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DRONES IN CONSTRUCTION

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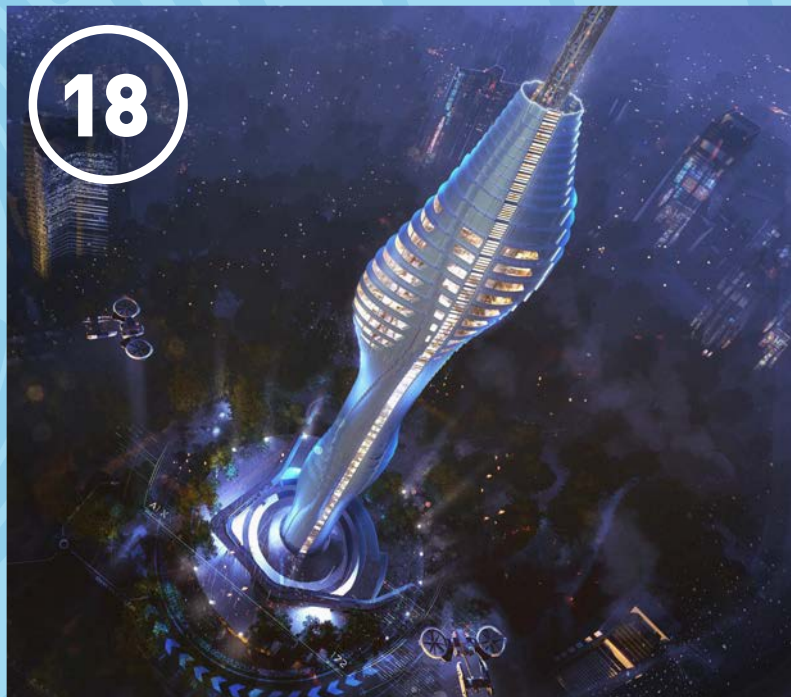


AERIAL VIEW: HOW DRONES WILL REVOLUTIONISE THE CONSTRUCTION INDUSTRY



BUYER BEWARE: WHAT YOUR BUSINESS NEEDS TO KNOW ABOUT DRONES

NEW DRONE ORDER: INDUSTRY TO BE HELD TO A HIGHER STANDARD IN 2018



REALITY CAPTURED: DRONES AND THE BIM PROPOSITION

BEST PRACTICE, REDEFINED: UNCOVERING THE IMPACT OF DRONE UPTAKE

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FIVE CITIES AND DISTRICTS ANNOUNCED FOR FLYING HIGH CHALLENGE

Five cities and districts will be among the first to consider how drone technology can support the needs of the local community, it has been announced.

Since November 2017, more than a third of all UK cities have bid for a place on the much anticipated Flying High Challenge, run by Nesta's Challenge Prize Centre in partnership with Innovate UK.

Over a period of six months, the successful applicants – Bradford, London, Preston, Southampton and the West Midlands metropolitan area – will each work alongside

the Flying High team to identify how drones might benefit their communities. They will explore public service applications and commercial opportunities, while simultaneously considering prevailing attitudes, environmental impacts, logistics and safety concerns when operating drones in complex urban environments.

But why these cities? According to Nesta, each sports impressive credentials in arenas as diverse as aerospace and autonomous technology. Many have adopted innovative new approaches to public engagement and economic development, meaning they're ideally placed to deliver on both the technical and societal aspirations of the programme.

"Drones are already improving people's lives," said Aviation Minister Baroness Sugg, "helping the emergency and rescue services, and keeping key national infrastructure like rail lines and power stations safe. But this is just the

beginning, which is why government is doing everything possible to harness the huge potential through our Industrial Strategy and Drones Bill.

"It's fantastic that this pioneering programme will enable cities to play a direct role in shaping how drones can be used to transform their public services and unlock business opportunities across the UK predicted to be worth billions."

Andrew Tyrer, Robotics Challenge Director for the Industrial Strategy Research Fund (Innovate UK), added: "How people think about and use drones has changed beyond recognition in the last ten years, and there is genuine excitement about how they could revolutionise our lives, jobs and economy. To realise that potential, we need to make sure they can operate safely in the toughest and most complex environments, and that's why we are supporting the Flying High Challenge through the government's industrial strategy."

NUCLEAR DECOMMISSIONING AUTHORITY PUTS UAVS TO GOOD USE

Nuclear Decommissioning Authority (NDA) funding has enabled two UK businesses to build a bespoke drone capable of assessing radiation levels at the Fukushima Daiichi nuclear power plant in Tohoku, Japan.

Already, the lightweight RISER drone, which relies on lasers to self-navigate through hazardous environments where GPS cannot reach, has been successfully trialled at Sellafield in Cumbria.

RISER – or Remote Intelligence Survey Equipment for Radiation – measures less than one metre wide and navigates via inbuilt 'collision avoidance' technology. This enables the drone to manoeuvre inside complex industrial spaces while transmitting data to a mapping system which clearly and concisely highlights areas of contamination.

Crucially, RISER sees the combination of two pioneering pieces of technology – drones and radiation mapping. It began with Createc's N-Visage software, which received £50,000 of NDA and Innovate UK funding in 2009. Three years on, further NDA funding led to the collaboration between Createc and Blue Bear, the aerial systems specialist. After a series of

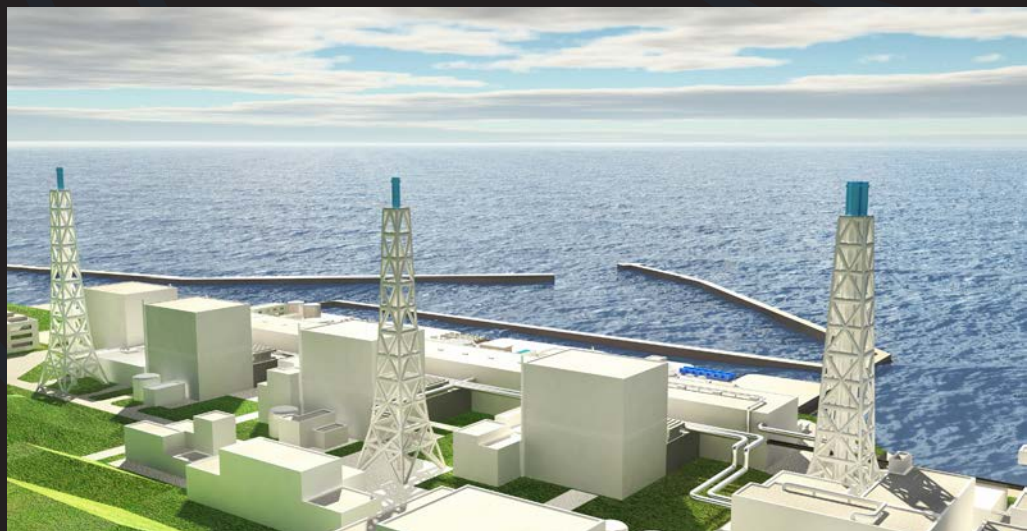
successful on-site trials at Sellafield, RISER was officially given the decommissioning go-ahead.

