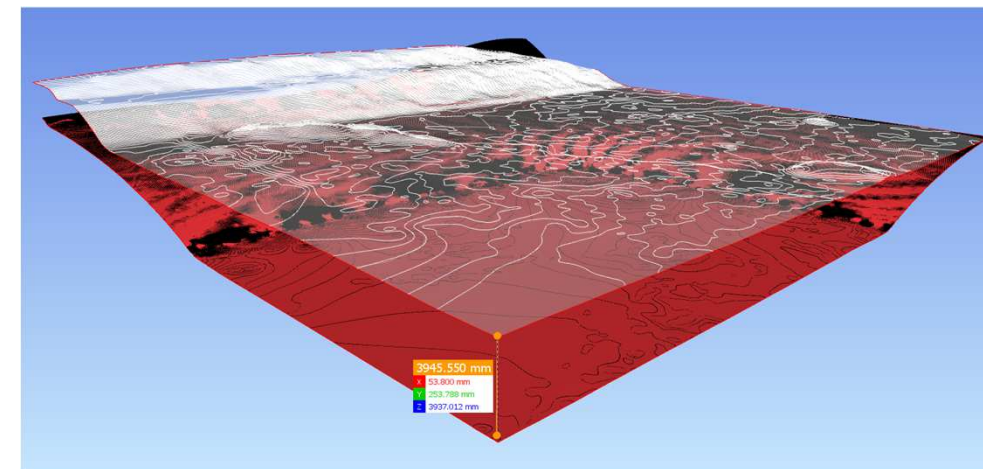





Benefits of Drones in Construction

Photogrammetry

- Reporting
- Topographical Surveys



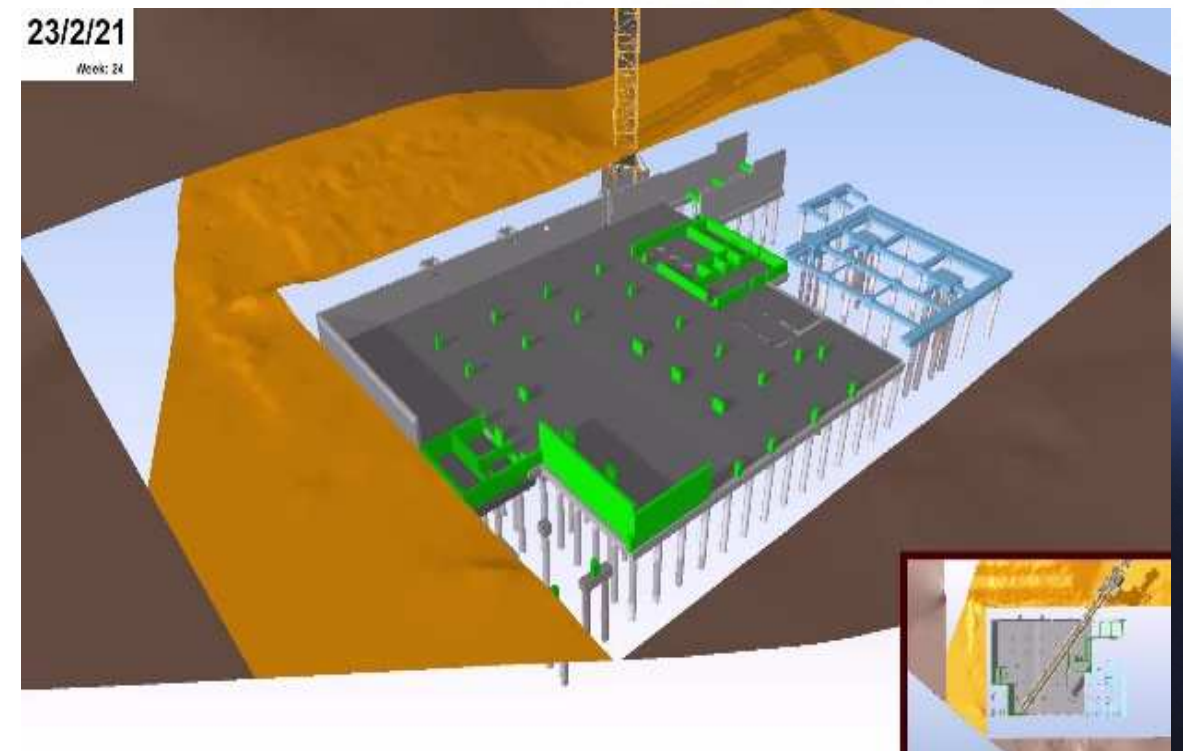
