SASIG Meeting
19th October 2022

Graham Brown
Chair
ARPAS-UK

Today's presentation: Drone Discussion

Overview of Topics:

- ARPAS-UK introduction
- What are drones and what is the fuss about?
- What are drones used for and where are they used?
    - Today - immediate benefits and actions
    - In coming years - opportunities and activities
- Understanding the economic benefits of drone use cases
- Some discussion points

ARPAS-UK: the UK Drone Trade Association

- ✓ The **not-for-profit** voice that represents the drone ecosystem and the professionals within it. Championing the drone community to both government and industry and working to accelerate the safe adoption of drones in all relevant roles and industry areas.
- ✓ A business enabler - providing learning and development to help companies keep up with best practice and give their clients good service
- ✓ An informed source - providing news & information to keep members up to date with the rapidly changing regulatory and legislative environment and the range of innovation and new solution developments. Providing use and financial cases for industry solutions.

To achieve this, ARPAS works with:

- ✓ **Regulators**: including CAA plus HSE, OFCOM, SIA
- ✓ **Government departments**: including DfT, BEIS, Home Office, Police (NPCC & NPAS)
- ✓ Other relevant organisations including **Industry Trade Associations, Institutes and Professional Bodies, Training companies, ITBs (e.g. ECITB)**, Landowners and recreational/hobby clubs & associations, Academic organisations including colleges and universities

ARPAS-UK
The UK Drone Association

In the future drone operations in UK cities will be widespread. Drones could be taking to the sky for medical transport, emergency Response, infrastructure development and maintenance and people and cargo transportation.

ARPAS-UK
Association of Remotely Piloted Aircraft Systems

Before we start

- Does anyone use drones?
- Is anyone thinking of using drones?
- Does everyone understand that drones are regulated by the CAA?
- Who owns the airspace?
- There is a different Aviation Language, Regulations and Legislation
  - ✓ NOTAM, ANO, CAP722,&22a, 722b, CAP1789, EASA….plus lots more
- Drones used for business/commercial purposes require Specialist Insurance
  - ✓ Compliant with EC 785/2004

Types of Drones – Simple Overview

Small Drones

- Sport & Recreation
- Data collection, Inspection, surveying
- Delivery

Large Drones

- Cargo
- Passenger carrying – Emergency Services, Search and Rescue, Air Taxi, Urban Air Mobility

Particular focus today is Small drones and their significant financial benifits

Examples of Future New Entrant Vehicles

- Urban Air Mobility (UAM)
- Regional Air Mobility
- Advanced Air Mobility (AAM)



New vehicles will be approved and certified from 2024 onwards

Types of Small Drones

Multi-rotor drone
Any drone that uses rotors to provide lift and thrust to manoeuvre