"We are thrilled to see RISER put to work in Japan, and delighted that our early-stage support for the N-Visage system enabled Createc to develop its potential further," said Professor Melanie Brownridge, Head of Technology at NDA.

"The subsequent collaboration with Blue Bear, again funded by the NDA through an initiative with Innovate UK, led to RISER. This shows the importance of funding innovative ideas through

their journey from the drawing board to the market – not just for the NDA's decommissioning mission but for the wider UK and overseas economy."

N-Visage is tailor-made to map radiation with pinpoint accuracy. Developed and comprehensively tested over a period of years, the software was previously put to use inside a reactor at the Fukushima Daiichi nuclear power plant. It will now make a return journey, this time atop a purpose-built drone.



DRONE TECHNOLOGY TAKING OFF IN CONSTRUCTION, SAYS PRODRONEWORX.

Drone technology is beginning to take off in the UK and Ireland construction industry, according to a new survey by ProDroneWorx, one of the UK's leading companies for aerial mapping, inspection and surveying.

According to the survey – 'Drone Technology within the Construction Industry' – a third of respondents are currently using drone technology and, of those that do not, nearly 80% plan to do so in future.

In the first survey of its kind in the UK and Ireland, ProDroneWorx asked senior figures within the construction industry, including surveyors, architects, engineers and construction firms, about their perception, usage and understanding of drone technology. The response to this survey was impressive with over 160 respondents taking part across the UK and Ireland.

ProDroneWorx believes that drone technology will transform traditional business models and help to reshape the construction industry. Indeed, early adopters are already starting to see a positive impact on their operational processes from the way projects are monitored to the inspection of assets.

Ian Tansey, Managing Director at ProDroneWorx, said: "In a world of tight margins and an increasingly competitive landscape, the use of drone technology gives construction firms a significant competitive advantage over their peers through reduced costs, increased productivity gains and the mitigation of risk."

About ProDroneWorx

ProDroneWorx is one of the UK's leading companies for aerial mapping, inspection and surveying. As a drone technology specialist, we pride ourselves on our professionalism and commitment to improving operational efficiency, reducing costs, mitigating risk and improving health and safety for our clients through the use of drone technology.

Our services include surveying, asset inspection, progress monitoring, measurements (volume, area and distance), 3D modelling, orthomosaics, digital surface/terrain models (DSM & DTM), thermal imaging and photography & video.

We primarily work within the construction industry, servicing property developers, construction firms, groundwork firms, civil and structural engineers, surveyors, architects, landscape architects and land buyers/sellers.

KEY TAKEAWAYS FROM THE SURVEY:

- A third of respondents (33%) are currently using drone technology in their operations. These early adopters understand the benefits it brings to their organisations.
- The majority of respondents (67%) are currently not using drone technology. However, most plan to do so in the future.
- Of the 33% that are currently using drone technology, the majority (60%) have been using it for less than a year. However, 11% of this sub-group have been using the technology for the last three to five years making them very early adopters. The three main reasons firms are using the technology are time savings (49%), increased operational efficiency (49%) and cost savings (47%).
- Even though a large percentage (67%) of firms are not currently using drone technology, there's huge pent-up demand as 77% of this group plan on using the technology in future.
- Only a small proportion of firms have no plans to use the technology in the future.
- Construction firms have two options when it comes to deciding how to incorporate drone technology into their business models and workflow: creating an internal drone unit/function, or using a third party specialist.
- Overall, the vast majority of firms (67%) plan to or currently use third party specialist companies on their projects rather than having an internal drone function within their company.
- Issues such as regulation, licensing, insurance, hardware, software and data processing are factors putting firms off an internal function.
- Many find it easier, cheaper and less risky to use a professional drone solutions company on projects.
- Awareness of drone technology and the various benefits it brings is high within the industry; 75% of respondents understand how the technology can be used within their business.
- Although drone technology has many applications within the construction industry, currently its primary use is in photography & video, surveying, asset inspection and progress monitoring.

RESPONDENT DEMOGRAPHICS:

- 161 respondents completed the survey.
- The majority of respondents (82%) were from England, followed by the Republic of Ireland at 8%; a smaller number were from Scotland (5%) and Wales (3%).
- 27% of respondents were from the construction sector, 19% architecture, 18% surveying, 12% other (ecology, agriculture, consultancy etc) and 7% engineering.

AERIAL VIEW: HOW DRONES WILL REVOLUTIONISE THE CONSTRUCTION INDUSTRY



BY STEVE MANSOUR, CEO, CRL

The introduction of drones is a positive development in our industry. It might sound far-fetched, but thanks to their flexibility, these small and sophisticated devices could soon be as common onsite as trucks and excavators.

A report by Goldman Sachs makes it clear that the largest expected take-up for commercial

drones is in construction, primarily in surveying and mapping sites. It estimates that total global spending on drones in the commercial market will be \$100Bn over the next two years. Of that, approximately \$11.2Bn will be generated by the construction industry.

Such sizeable growth is evidence that

business leaders no longer view drones as mere high-tech toys. In fact, they have many commercial applications: builders seeking an edge on their competitors, land developers wanting to save time during site surveys, and inspectors examining hard-to-reach areas. Getting an aerial view of a building or



“ One imminent challenge is the regulatory environment in which drones operate. The industry’s rapid growth has outpaced the development of rules and systems to govern their use, and the resultant uncertainty has slowed commercial adoption and innovation. ”

development is now easier and cheaper than ever.

Construction sites around the world depend on inspections and surveys to gain a comprehensive understanding of a build’s progress, and to ensure that safety standards are being met in the process. With cutting-edge drone technology, operators can now easily and quickly perform inspections in a cost-effective and efficient way, whilst also keeping employees away from dangerous environments.

Contractor Galliford Try is one of the pioneers. It conducted an initial analysis of the roof of an old school building before its conversion into a modern care home. In under an hour, they captured a set of high-resolution images of the entire roof structure, from the comfort of their office.

