

Wednesday, March 31, 2021

Welcome to the Pathfinder Community Event

The webinar will begin shortly...



Department
for Transport



Department for
Business, Energy
& Industrial Strategy



Civil Aviation
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CATAPULT
Connected Places

Connected Places Catapult

Government Drones Pathfinder Community Event

Webinar, Wednesday 31st March 2021



Department
for Transport



Department for
Business, Energy
& Industrial Strategy



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Agenda

10:00 – 10:05 - Welcome and Introduction

David Pounder, Connected Places Catapult

10:05 – 10:45 Pathfinder Steering Committee

- **Department for Transport** – Fozia Chughtai Head of Drones Policy, Emerging Aviation Technology, DfT
- **Department for Business, Energy & Industrial Strategy** - Supporting R&D and Business Growth in Robotics, including Drones – Gordon Baker, Robotics and Autonomous Systems Lead, BEIS
- **Connected Places Catapult** - Pathfinder 2020/21 Update – Howie Chau Systems Engineer, CPC
- Drone Pathfinder Catalyst Programme (2021/22) – Fozia Chughtai, DfT and Chris Gee, CPC
- Q&A Session

10.45 – 12.00 Industry Presentations

- Airspace Integration of Drones in Support of COVID Response Pathfinder - John Henderson, **Trax International**
- Close Visual Inspection in Industrial Environments – BVLOS - John McKenna CEO, **sees.ai**
- Drone Demonstration & Development Pathfinder Overview and Outcomes - Jennifer Cooke Aviation Innovation and Future Technology Lead, **Maritime & Coastguard Agency**
- Unlocking BVLOS to Realise the Future of Drone Technology – David Pankhurst Head of Drone Solutions, **BT**
- Open Access UTM Project 2020/21 – Chris Gee Principal Engineer, **Connected Places Catapult**

12:00 – 12:40 Drone Pathfinder Catalyst Programme – UK Sectors & Industry Roadmap

- Q & A Panel: Fozia Chughtai (DfT), Gordon Baker (BEIS), Andrew Chadwick (CPC), Howie Chau (CPC), Chris Gee (CPC)

12:40 – 12:45 Wrap up and close

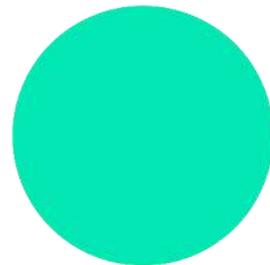
Department for Transport Update

Fozia Chughtai

Head of Drones Policy,
Emerging Aviation Technology



Department
for Transport



Supporting R&D and Business Growth in Robotics, including Drones

Gordon Baker

Robotics and Autonomous
Systems Lead



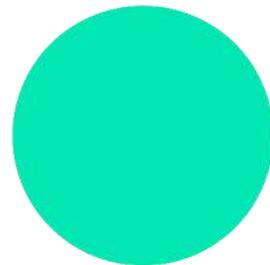
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& Industrial Strategy

Connected Places Catapult

Drone Pathfinder Programme

Howie Chau

Systems Engineer



Pathfinder Programme

The Pathfinder Programme is part of a wider programme of work, both Government led and across the UK's public and private sectors. The programme is aimed at enabling integration of drones into UK airspace.

Pathfinder projects aim to **push the current state of play** and understand the major **technical, operational** and **regulatory** opportunities and barriers that exist for the adoption of drone technology.

Pathfinder Steering Group



Benefits of becoming a Pathfinder include the opportunity to:

- Inform Government roadmaps and policy as well as future regulatory constructs
- Learn from other Pathfinder projects and the Pathfinder Community at Pathfinder Community Days
- Access to the CAA Innovation Hub services

Pathfinder Projects 20/21



Local BVLOS in controlled environments

- Led by Sees.ai



Above and Beyond

- Led by Wales & West Utilities



UASs to detect marine ingress near nuclear power stations

- Led by Cranfield University



Airspace integration of drones in response to Covid-19

- **New Pathfinder**
- Led by Trax International



Infrastructure Inspection

- **Completed in 2019**
- Led by Costain



MCA drone demonstration & development

- **Completed in 2020**
- Led by Maritime and Coastguard Agency

How to become a Pathfinder

Go to <https://cp.catapult.org.uk/opportunity/join-the-pathfinder-programme/> to download

- Pathfinder Application Guidance
- Pathfinder Terms and Conditions
- Pathfinder Framework

Make a request for an application by emailing drones@cp.catapult.org.uk

Applications will be assessed by the Pathfinder Steering Group against the criteria detailed in the Application Guidance