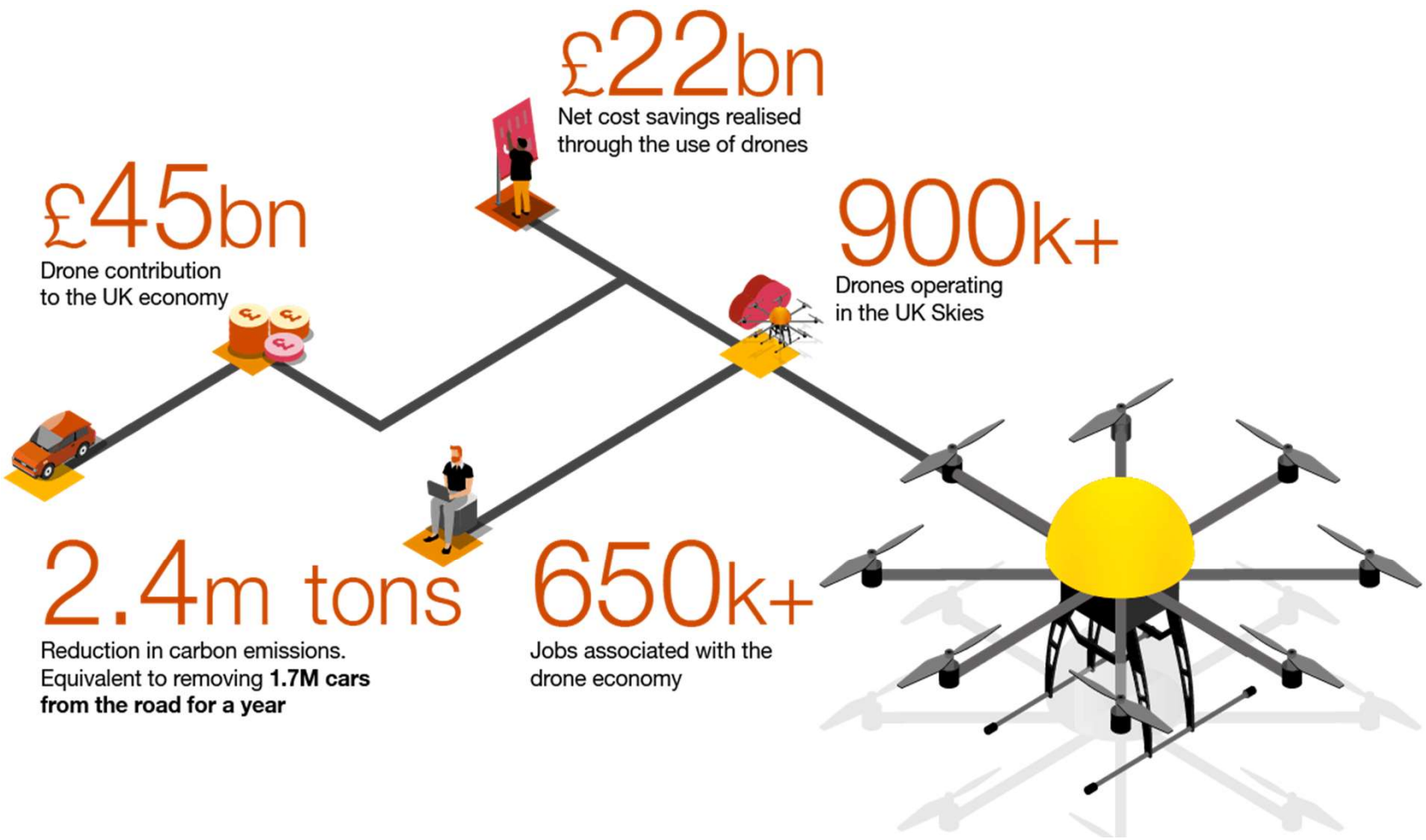
Fixed-wing drone
Any drone that uses the flow of air across a wing to achieve lift, thrust is provided by propeller, turbine, jet, etc

Hybrid drone
Combines body shape and propulsion methods to give optimum performance

Tethered drone
Secured to a cable that could be used for data transfer or to supply power, fluids, gasses etc

Robot
Machine designed to carry out a task

The 2030 opportunity:
PwC Skies Without Limits 2.0



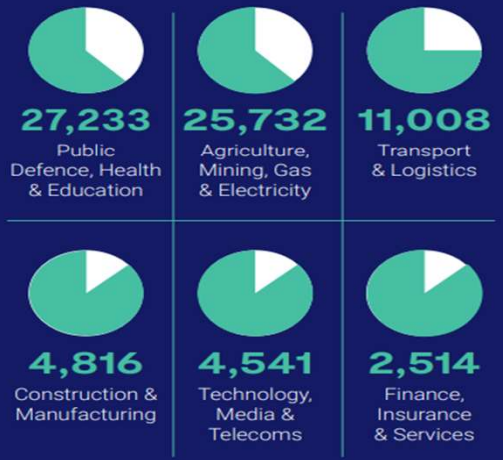
Market opportunities

The global market for drones, AAM and supporting services is projected to be approximately

$74 BILLION BY 2035

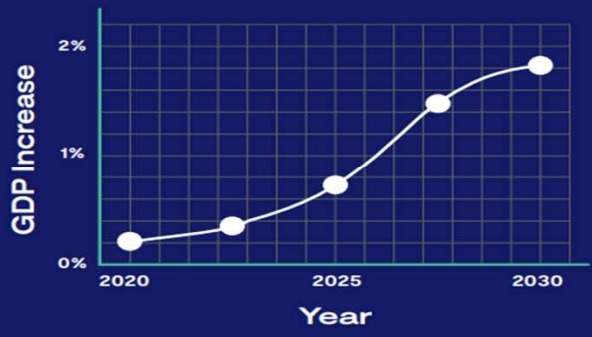
DRONES	AAM	SERVICES
$38 BILLION	$32 BILLION	$4 BILLION

76,000 drones projected to be in use by industry in the UK by 2030



Predicted impact on UK economy

There is predicted to be a 1.8% increase in GBP and £16bn in net cost savings to the UK economy by 2030 through drone services



Consumer vision 2030

How new classes of air vehicles will benefit consumers in 2030

Drones

Unpiloted, non-passenger carrying vehicles varying in size from small to large

Delivery convenience
Distribution and delivery services are rapid, convenient and within each reach for everyday goods and services

Supporting services
Drones support emergency services and perform complex inspections/operations

Increased acceptability
Drone operations are quiet, safe and acceptable as part of day-to-day life