The high-quality information collected by drones can give users the opportunity to view a site in real time as it progresses, to better manage resources and keep projects on schedule. Additionally, drone technology will give those in the industry the ability to view a project without having to step foot onsite.

By closely monitoring and analysing this up-to-date imagery and data, construction projects will save time and money. In addition, drones can improve communication and collaboration between different parties, onsite and offsite, to enhance planning as a site grows.

With this in mind, it is likely drones will further revolutionise construction through the use of 3D modelling, reducing the amount of time taken to design, analyse and maintain a structure or implement changes. This data can be imported into Business Information Modelling (BIM) packages in

various file formats, making the integration of digital data into workflow processes straightforward.

The advent of drones is also causing an increase in security efficiency, whether they are used to maintain the safety of employees or to protect the job site from theft or vandalism. Drones have the ability to create a round-the-clock, real-time monitoring system, greatly elevating onsite security whilst minimising health and safety risks.

What does the future hold?

Whilst the potential for drones is high, there are still some factors making people cautious about their impending adoption.

One imminent challenge is the regulatory environment in which drones operate. The industry’s rapid growth has outpaced the development of rules and systems to govern their use, and the resultant uncertainty has slowed commercial adoption and innovation.

Regulators in the UK and US have recently relaxed regulation to make drone flights easier. However, restrictions still significantly limit their commercial uses, with bans on drones flying near buildings or people, and the requirement for pilots to keep them lower than 120 metres and in their line of sight.

In the UK, the Department for Transport’s forthcoming ‘Drone Bill’ will propose new safety features, such as registering drones weighing over 250 grams. However, restrictions on where and how drones can be flown will need to be adapted before

their commercial potential can be fully explored.

The forthcoming bill follows newly proposed rules from the European Aviation Safety Agency (EASA). These seek to create a regulatory environment to foster the development of all civil unmanned aircraft systems. Whilst these rules will create a new framework that should ensure consistent safety standards for drones, clarity is needed around restrictions before the use of drones is commonplace on the construction site.

As with any regulatory introduction, organisations will have to adapt. Whilst this could mean more work is needed to ensure relevant processes are compliant, the long-term gains far outweigh any short-term hurdles.

Drone adoption is set to grow in the future, and at CRL we’re certain there is much more to see with regard to the development of new products and technological innovations. These improvements will make drones fly faster for longer, whilst enhancing safety. The real benefits will come from enhancements to the drone itself, with sensors and the use of predictive data analytics to analyse real-time information through machine learning and algorithms.

The construction industry is evolving rapidly, and with all the innovations and changes to traditional methods comes the need for greater efficiency in all aspects of business. Drones will be a major disruptor in the near future. Early and effective implementation of the technology will give forward-thinking companies a significant edge in a very competitive market.



FIGHT OR FLIGHT: GOVERNMENT ROLLS-OUT NEW DRONE REGULATIONS AMID MOUNTING SAFETY CONCERNS

AS DRONE UPTAKE SOARS AND THE UNMISTAKABLE WHIR OF ROTOR BLADES BECOMES AN INDUSTRY NORM, POLICY MAKERS ARE TAKING STEPS TO ENSURE THE SAFE AND RESPONSIBLE USE OF UAVs OR UNMANNED AERIAL VEHICLES. BUT HOW REAL IS THE RISK OF INCIDENT AND WHAT PRECISELY DOES THE GOVERNMENT INTEND?

In July 2017, an unidentified drone flew into conflict with an Airbus 319 on approach to Gatwick Airport. According to the UK Airprox Board investigating the incident, the risk of a mid-air collision was high. "A larger aircraft might not have missed it," read the authority's report, "and, in the captain's opinion, it [the drone] had put 130 lives at risk."

It's a familiar story and one that seems to play out with greater frequency across the globe. Three months later, a second drone flew headlong into a commercial airliner in the skies above Quebec City, Canada - the first collision of this kind to take place in North American airspace.

Thankfully, the passengers and crew were uninjured and the aeroplane sustained only minor damage, leading many to wonder whether the risk had been over-egged. But the threat of irresponsible use is a little more serious than some would have you believe.

What differentiates a drone from bird-strike is the base components of a bog-standard UAV. While an

aircraft can fly with one engine out of commission, a drone containing combustible lithium batteries can complicate matters considerably, while debris from a UAV can damage the airframe itself. There are anxieties too about potential impacts to windscreens and helicopter rotors – not to mention smaller, less well protected aircraft. How would a microlight fare in the event of a mid-air collision, for example?

Research – jointly conducted by the Department for Transport, British Airline Pilots' Association and the Military Aviation Authority – indicates that a drone weighing in excess of 400 grams could cause lasting damage to a helicopter windscreen. Airliner windscreens were found to be much more resilient, however. It would take a much bulkier drone – one weighing around two kilograms – to irrevocably damage an airliner, and only if the airliner was flying at a high speed, i.e. not during take-off or landing.

These findings are somewhat encouraging, though a significant amount of testing remains to truly identify the threat of irresponsible use. The government is not content to sit and wait

for the results, however. Newly drafted legislation means that drone operators will have to sit safety awareness exams as part of a concerted effort to regulate their use.

Any owner of a drone weighing 250 grams or more will have to register their details, the thinking being that this will actively encourage operators to fly responsibly. It's a system of accountability – a way to hold reckless operators responsible for their actions. For convenience, owners will be able to register online and put their credentials to the test via a compulsory drone safety awareness course.

The government has been quick to acknowledge the importance of drone uptake. Already drones are making a significant contribution to the UK economy and they remain at the forefront of Theresa May's industrial strategy unveiled last year. Undoubtedly, Great Britain is wise to the opportunity but the correct procedures must be in place before that opportunity can grow.

“ Any owner of a drone weighing 250 grams or more will have to register their details, the thinking being that this will actively encourage operators to fly responsibly. ”

KNOW YOUR DRONE CODE

THE GOVERNMENT, IN COLLABORATION WITH THE CIVIL AVIATION AUTHORITY, HAS DEVELOPED A NEW DRONE CODE WHICH IDENTIFIES SIX CORE VALUES:

- 1 **ALWAYS KEEP YOUR DRONE IN SIGHT.**
- 2 **STAY BELOW 400FT (120M) TO COMPLY WITH THE DRONE CODE.**
- 3 **EVERY TIME YOU FLY YOUR DRONE YOU MUST FOLLOW THE MANUFACTURER'S INSTRUCTIONS.**
- 4 **KEEP THE RIGHT DISTANCE FROM PEOPLE AND PROPERTY.**
- 5 **YOU ARE RESPONSIBLE FOR EACH FLIGHT.**
- 6 **STAY WELL AWAY FROM AIRCRAFT, AIRPORTS AND AIRFIELDS.**

"The UK is at the forefront of an exciting and fast-growing drones market and it is important we make the most of this emerging global sector," said former Aviation Minister Lord Callanan.