		SAFETY CHALLENGES											
		Communication				Navigation			Surveillance				
		RF spectrum access & risks	Command and control range capabilities	Understanding of the BVLOS operating environment not visible to the remote	Robustness of the Comms link	External limiting factors/pilot	Reliance on GNSS	Radio positioning service capabilities	Geofencing and geo-awareness capabilities	Non-cooperative surveillance	Management of unmanned traffic	Providing the airspace picture	Topographic intelligence
OPERATIONAL CHALLENGES	Long, Linear BVLOS Operations in Rural / Remote Locations / Low Population												
	Large Area Surveys in Rural / Remote Locations / Low Population												
	Urban BVLOS Operations												
	One-to-Many Drone Operations												
	Robust, Resilient, Redundant Drone Operations												

Pathfinder Challenges from Application Guidance

Drone Pathfinder Catalyst Programme

Fozia Chughtai

Head of Drones Policy,
Emerging Aviation Technology, DfT

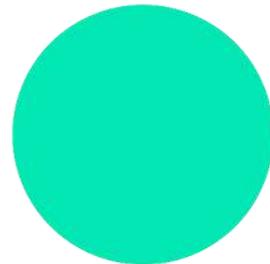
Chris Gee

Principal Engineer, Connected Places Catapult

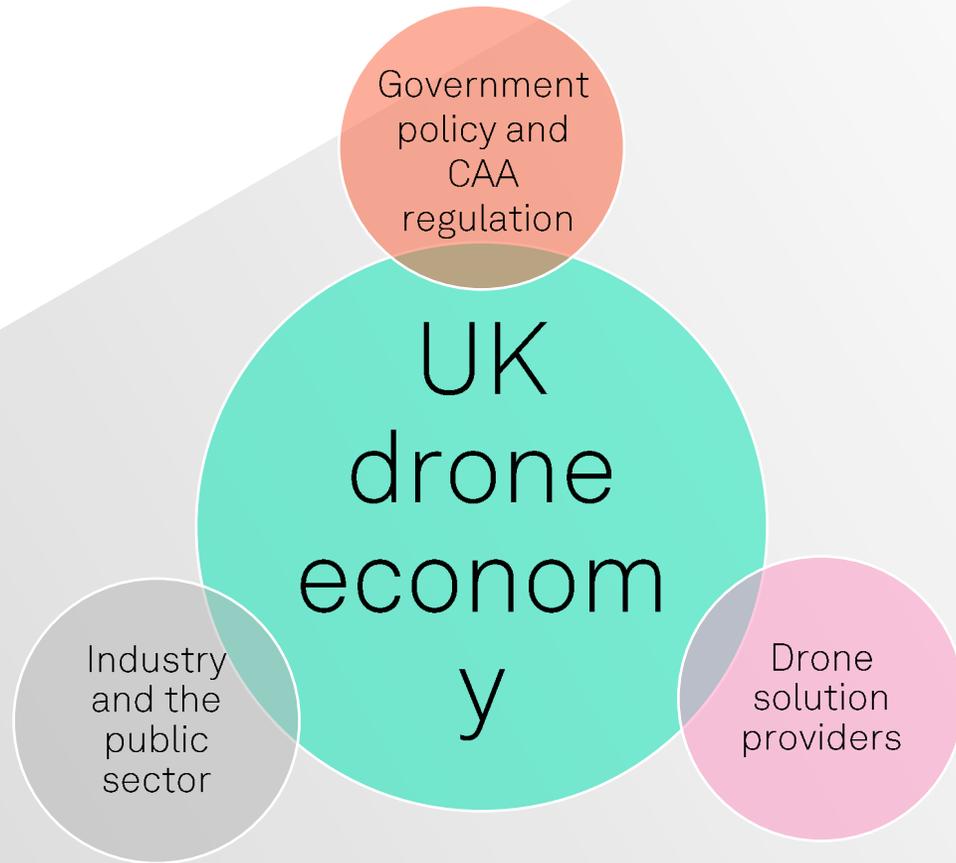


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Drone Pathfinder Catalyst Programme



The Drone Pathfinder Catalyst Programme aims to boost the development and use of drones across the UK economy.

We will achieve this through:

- Engagement
- Demonstration
- Innovation
- Public dialogue

Engaging beyond the drone industry



We have an extensive programme of engagement planned for the next 12 months with each quarter focusing on specific industry sectors.