Advanced air mobility

Electrical vertical take-off and landing vehicles that provide short journeys for up to 10 people

Regional air mobility

10+ person electric, hydrogen or hybrid aircraft providing short-medium range hops between fixed locations

Reduced congestion
Efficient use of airaspace resources reduces ground congestion (especially in urban areas)

Improved connectivity
Rural and traditionally disconnected regions form part of a highly distributed transport system within close proximity

Increased consumer choice
Allowing consumers to choose between cost and environmental efficiency

Seamless journeys
Existing transport is integrated as part of a seamless end-to-end transport network including ticketing

Reduced journey time
Average journey times significantly reduced

Journey convenience
Services are available on demand, reducing impact of travel and travel times

Improved affordability
Operations are affordable and widely available for the general public

Increased sustainability
Operations are electric- or hydrogen-based, minimising the environmental impact

Improved accessibility
Improved access to services and employment opportunities for those with reduced mobility

Benefits to the UK economony
Predicted 1.8% increase in GDP and 628,000 jobs supported by 2030

2030 use cases

Example use cases showing how new classes of air vehicles will operate in the future aviation environment by 2030 and the benefits these will bring to consumers

UC01 Inter–town transit

Access to convenient air travel for mobility between towns and cities. Passengers can access a scheduled electric- or hydrogen-powered aircraft on high-density routes. The air travel element connects seamlessly with other forms of transport to create a kerb-to-kerb mobility system that users can access with a single ticket.

UC02 Rural/ disconnected transit

Air taxis for transit between rural and traditionally disconnected areas on a scheduled/on-demand service as part of a highly-distributed aviation system.

UC03 Drone delivery

Retail organisations provide on-demand last-mile delivery of cargo within each reach of consumers utilising a network of drones operating Beyond Visual Line of Sight.

UC04 Cargo delivery

Cargo is transported as part of an operational service, across the UK between distribution centres by fleets of zero emission eCTOL aircraft and automonous drones.

UC05 Maintenance and inspection

Rapidly deployed and high-endurance autonomous drones carry out maintenance and inspection operations of infrastructure in complex environments, reducing risk to personnel.

UC06 Intracity journey

Passengers have access to automonous Electric Vertical Take-Off and Landing (eVTOL) vehicles for mobility between urban locations as an additional mode of transport.

UC07 Emergency services support

Emergency services have a deployable drone operation to support rapid first response in a range of scenarios including road traffic accidents, search and rescue, fire response and situational awareness.

UC8 Rapid airport transfer

Passengers have access to on-demand air mobility to provide transit between their homes and nearby airports, between hub airports and local airports for onward transfer or between airports and high-volume cities and towns.

Benefits across society

Unmanned systems use cases

uses for autonomous or semi-autonomous unmanned platforms is only limited by imagination

Key Industry segments below are leading the adoption of drones for a wide range of tasks

Military

Oil & Gas

Telecom

Renewables

Mapping & Surveying/ Construction

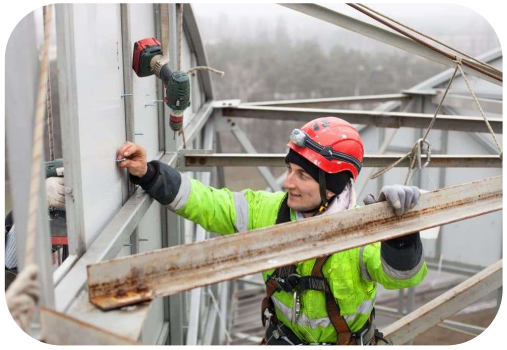
Emerging Markets

Interior Inspections and Inventory

Delivery of Critical Supplies

- The 5G rollout will require hundreds of thousands of site and tower inspections over the next several years.
- The return on investment (ROI) for many energy-related drone use cases is high.
- Drones are increasingly being adopted to monitor warehouse inventories. It’s also an area where unmanned-unmanned teaming can be utilized.
- The response to COVID-19 has accelerated progress in developing capabilities and regulatory frameworks to support deliveries by unmanned systems.

Drones can do things quicker, cheaper, safer and more accurately than traditional methods

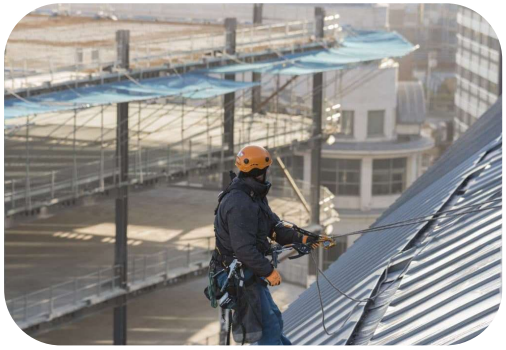


Safer

- Take the risk of working at height out of the process altogether.*

Quicker

- Rapid deployment will minimise any potential disruption to residents or staff, with no damage to property or surroundings.