"Our measures prioritise protecting the public while maximising the full potential of drones. Increasingly, drones are proving vital for inspecting transport infrastructure for repair or aiding police and fire services in search and rescue operations, even helping to save lives.

"But, like all technology, drones too can be misused. By registering drones and introducing

safety awareness tests to educate users we can reduce the inadvertent breaching of airspace restrictions to protect the public."

One option currently under consideration is 'geo-fencing' – essentially an invisible wall designed to blanket designated buildings. This technology, which relies on GPS coordinates, can be built into drone architecture to prevent flight over prisons or airports, for instance.

Geo-fencing would allow drones to hover at the periphery of a zone but restrict flight into or launch from an affected area. Already, manufacturers are

beginning to incorporate this technology into their UAVs but these measures will need government support to well and truly get off the ground.

In the meantime, the regulations are clear. If you own a drone weighing 250 grams or more, the onus is on you to register it or face the consequences.

Find out more here:
<http://dronesafe.uk/>

“Drone use in the construction industry is already significantly reducing the time and resources needed to plan and build our roads and buildings, as well as the margin for human error, making progress faster, safer and much more cost-effective.”



NEW DRONE ORDER: INDUSTRY TO BE HELD TO A HIGHER STANDARD IN 2018

**ROBERT GARBETT, FOUNDER
AND CHIEF EXECUTIVE OF
DRONE MAJOR GROUP AND
FORMALLY APPOINTED BRITISH
STANDARDS INSTITUTION
(BSI) UK LEAD AT THE
INTERNATIONAL ORGANISATION
FOR STANDARDISATION (ISO)
COMMITTEE**





I have been closely involved over the past three years in the development and adoption of the first quality and safety standards for the drone industry, in my role as Chairman of the British Standards Institution (BSI) Committee on Drone Standards.

The new drone standards, due to be unveiled for the first time in 2018, are set to release the true potential of this fast-growing industry, revolutionising the way we live, and transforming business sectors from transport to infrastructure, agriculture to medicine – across air, land, sea and space. Drones, empowered by standards that can be trusted and relied upon are the key to many of today's economic, transport, security, environmental and productivity challenges.

The enormous impact of drones has yet to be fully recognised and the construction industry in particular will be one of the key sectors that will benefit most substantially from the 'drone revolution'. Central to this will be the adoption of the new drone standards which will open up new avenues to innovation that we can only begin to imagine. Drone use in the construction industry is already significantly reducing the time and resources needed to plan and build our roads and buildings, as well as the margin for human error, making progress faster, safer and much more cost-effective. Indeed, drones are shaping plans for new smart cities for which the use of these technologies will be part of

the fabric of life. Drones have the ability to decentralise populations, regenerate businesses and ultimately create opportunities and greater employment in areas which have been declining as our cities have become more condensed.

Drone Major Group is the first company in the world to bring together services dedicated to the drone industry and to the promotion of increased global connectivity. For this reason, we have taken a very close interest in supporting the introduction of the first ever formal drone standards. Standards improve the quality and performance of products and services, making things safer, helping organisations reduce risk and making businesses more sustainable. Standards help promote trade, enable innovation, improve productivity and protect consumers.

The new standards have been developed to provide an underlying 'Safety Quality' for the industry to ensure that air drones are 'Safe to Use' and 'Used Safely'. This is achieved through the development of two interlocking standards; when applied together, these standards are designed to result in an assurance of airworthiness within the drone industry.

The first, **aimed at manufacturers**, outlines the minimum safety quality standard for the product. Through this standard, manufacturers who choose to comply will be recognised as producers of air drones which are designed and manufactured to an

internationally recognised level of safety quality and, as such, will be deemed safe to use.

The second, **aimed at operators**, details the industry-recognised standard for the safe operation of air drones. Through this standard, operators who choose to comply with it will be recognised as following the internationally recognised level of safety quality of operations and, as such, will be deemed to be using the product safely.

Initially, the International Organisation for Standardisation (ISO) Committee standard will cover all air drones across all environments of use. However, as the project develops, it is envisaged that environment-specific protocols will be recommended to provide specific safety quality requirements for products and their operation across a wide range of specialist environments, including the use of drones in construction.

Use within confined spaces, operation in close proximity to buildings, and use in dangerous environments are all considerations which will be covered by the additional standards protocols which will be written by experts with significant experience in the construction sector.

These recommended protocols will then be reviewed by peers around the world and the wider construction and air drone operator community.

This process, unique to national and international standards, ensures that the resulting protocols are open and immediately relevant on a global scale.

BUYER BEWARE: WHAT YOUR BUSINESS NEEDS TO KNOW ABOUT DRONES



WHETHER YOU'RE A COMMERCIAL OPERATOR OR A CONSUMER HOBBYIST, YOU NEED TO KNOW THE DOS AND DON'TS OF RESPONSIBLE DRONE USE. WHICH CREDENTIALS ARE REQUIRED, WHAT TRAINING IS AVAILABLE, AND WHERE CAN'T YOU FLY?

HERE, JONATHAN NICHOLSON – ASSISTANT DIRECTOR OF COMMUNICATIONS AT THE CIVIL AVIATION AUTHORITY (CAA) – WALKS US THROUGH THE ESSENTIALS AND EXPLAINS WHAT YOUR BUSINESS NEEDS TO BE DRONE READY.

For the uninitiated, what credentials must a commercial business have to legally operate a drone?

First of all, it's not necessarily that you're a commercial business operating a drone. It's more that you're a commercial business *making money* from operating a drone. If you're a farmer, for example, and you're using a drone to survey some of your land, that's not necessarily commercial use.

As far as the CAA is concerned, if you know that you're going to be paid directly for flying a drone *before you fly it* that is commercial use. If, for example, an estate agent were to offer you £150 to shoot some aerial footage of a property. Essentially, it all comes down to knowing that you're going to be paid for actively flying your drone in advance of actually flying it.

Ideally, you would hire a commercial drone operator but if you would rather fly the drone yourself you would need permission from the CAA. Now, it's up to you how you go about that. For most this would mean either yourself or an employee completing a one- or two-day course, after which the people running it would make a recommendation to us that you had met the requirements. Tied to this, you would receive an operations manual which basically outlines how to fly a drone.