First quarter engagement:

- Regional - local authorities and Local Enterprise Partnerships
- Construction
- Housing

Demonstrations and knowledge sharing



Real world demonstrations to bring to life the benefits of drone solutions



Case studies and economic analysis for each demonstration delivered

Enabling innovation

6 grants of £30k for ambitious projects aligned to the following themes:

- Onboard detect and avoid
- Autonomy
- Communication and navigation

Pathfinder projects delivering pioneering solutions:

- Technical support
- CAA engagement
- Market exploitation



Facilitating public acceptance

We will be running a research and engagement programme to understand public views of drones and address public acceptance paving the way for drone deployment across multiple sectors in the UK.

- Educate
- Listen
- Respond



How to get involved in the programme

- Industry engagement
- Demonstrations
- Pathfinder project
- General questions - drones@cp.catapult.org.uk



Pathfinder Steering Committee

Q&A

Please note questions relating to Pathfinder Catalyst Programme will be covered by the Q&A panel at the end



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Enabling BVLOS operations in non-segregated airspace

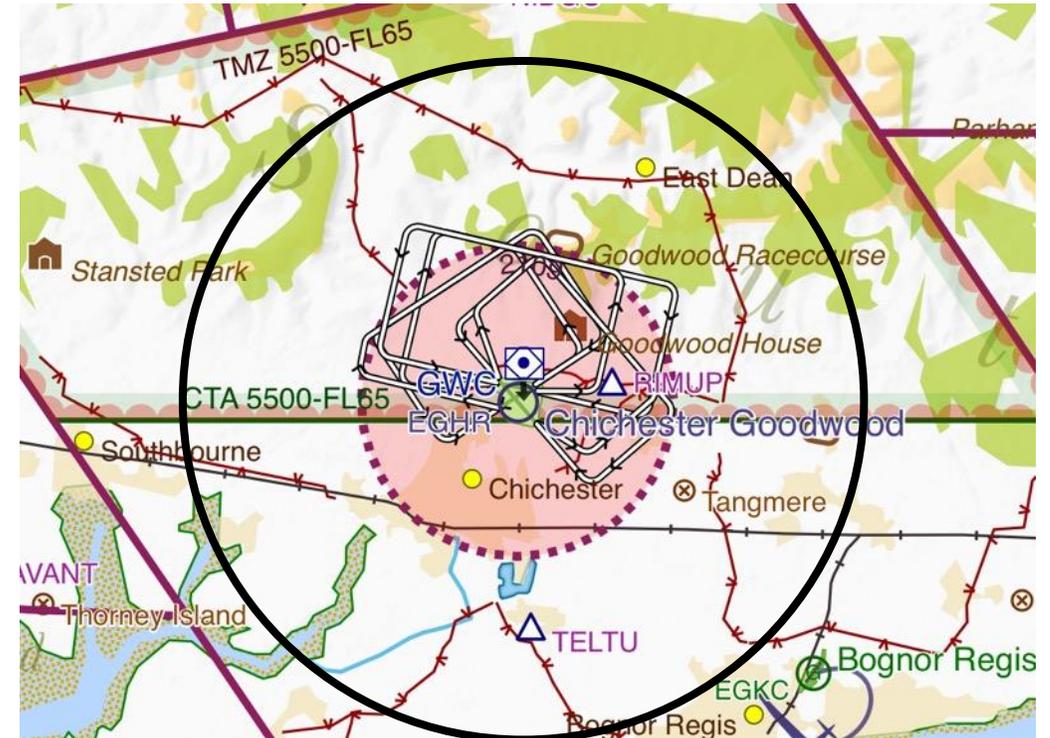
Pathfinder Community Day

31st March 2021



Background

- Temporary Danger Areas (TDAs) have been approved by the CAA at various locations including Goodwood Aerodrome to facilitate BVLOS operations in segregated airspace. Such solutions are only short-term. An alternative solution that allows BVLOS operations through a technology as effective as “see and avoid” should be found.
- Consortium partners: Trax, uAvionix, Plane Finder and ANRA Technologies are working together with trial hosts Goodwood Innovation Centre and trial participants Skyports on a project that aims to prove a concept of safe BVLOS UAS operations alongside conventional traffic in non-segregated airspace.
- This airspace will take the form of a Transponder Mandatory Zone (TMZ) requiring all airspace users to be conspicuous. Such a trial requires initial VLOS & BVLOS testing in a TDA to develop the safety assurances to enable transition to BVLOS operations in a TMZ.



The Team



- Trax consultants are experts in airspace change, policy, regulatory approvals, classifications and restrictions, flight planning, IFP design, mapping, terrain and charting, live airspace trials, concept development, airspace operational procedures, safety risk assessments and stakeholder engagement and consultation. Trax holds a CAA Permission for Commercial UAS Operations which will be used for the VLOS testing. Trax may seek an OSC for BVLOS operations subject to time constraints.