Cheaper

- Small gains in efficiency can translate to millions in savings.

Greater accuracy

- A photo is worth a thousand words, and potentially millions of pounds.

* Health and Safety Executive (HSE) data shows that falls from height were still the biggest cause of fatal injuries between 2013 and 2018.

Examples drones use in local government:

- Land surveying - image and video capture to gain a better perspective of sites and the use of sophisticated photogrammetry software to produce orthomosaics for surveying of potential development sites
- Building/structures inspections - thermal surveys of roof structures and bridge inspections
- Transport management - from tracking congestion to planning and maintaining roads and monitoring the progress of large development schemes
- Emergency planning - monitoring areas that have been subject to flooding
- Coastal management - creating a detailed orthomosaic enabling highly accurate rates of erosion to be calculated. Drones have also been used to assess the severity and impact of coastal landslides.
- Greenspace management - prioritise maintenance of parks and open spaces. Drones have also been used for monitoring of habitat and wildlife in locations that would otherwise be difficult and dangerous to access
- Enforcement - collecting evidence to assist with enforcement action. This included assessing damage to a site caused by travellers and aerial photographs of a property to be used as evidence in a court action
- Communications/public relations - showcasing regeneration projects & commemorative events

Drone Pathfinder Project examples

- **Network Rail**

Network rail demonstrated how drones minimise the risk of trackside working and reduce network outages

- **Housing Asset Inspection**

Vantage UAV demonstrated how drones could be used to reduce the overall cost of planned and unplanned maintenance in asset inspection

- **Drone in a box (**Herotech8 and Idroneimages)

Demonstrate how increased automation drone in a box solutions can deliver greater efficiencies and unlock new applications through increased automation

- **Mountain Rescue - Buxton**

Buxton Mountain Rescue demonstrated how drones designed for inclement weather can save lives in search and rescue

- **Coastal Erosion Monitoring**

Project to review with the Environment Agency how drones can monitor the UK's changing coastlines that are increasingly under threat due to climate change

- **Agriculture**

Collaborations demonstrate how drones can increase yield and reduce the use of fertilizers and pesticides through more targeted application

- **Cross industry**

The programme supported by **ARPAS-UK**, the UK industry trade association and professional body focused on use cases and their benefits

Renfrewshire Council – multi million £ savings

Renfrewshire Council owns about 12,000+ properties in their social housing portfolio consisting of 2-5 story low rise accommodation and 14 high rise towers.

- Until 2016, they had been using mobile elevated working platforms and scaffolding
- Previously, roof tiles with a 30 year life-span were replaced at 30 years, regardless.
- Drones have enabled the council to assess roof health more effectively and maintain them for an additional 2, 5 or 10 years.
- Using traditional methods, the data gathering process would have been to slow for this approach to be viable

"Last year alone, this methodology saved the council £4m+ and allowed an entire programme of inspections to be carried out in under 2 months"
Source: Duncan Smith, Renfrewshire Council

CATAPULT Connected Places

ARPAS-UK The UK Drone Association

What are Drones used for?

- Inspections
  - ✓ Buildings
  - ✓ Wind farms
  - ✓ Solar farms
  - ✓ Long linear assets- rail, utilities

- Surveyors
  - ✓ Planning
  - ✓ Pre-construction
  - ✓ Construction
  - ✓ Post close-out monitoring and inspection

- Gas Detection
- Environmental & Conservation (SnotBot)
- Agriculture, precision agriculture, spraying
- Security & Surveillance
- Film, Television, News, etc
- Delivery (trials)

Safer, faster, cheaper, greener…and greater accuracy

And in the Future

- Artificial Intelligence
  - To help the drone
  - To help automate solutions for Industry
- Robotics will see development of “Drones that Do”
- Automation, autonomy will help drive productivity
- More and more attachments and sensors
  - smaller,
  - lighter and
  - cheaper to expand use
- EC, DAA, Remote ID, etc will improve the use of integrated airspace and BVLOS

And in the future (2)

- Urban Air Mobility e.g. Air Taxis, regional transport
- Freight transportation - bulk cargo, last mile delivery e.g. medical, B2B, B2C (later)
- In future - “Drones that Do”
  - ✓3D printing
  - ✓Nail gun - roof tiles
  - ✓Fire fighting
  - ✓Window cleaning
  - ✓Conservation