The course itself would cover things like airspace, aviation law, when and where to fly and hands-on drone control.

What kind of training opportunities are available to potential operators? What would you recommend?

There are tons of different courses out there. If you are going full commercial and seek approval from us then there are a number of National Qualified Entities (NQEs) – a list of which can be found on our website. These are organisations designated by the CAA as able to conduct the course and recommend people that have met the requirements.

If you just want general training, however, there are hundreds of people out there who do hour-long, half-day or full-day courses. I completed a full-day course myself a couple of years ago and, while I have no official certification as a result of that, it was really useful – not only to learn about the laws but also to find out how to fly a drone.

When you have a piece of kit worth upwards of £800 to £900, you don't want it to disappear into a tree or over the horizon never to be seen again. The course was great and well worth

doing but it didn't give me an official qualification – it just meant that I was more comfortable flying a drone and a lot less likely to lose it.

What are the potential consequences for drone operators not following the guidelines?

Ultimately, you could be prosecuted. The drone rules are law. But what happens to you depends on what it is you've done. If you're found guilty of endangering an aircraft with a drone, for instance, you could go to prison for up to five years.

As drone uptake increases, so too does the risk of in-air collision. Does irresponsible drone use pose a significant threat to aviation?

There's still a lot more testing to be done to assess the full risk. We would rather look at it not just from the perspective of a commercial airline as well. If you think about what's flying at lower altitudes where drones tend to operate, those aircraft have a lot less physical protection than an airliner.

But I'm conscious to remind everybody that drones have equal access to the airspace. Drone users have just as much right to be where they're allowed to be, so long as they're flying safely. It does come with responsibilities, however. If you're an air ambulance helicopter pilot, the chances of you spotting a small drone are a lot less than of the user seeing the helicopter. Microlights, paragliders and parachutists all share that same airspace and they have little or no protection. It's these things that drone pilots have to be aware of when flying their drones.

How aware are drone operators of where they can and cannot fly?

This feeds into the larger education piece. For the past couple of years, we've been running quite an extensive education campaign targeted at consumer drone users. Commercial drone users should absolutely be aware of where they can and can't fly, however.

Consumers could buy a drone from a high street store now and be flying by the time the battery has charged. They might know nothing at all about airspace. This is why we're doing a lot of work around education. A copy of our drone code is available with many consumer drone purchases. There's also quite a few apps and websites out there that list all of

the permanent airspace and any temporary restrictions – if an air show is taking place or a security incident has occurred, for example. We strongly recommend people use those.

In your view, are regulations moving in step with drone uptake or is the UK still playing catch-up?

The UK's regulatory history with drones is a bit strange in that we were one of the first countries to have drone regulation. However, we envisaged that the drones people would use would be large-scale, used commercially for filming or surveying, and we built all our regulations around that assumption. But it turned out that everybody wanted a drone and they were going to be very cheap and relatively small, all of which means that we've had to adapt and change as the technology develops.

The thing to say on future regulation is that the European Aviation Safety Agency has been working to create a unified set of standards across the EU. They've actually just published that final set of standards but we'll have to wait two to three years before they come into effect. With Brexit on the horizon, we don't know what will happen but it's highly likely that the UK will adopt these rules in one form or another. There will then be one set of standards for the whole of Europe, meaning a UK construction company will have the benefit of knowing that the same rules apply in the Netherlands.

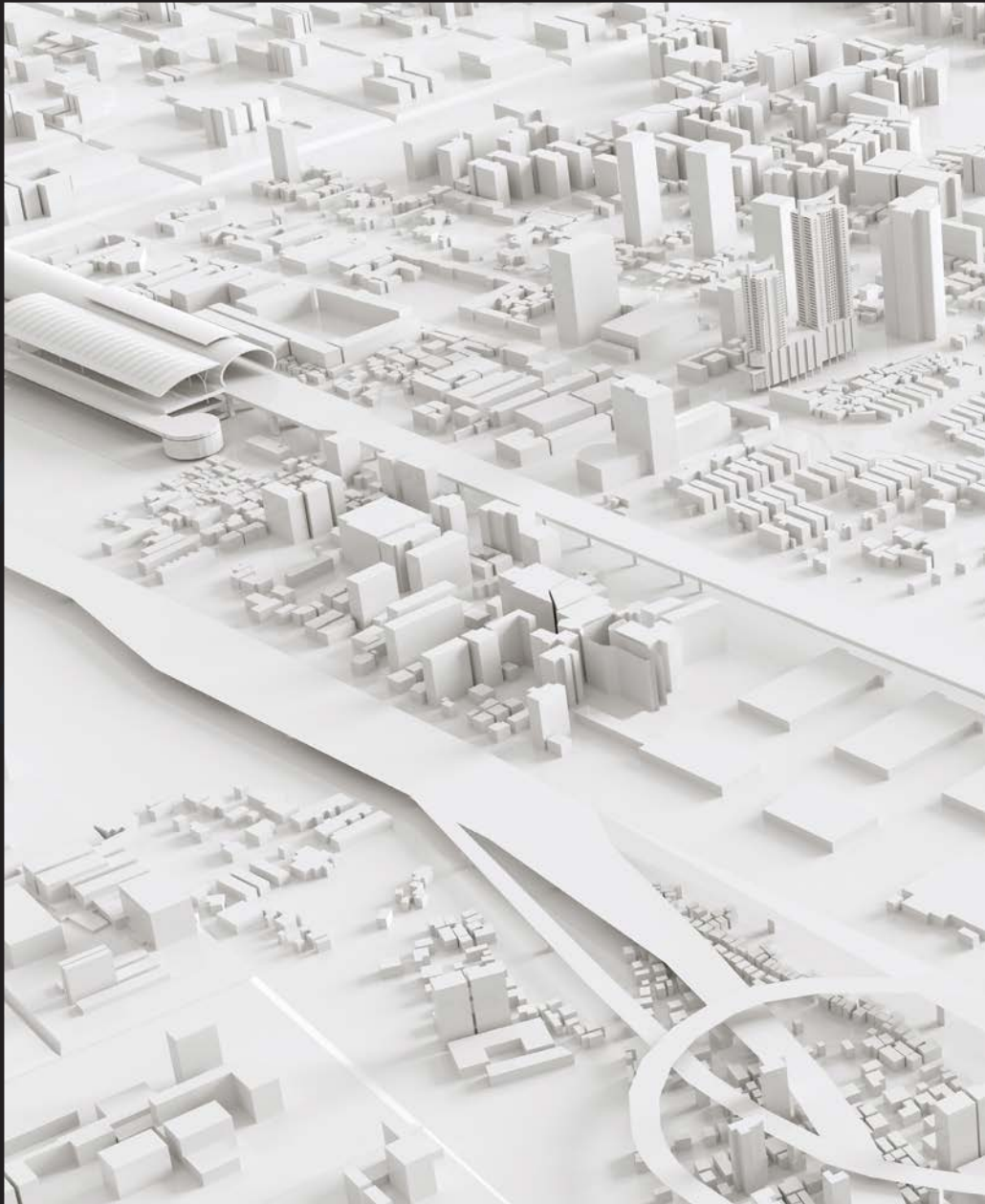
Ultimately, what would you like to see happen to ensure the safe and responsible use of drones in the future?