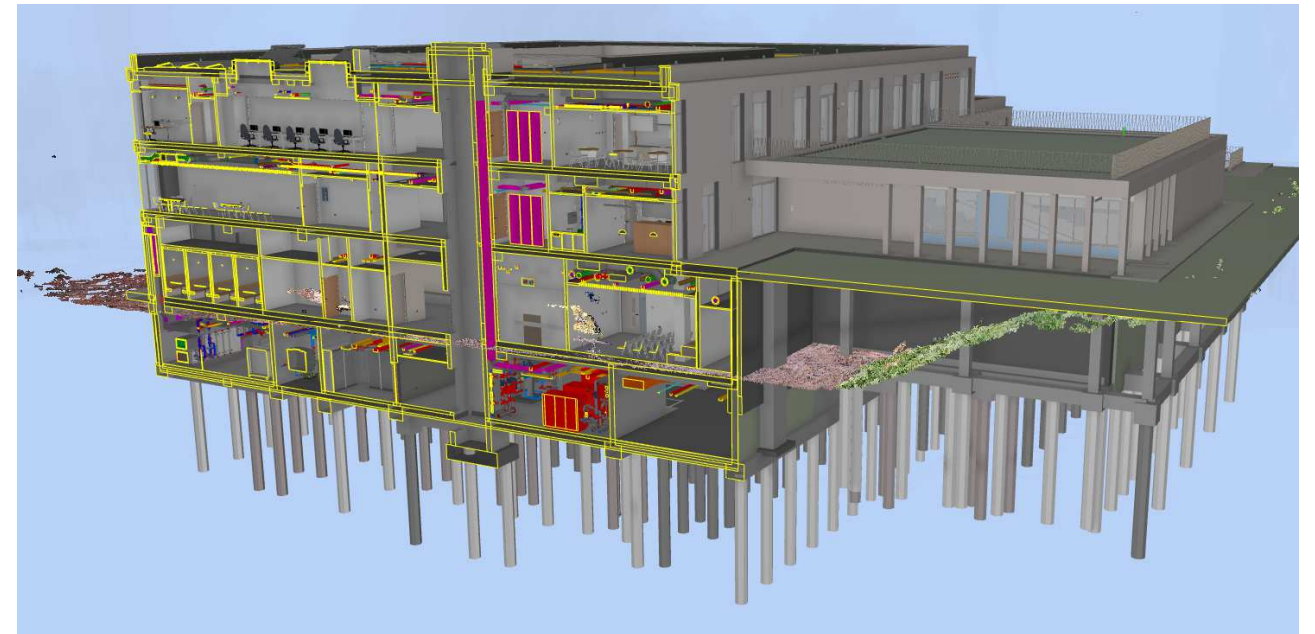
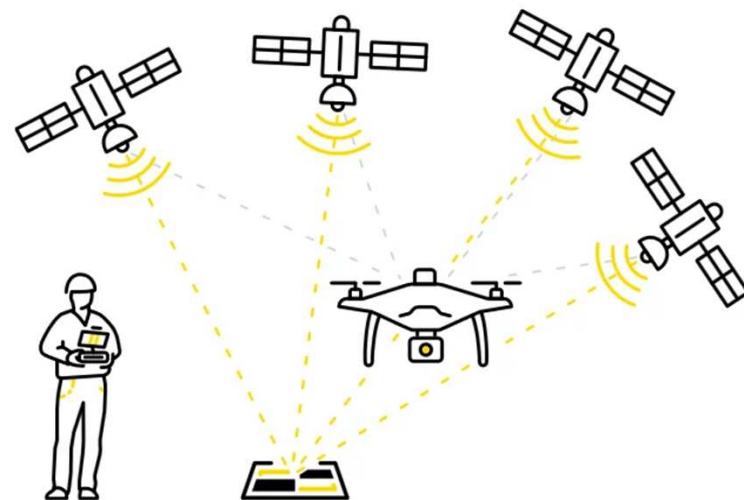
-  Pre-existing Site Conditions before Excavation.
-  Elevation of Site at formation Level.