Public Perception

Use cases & applications tested in the research

Security & law enforcement

Commercial parcel delivery

Keeping people safe

Infrastructure / construction

Filming for leisure

Agriculture / mining

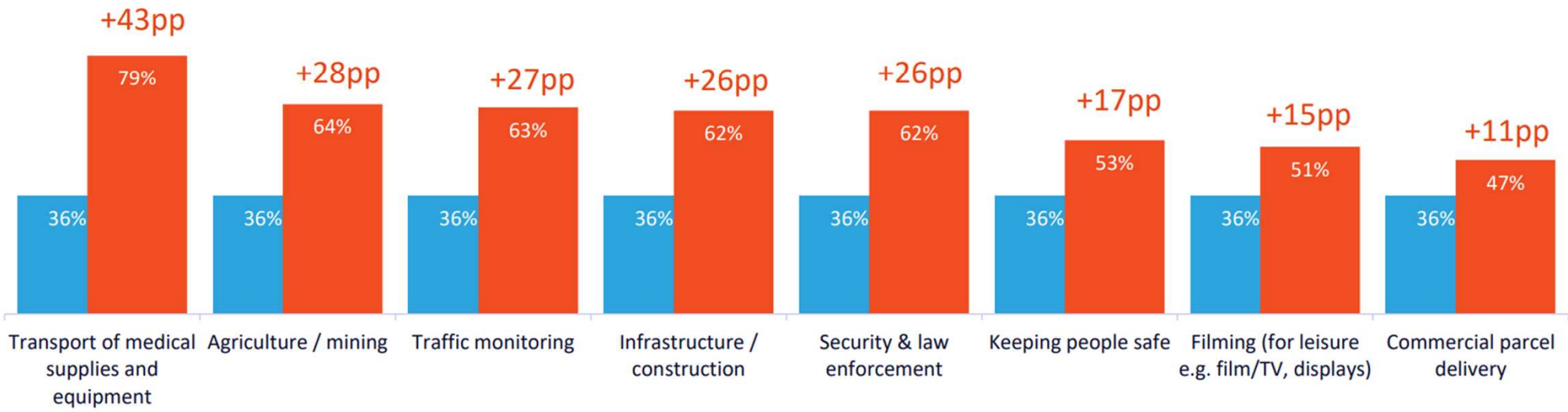
Transport of medical supplies

Traffic monitoring

The majority of use cases generate positive sentiment, especially those where personal benefit is clear and obvious

Impact of Drone use case on sentiment

Positive sentiment towards Drones (% point increase before vs after seeing use case examples)



Question(s): C1: Here is one example of the positive benefits of drones If you heard or read about this use of drones. How positive or negative would you feel about drones now? Base: All respondents (c.255 per cell)