We should seek to exploit as many opportunities for drones as possible, whilst making sure that we don't impact other airspace users. The CAA is the aviation safety regulator and so we're all about making sure airspace users go about their business in the safest way possible, but without stopping them from doing great things. We absolutely don't want to impact anyone's use of a drone. We want the opposite, to facilitate drone uptake – but it has to be done in a coordinated way that works for everyone.

We're not a million miles away from autonomous mini-drones flying around city centres monitoring things. But that has to work around the medivac helicopter dropping into a nearby park to pick up someone involved in a serious accident. Drones must work this way – hand in hand with other airspace users.

To find out more, please visit:
<https://www.caa.co.uk/>

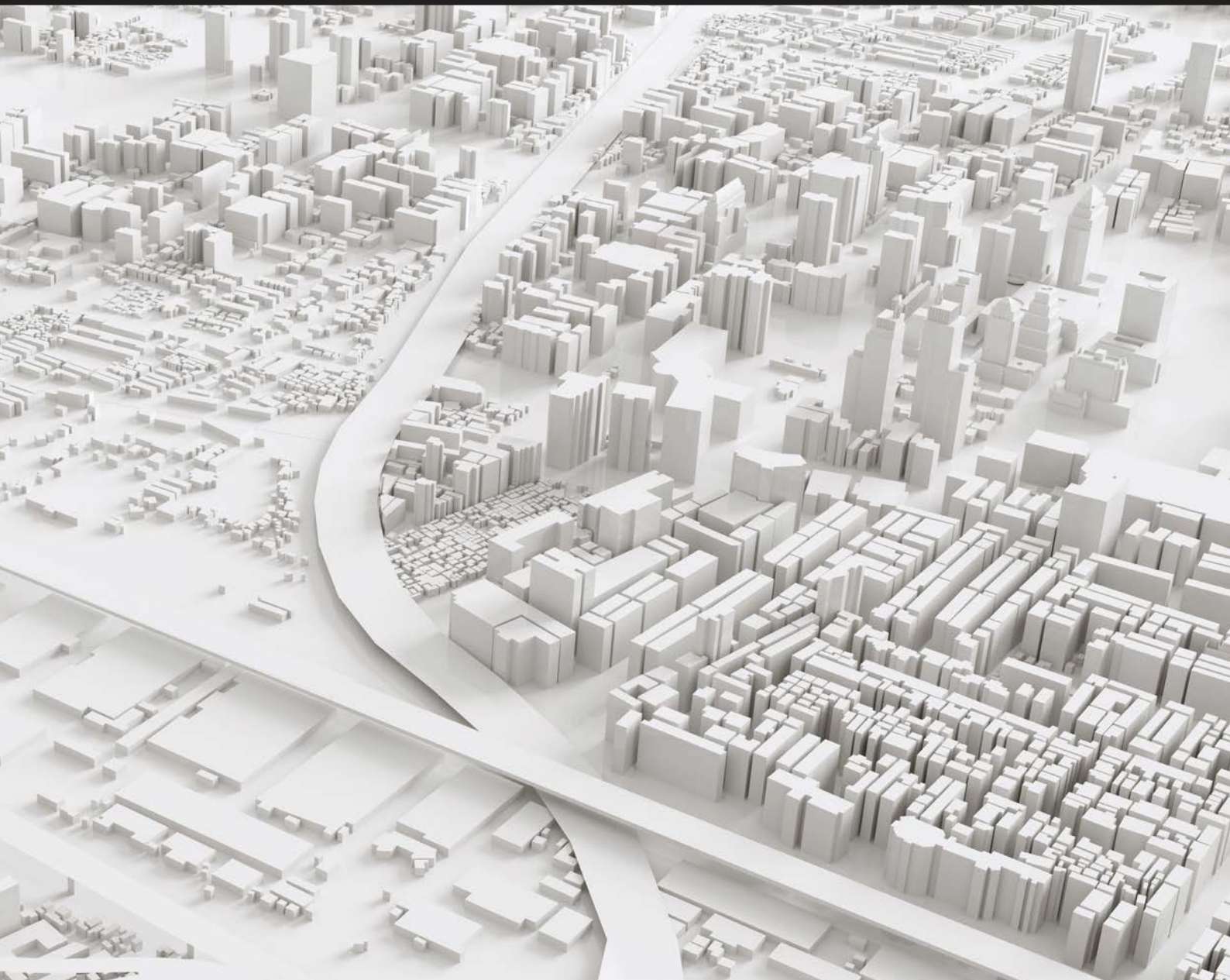
“ We’re typically brought in to provide independent opinion on what went wrong during a project – whether it’s time, money or technical. Across all three disciplines; time, money and technical, from inception right the way through to closing out of a project, people have expressed genuine interest in drones and reality capture. ”



REALITY CAPTURED: DRONES AND THE BIM PROPOSITION

THE ARRIVAL OF BUILDING INFORMATION MODELLING (BIM) HAS ENABLED CLIENT AND CONTRACTOR ALIKE TO MAP AND MODEL THEIR CONSTRUCTION PROJECTS WITH PINPOINT ACCURACY. IT'S A PROCESS KNOWN AS REALITY CAPTURE, AND DRONES ARE HAVING AN IMMEASURABLE IMPACT ON THE WAY IN WHICH WE MODEL OUR WORKS IN PROGRESS.

HERE, DR DAVID-JOHN GIBBS – MANAGING CONSULTANT, BIM ADVISORY AND DISPUTE RESOLUTION AT THE CONSTRUCTION CLAIMS AND CONSULTANCY FIRM, HKA – SHARES HIS THOUGHTS ON REALITY CAPTURE AND THE PIVOTAL ROLE DRONES NOW PLAY IN SECURING ACCURATE ON-SITE DATA.