Benefits of Drones in Construction

Photogrammetry

- Topographical Surveys





Benefits of Drones in Construction

Photogrammetry

- Validation

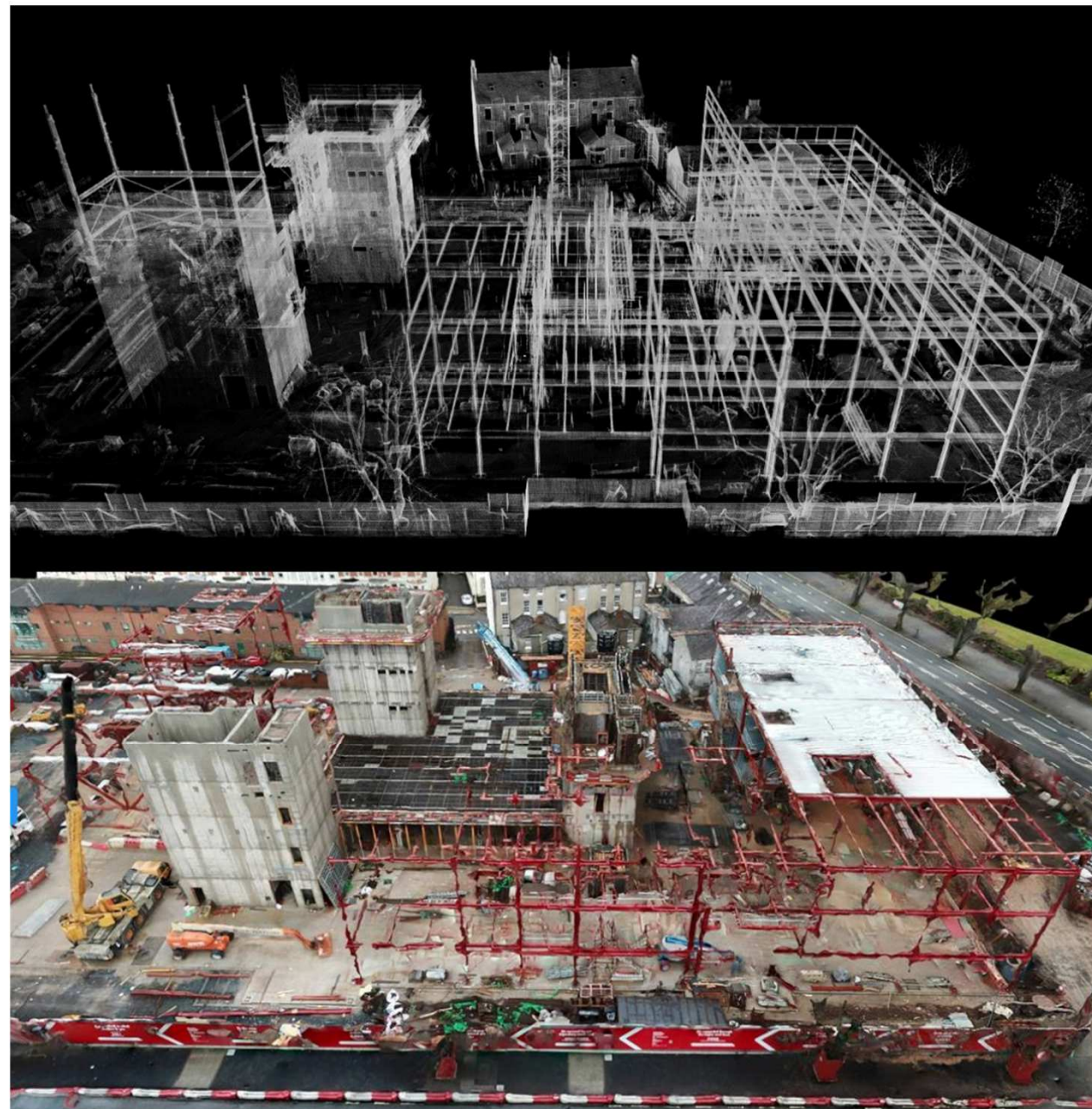




Benefits of Drones in Construction

Photogrammetry

- Validation





Future of Drones in Construction

The Connected Job Site

- 5G Connected Drones



Data sent back to an operator from the drones on board cameras and sensors, allowing a much greater range of uses



Data sent to the drone such as changing weather forecasts or updated air traffic control information¹⁵ allowing more effective and safer drone use.

















Future of Drones in Construction

The Connected Job Site

- Fully Autonomous Flights

DRONE INDUSTRY INSIGHTS

THE 5 LEVELS OF DRONE AUTONOMY

Autonomy Level	Level 0	Level 1	Level 2	Level 3	Level 4	Level 5
Human Involvement						
Machine Involvement						
Degree of Automation	No Automation	Low Automation	Partial Automation	Conditional Automation	High Automation	Full Automation
Description	Drone control is 100% manual.	Pilot remains in control. Drone has control of at least one vital function.	Pilot remains responsible for safe operation. Drone can take over heading, altitude under certain conditions.	Pilot acts as fall-back system. Drone can perform all functions 'given certain conditions'.	Pilot is out of the loop. Drone has backup systems so that if one fails, the platform will still be operational.	Drones will be able to use AI tools to plan their flights as autonomous learning systems.
Obstacle Avoidance	NONE	SENSE & ALERT		SENSE & AVOID	SENSE & NAVIGATE	SENSE & NAVIGATE

Source: DRONEII.COM

Date: March 12th 2019

DRONEII.COM
 DRONE INDUSTRY INSIGHTS





Future of Drones in Construction

Attachments

- CivDrone for Setting Out.
- LiDAR
- Caged Drones for Inspection





Future of Drones in Construction

Integration with BIM

- Measurements within the CDE and compared against the BIM model.
- Raising RFI's or tasks against drone data within the CDE.





What Do I Need?

How to get started with a Drone Programme.

- Identify persons best suited for the role.
- Set your budget.
- What type of drone do you need?
- How often do you want / need drone data from a particular project?
- What do you want to do with the information?





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Thanks for Listening

Any Questions?