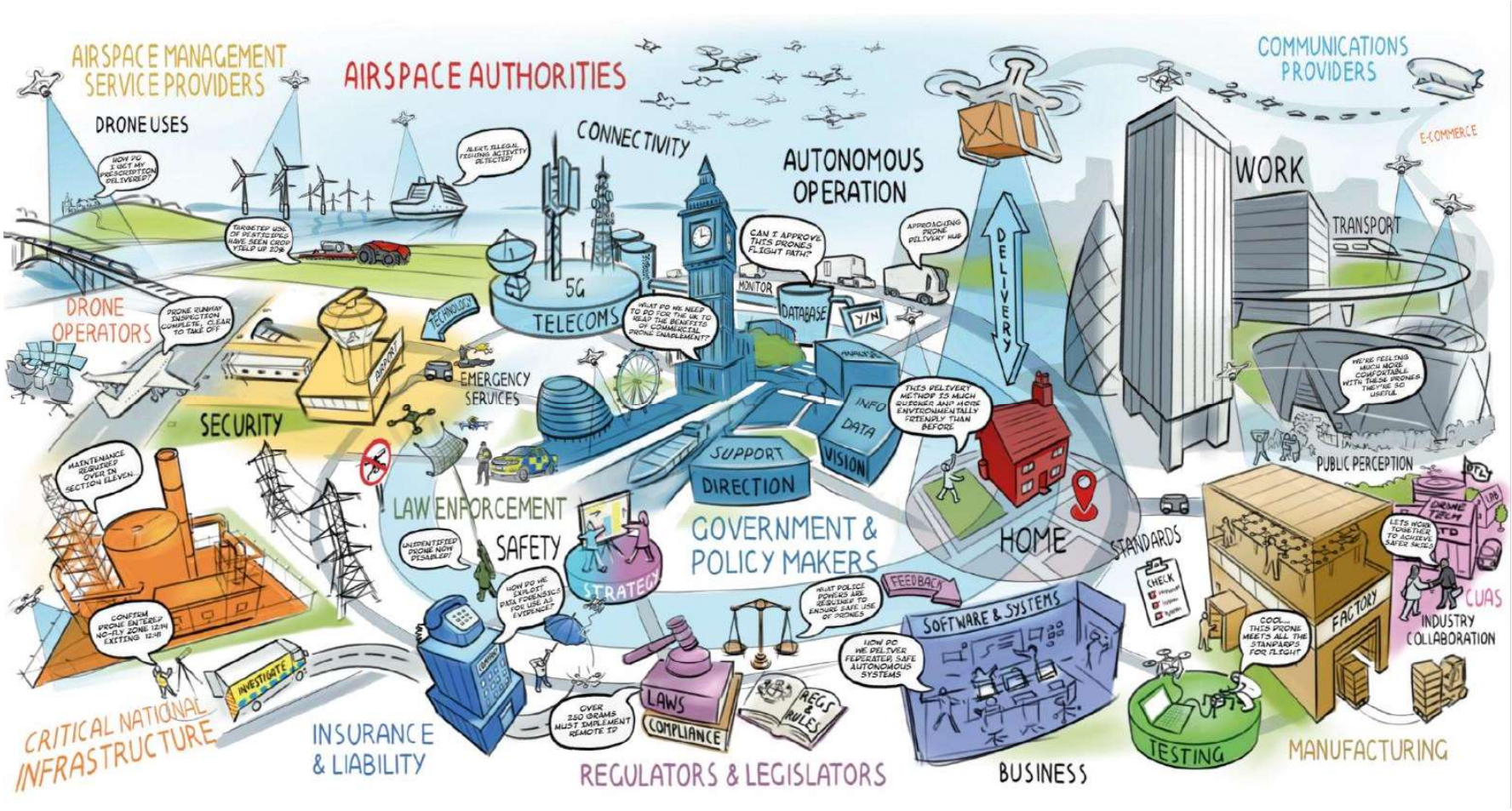
New tech frontiers

- Autonomy, AI: control systems that adapt
- Materials, design, batteries and propulsion
- Sensors, imaging and on-board processing
- Navigation, comms and connectivity
- Robotics and AI solutions will change the landscape

Challenges…

- Demonstration + integration of solutions
- Traffic management for scale and deconfliction
- Airspace Integration

A complex, multi-player picture



What are the key trends driving the unmanned systems Industry?

Autonomy and AI are critical technologies driving drone adoption in commercial and military settings

Autonomy

As unmanned platforms become more autonomous, manpower costs decrease.

Artificial Intelligence

Machine learning will allow unmanned systems operate autonomously and process data faster.

Manned-Unmanned Teaming

This trend is being championed by several militaries to increase ISR and precision strike capabilities while decreasing manpower requirements

Unmanned-Unmanned Teaming

Commercial drone and robotics companies are partnering to provide autonomous data gathering platforms in multiple domains.

Swarming

There has been much research, testing, and investment into multiple drones collaborating to achieve a mission.

Minimizing Time to Data

Drone OEMs an[illegible]es providers are continuously improving platforms and software to minimize the time required to make fast, informed decisions.

Data Integration Across Platforms

Many drone se[illegible]oviders are utilizing and/or developing services that enable integration of data collected from a wide range of sensors.

Delivery by Unmanned Systems

The COVID-19 pandemic has increased demand for contactless delivery and many nations have enabled increased operations though regulatory support.

Image Sources: C4ISRNET.com, Percepto.com, UASMagazine.com.