What is your view on drone technology? Are drones having a noticeable impact on construction best practice?

Definitely. For me, with my Building Information Modelling focus, BIM is all about best practice when collecting, managing and sharing data on a construction project. Anything to do with digital capture is really interesting to me. It's why I fall into the drone camp, I guess.

I would say at the backend of last year interest in drones and reality capture in general – whether aerial or on the ground – went through the roof. We received a huge volume of enquiries and for multiple different uses as well.

I'm quite fortunate. My role spans the three core components of our business. Firstly, advisory – the strategic advising of clients front of house, sometimes before they know what asset they're looking for themselves. Then consulting, which is a little more focused on progress and dispute avoidance. How do we assist our clients in the best possible way? Finally, we have the expert witness side of things. We're typically brought in to provide independent opinion on what went wrong during

a project – whether it's time, money or technical.

Across all three disciplines, from inception right the way through to closing out of a project, people have expressed genuine interest in drones and reality capture.

In your view, what factors have led to the noteworthy rise in drone uptake and reality capture?

It's a combination of things, really. The industry as a whole is becoming more aware of the opportunities associated with digital.

As I see it, there are three phases to reality capture or drone scanning. Firstly, the scanning element itself – capturing the data. As technology evolves, the equipment becomes more affordable. Today, the actual cost of owning a commercial drone is far lower than it once was, particularly against the opportunities available.

The second element is data storage or processing. It is now much easier and cheaper to store data, and the act of processing and pooling that data is becoming more automated, driving costs down even further.

Finally, we have the third stage – the modelling

or presentation of data. This is probably the trickiest part at the moment; turning all of that raw information into something smart. But the uptake of BIM means that you can model around the data, convert it into 3D objects or combine it with data from other sources.

For instance, during a BIM project you will have a 3D representation of what the project should look like on completion. You could perform a drone scan or a ground level reality capture and overlay that data on the 3D model for comparison.

Straightaway people are beginning to sense the benefit of coordinating different data sets, and in these three different streams I definitely see affordability being a big factor.

How aware is the industry of the synergy between drones and BIM?

The awareness is definitely there. People see the opportunity, but that opportunity might actually be bigger than they realise. Businesses are conducting huge amounts of research and development (R&D) at the moment. There are start-ups specialising in aspects of drone use, and the big contractors are all exploring the potential.



“ When problems occur, we’ve noticed that people on construction projects – be it the contractor, sub-contractor, or client themselves – often want to capture progress at a particular point in time, especially if they don’t feel things are going to plan. ”

I wouldn’t say we’re at the optimum solution just yet but you can certainly realise value from where we are in the R&D journey, without question.

For the uninitiated, can you explain the rationale behind reality capture and the role drones play in acquiring accurate on-site data?

It’s probably best to talk about some of the examples that we’re currently seeing. From an advisory perspective, we’ve been engaged by a client – a developer in Asia – to keep record of their site. They’re looking to capture data at certain intervals so that they can monitor progress on a project. Drones lend themselves very well to this because you’re in the sky and able to capture data efficiently without restriction.

On that same project, the client is also interested in engagement, internally for key stakeholders but also externally so that the public can view the development over time. If done right, the models themselves can be quite engaging and they give people an opportunity to investigate and interrogate the development fully.

When problems occur, we’ve noticed that people on construction projects – be it the contractor, sub-contractor, or client themselves – often want to capture progress at a particular point in time, especially if they don’t feel things are going to plan. Photographs are great but you often lose context. I could photograph a hole in the wall but you might not know where that hole is when you come to look at the photo months later.

Reality capture does away with all that. It’s a lot like an internal of a site, something akin to Google Street View where you can walk around and fully explore a construction project in the proper context.

And then there are the instances when we’re not actually capturing the data but being

given it. Clients across the globe capture data and give it to us so that we can make an informed decision on what’s happening.

For instance, another Asian client provided us with progress scans – kilometres and kilometres of infrastructure – so that we could gauge progress from the air. You get a completely different insight than you would on the ground. Drones go where people can’t, which is fantastic, and you’re able to absorb information a lot more quickly.

These are just some of the benefits that suit the streams of our business. But there are a lot more aspects and the benefits go way beyond just these.

What advice would you have for companies looking to implement reality capture and drone technology?

It’s all about the value proposition really. It’s easy to get carried away and collect data because you think it’s valuable. There probably is value there but you should always think about how much it’s costing to put a drone up in the air. It’s not free yet, or at least I don’t know of anyone who does it for free, but it is getting cheaper.

It’s clichéd, but start with the end in mind. Why am I capturing this data, how could I potentially use it, and what do I have to do to that data to get there? That’s what people often forget. They think about capturing it and about how they would like to put it to use but they don’t fully appreciate the journey that data must go on. It’s not always as straightforward as people think.

Do you see drone uptake increasing in the construction industry?

It’s an interesting thought actually. I think drone use will increase as long as the

regulations remain the same. I’d like to think over the next five to ten years it will become business as usual – just something else that surveyors do as part of their day job.

But there are a lot of unknowns out there. Uptake is probably moving faster than legislation can cope with, especially around the world. Different countries have different laws and there are obviously restrictions in place – the ability to fly beyond your line of sight, for example. Government reviews are currently looking at the potential to relax that law or even tighten it depending on the outcome of testing. Something like that could greatly help or hinder uptake.

But as long as it’s safe and affordable, the use of drones will hopefully increase.

Finally, how do regulations on drones compare to those of other countries?

As far as I’m aware, the standards that we have here in the UK are pretty good. Normally, if you can legally fly in the UK, you’re okay or at least on your way to flying elsewhere in the world. You may need to apply to a different aviation authority but normally you’re at a standard that meets the requirements of other countries.

Around the world, regulations will differ. Depending on who your client is and whether or not you can secure a letter of support, you’re normally OK. But again, all of this is subject to change.

For more information on reality capture, please visit: www.hka.com

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“ In order to check on the habitable parts of the building and the electronic equipment above, we need drones that can visually inspect the structure. And this is something that is starting to inform the maintenance of other structures, because buildings are becoming more like machines as time moves on.”

BEST PRACTICE, REDEFINED: UNCOVERING THE IMPACT OF DRONE UPTAKE

HAVING TOUCHED DOWN IN CONSTRUCTION, DRONE TECHNOLOGY IS CURRENTLY REDEFINING THE WAY IN WHICH THE BUILT ENVIRONMENT IS CONCEIVED, CONSTRUCTED AND MAINTAINED – AND THE KCTV TELECOMMUNICATIONS TOWER IN ISTANBUL, TURKEY IS NO EXCEPTION.

IN AN EXCLUSIVE INTERVIEW, ANDREW WATTS – CHIEF EXECUTIVE OFFICER OF ENGINEERING SPECIALIST NEWTECNIC – IS ON HAND TO EXPLAIN HOW HIS PRACTICE IS PUTTING DRONE TECHNOLOGY THROUGH ITS PACES, THE CHALLENGES ASSOCIATED WITH EARLY ADOPTION AND THE SAFETY CONSIDERATIONS WHEN SPECIFYING AN UNMANNED AERIAL VEHICLE.

Newtecnic is making innovative use of drone technology for the KCTV Tower in Istanbul. Could you describe how drones are being implemented and why? What is the benefit?

For the KCTV Tower project Newtecnic is primarily using drones to identify and maintain elements of the building that need to be cleaned, repaired or replaced. Given the height of a telecommunications tower, this isn't a building that's conceived to be cleaned regularly as you would a glass tower.

In order to check on the habitable parts of the building and the electronic equipment above, we need drones that can visually inspect the structure. And this is something that is starting to inform the maintenance of other structures, because buildings are becoming more like machines as time moves on. They have a specific purpose to fulfil – they're no longer considered a monument to weather gracefully as an Oxbridge University building would.

In the case of the KCTV Tower, glazing at the very top provides big views out across the city but it's also required to project natural daylight into the building itself. This glazing needs to be highly maintained, particularly with the very strong likelihood of people pressing their hands and faces against the glass, applying continuous pressure and greater wear to the façade assemblies.

Understanding how the façade assemblies are performing over an extended period gives a snapshot of how the building is faring

between maintenance cycles, and regular use of drones helps to identify the behaviour of the building – how the assemblies are moving, for instance – by looking at the small changes in joint widths between panels.

Ultimately, it's much more than a photographic record. It provides a metric for measuring movement long term.

Was this kind of in-depth measurement possible prior to drone technology?

It wasn't. Previously, possibly once a year but in many cases every two to three years, a cradle would be lowered with two operators on board – one to work the motor and another to ensure the cradle stays close to the façade. Both people were effectively looking after themselves and their own safety, however, which obviously didn't put them in the best frame of mind to inspect a façade.

This method also meant that they were a lot less likely to make an accurate record because they were so close to everything. It's difficult to see the wood for the trees, and it can be equally difficult to join photographs up into an overall understanding of how a building's envelope is behaving.

But drones allow for an excellent photographic record, which can be used to view things in a completely different way, while the means of retrieving information is completely separate from the method used to analyse it.

That's still very much a problem on traditional building sites – inspecting something while

actually being part of it. You can't take yourself out of the equation, which means the quality of the inspection won't be as good as it could be if you were physically removed from the experience.

What are the challenges associated when bringing drone technology into a business?

As with all innovations, you have to introduce drones in a way that makes them seem very practical and matter of fact. You have to show an immediate benefit and make that benefit seem indispensable. Being able to investigate what is happening during the installation of a façade panel is pretty critical, especially when the alternative is waiting an hour or more for the opportunity to take a photograph.

Once you can demonstrate a practical and inexpensive addition to your suite of tools, it quickly becomes the norm.

Are drones in construction now ubiquitous or do they still have a certain novelty?

There's still a novelty attached to it, I think. There's always the risk with any early adoption – and drones are no exception – that people are more interested in the equipment than what it can do. Drones are actually about moving people off-site and into an office environment where they view data rather than using a piece of equipment. And so the challenge for people wanting to deploy drones is not so much the novelty but the shift in work practices, which is always painful when working in construction.



When any new technology is produced there's a threat to the privileges that the previous technology brought. The privilege of being a banksman on-site, the training required, and all the established safety procedures start to be swept aside and are instead replaced with a whole new way of working – not by sitting in a cradle but by sitting at a desk.

As an early adopter, did you feel you had to make the case for drones?

Yes. There's the whole issue of safety – what happens if a drone fails? Therefore, we have tethered drones. But is it going to smash against a panel and cause more problems than it solves? It's that lack of familiarity with something without being able to see an immediate benefit.

To understand drones, you need to understand a change in thinking. Building owners and engineers want to know how their creations are faring long term. How are they wearing? Which bits need cleaning to avoid corrosion? In 50 years' time they may want to dismantle and recycle the façade as it becomes a symbol of a bygone age.

Engineers want to know how buildings are behaving and inform the building owners accordingly. It's what you would expect of a car or electrical device and there's no reason people shouldn't expect the same of a building during its lifespan.

Responsible drone use is an obvious concern. How does Newtecnic ensure the safe use of drones onsite?

You need to ensure that the performance criteria of the equipment used is fit for purpose and only fit for purpose. A drone should not be overpowered, and it should not have any more on it than it has to.

Once drones become multi-purpose there's a big temptation to over-specify them and this adds a degree of danger because they're overpowered – they have too much reach or are too fast to handle.

You only need look at current road vehicles. They seem to be grossly overpowered for their primary role which is to deliver people and goods around cities. They're also designed to travel at high speed along motorways so there's a temptation to drive them quite quickly which brings its own dangers. Drones are no different.

Whilst it's very tempting for an owner to buy a "turbo" version as it were, you should only ever buy what you need.

Can you envision a day in which construction is fully automated or done via proxy machines? In your view, when might this be?

It's already happening in the construction sector – albeit on a smaller scale – but within

the next 20 years a lot of highly engineered buildings will be built through automation.

The driver for all this will be the new world cities like Neom in Saudi Arabia. Given the size of that city it's going to be quite difficult for there to be large temporary industrial zones for factory use or off-site fabrication.

Even in London there are severe restrictions on deliveries and, though the whole business of manufacturing off-site is the current 'state of the art', the bleeding edge is really automation.

It's almost a return to a pre-industrial form of construction where assembly is done in small fabrication workshops or construction labs positioned on-site or attached to the building itself as a kind of limpet.

The only limpets we have at the moment are platforms, on to which cranes deposit façade panels or interior components. Once those are turned into enclosed boxes, fabrication can actually be carried out here. They won't even need to be in the footprint of the building, which has been the problem for construction to date.

To learn more about the KCTV Tower project, please visit: www.newtecnic.com



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