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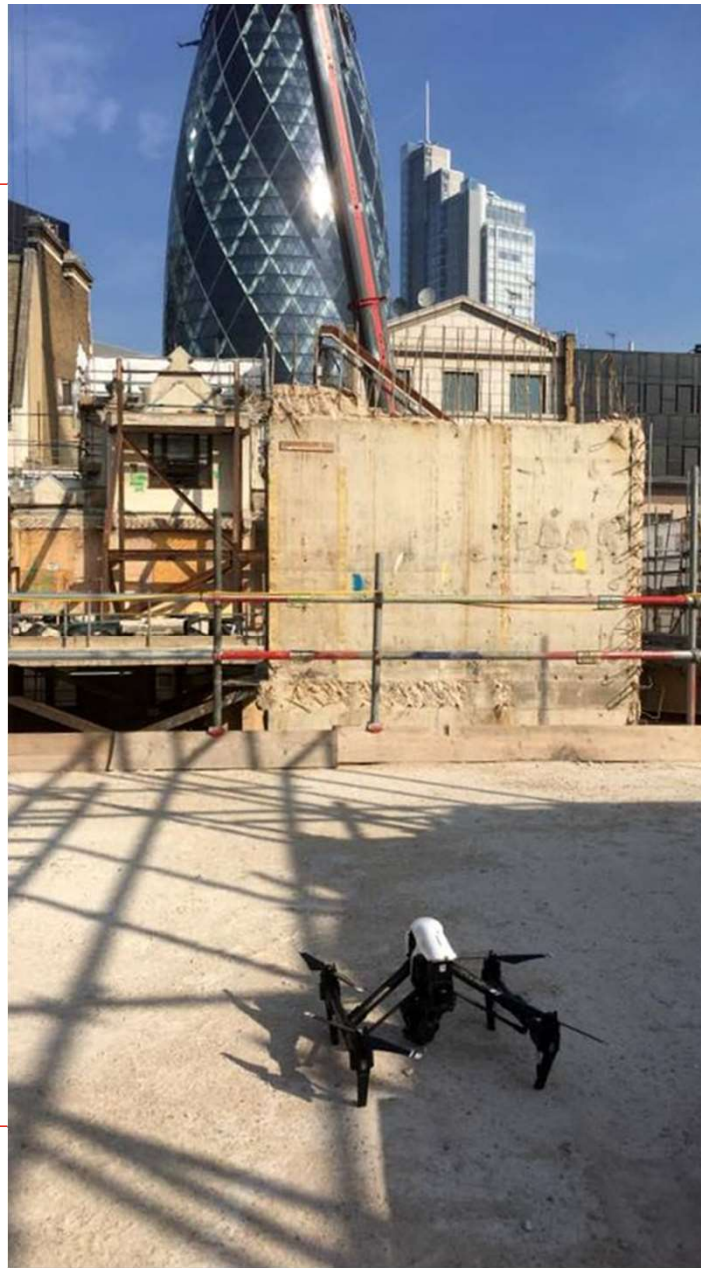
SUMMARY



Summary

- Drones should be considered for any role where work is:
  - At Height
  - In enclosed spaces
  - In a hazardous area
  - In a hard to reach area
- More accurate and efficient capture of data
- Greater insight into integrity of your assets
- Data collected faster & more safely
- More accurate scheduling of maintenance
- More efficient use of resources
- Significant reduction in expense
- (Assist with legal disrepair scenarios)

Future Flight Landscape

https://ktn-uk.org/programme/future-flight-landscape/

The size of the prize in the UK

By 2030:

- £16 billion net cost saving
- £42 billion increase to GDP
- >900k drones in UK skies
- 650,000 jobs in the UK Drone economy

HM Government

Department for Business, Energy & Industrial Strategy

Department for Transport

Advancing airborne autonomy

Commercial drones saving money and saving lives in the UK

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That’s all from me.
Any Questions?

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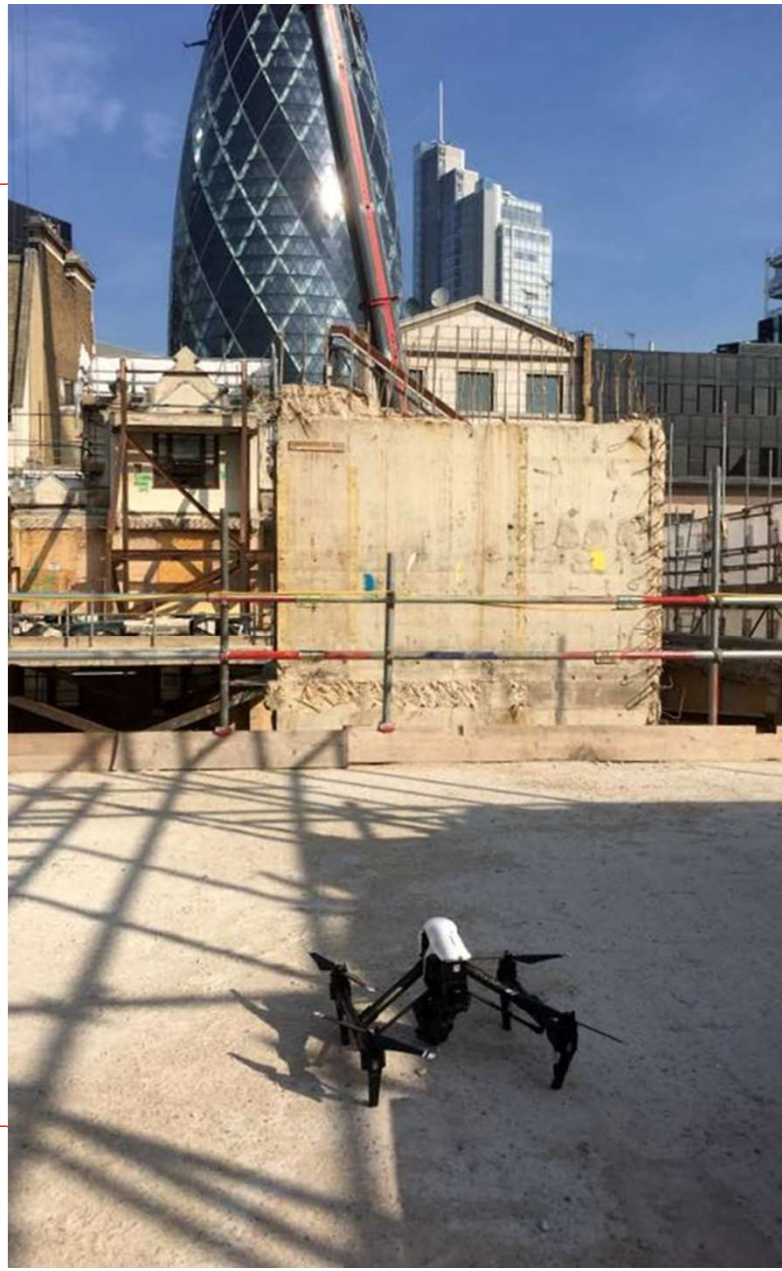

Discussion Topics

- Local Drone Use
  - Recreational use
  - Commercial use
  - In House use
- Policies (covering the above)
  - Flexible to allow for current & future opportunities
  - Enforceable
- Planning for future UAM/AAM etc

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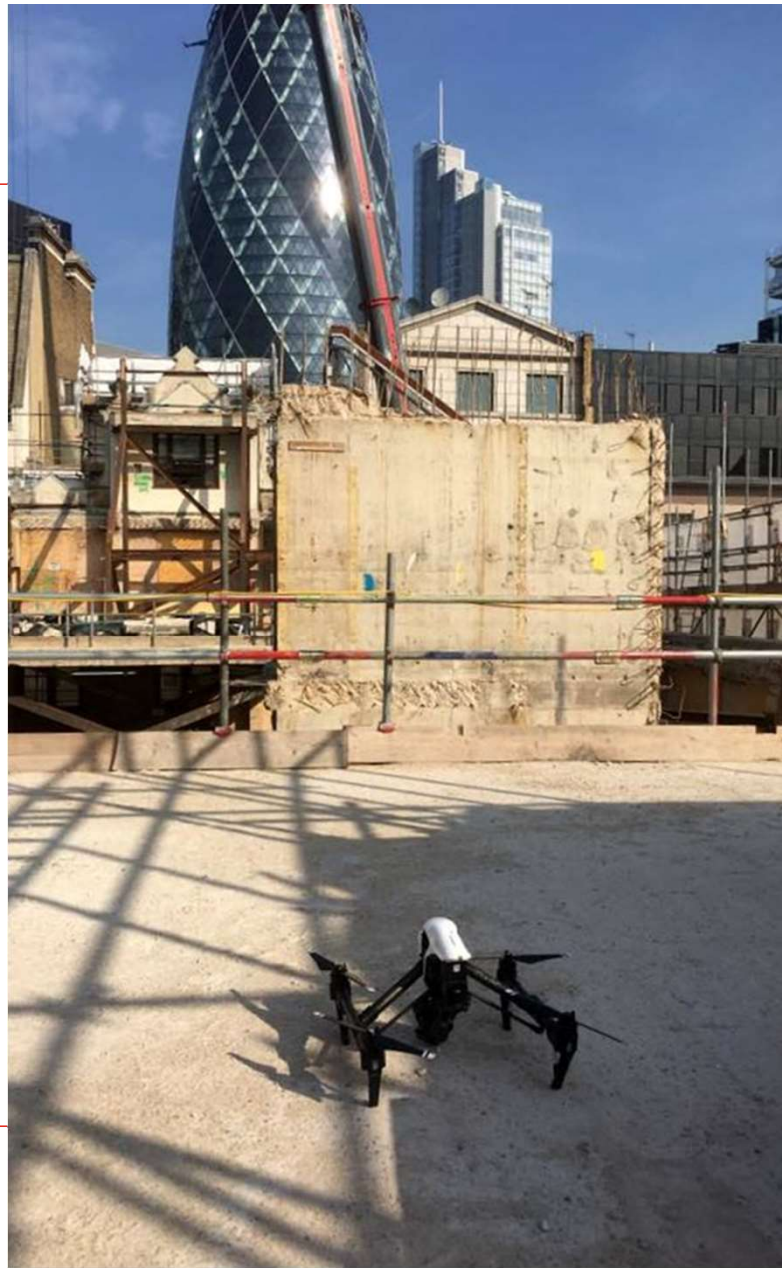

THANK YOU