- uAvionix are experts in developing state-of-the-art airborne avionics transmitters and air/ground-based receivers, navigation aids and UAS integration. uAvionix President Christian Ramsey is appointed to the FAA's Drone Advisory Committee. They have proven and established track record in dealing with the UK CAA and with the process of seeking test licence applications for emissions via Ofcom.



The Team



- ANRA's software platform supports a myriad of UAS through a cloud-based architecture to enable real time flight planning, traffic management, strategic de-confliction, compliance, and fleet management while supporting stakeholder interfaces and integrations. The software will utilise the uAvionix data inputs, configuration and CAA permission for trial, in order to demonstrate acceptability for the UK market.



- Plane Finder's global surveillance network enables end to end control ensuring data integrity that is trusted by industries around the world. In the consumer market Plane Finder's innovations are subscribed to by millions of global Plane Finder app and website users. Together this gives immense domestic and international exposure.



The Team



- The Goodwood Innovation Centre is a joint venture between Goodwood Aerodrome and Across Safety Development. At its heart is a team of dedicated professionals experienced in both the manned and unmanned aviation sectors, who are passionate about bringing new UAS technology to market.
- Goodwood Aerodrome and the Innovation Centre at Goodwood are trial hosts and sponsors of the airspace trial.



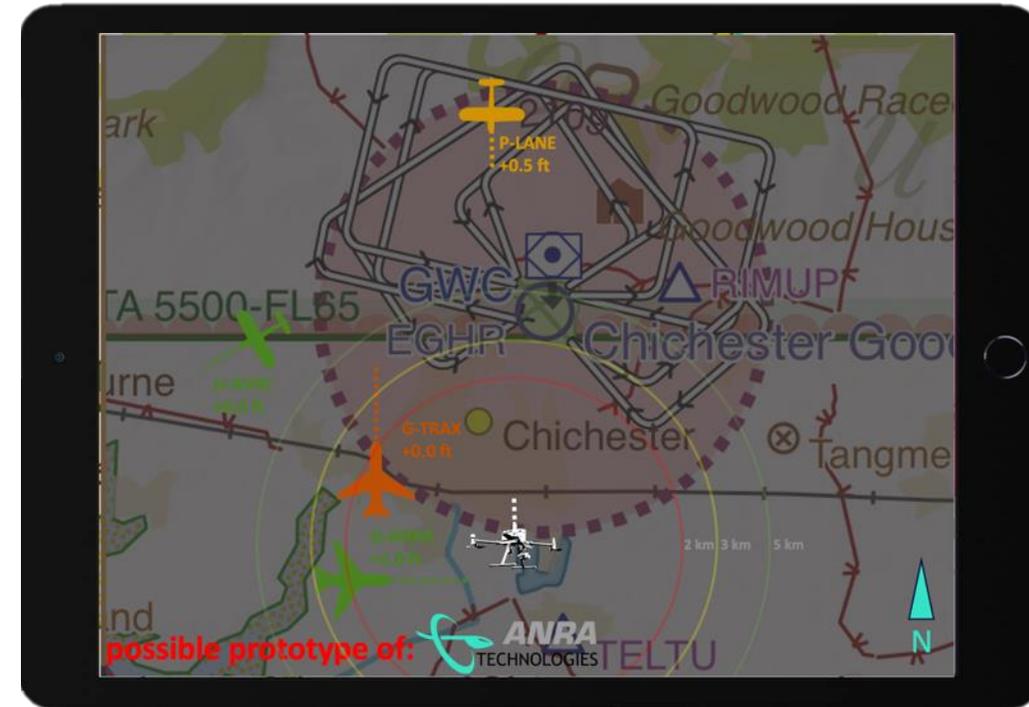
Skyports

- Skyports is a mobility company developing and operating landing infrastructure for the electric air taxi revolution, as well as operating cargo drone deliveries.
- Skyports are a UAV operator trial participant with a BVLOS OSC and suitable aircraft. Their OSC will require approvals for this concept.



Proposed solution

- A comprehensive surveillance picture in combination with an advanced UTM platform will be used to demonstrate the 'Detect and Avoid' capability of the UAV operator is as good as the 'See and Avoid' capability of conventional aircraft under Visual Flight Rules (VFR).
- uAvionix and Plane Finder are deploying a robust surveillance and broadcast environment created by a network of ground stations that receive the EC information from aircraft and rebroadcast it to all as an integrated air picture via international standards.
- ANRA Technologies Smartskies UTM platform and alerting system will be provided to the UAV operator who will test a series of pre-defined routes in a number of different scenarios.
- Trax will develop the operating protocols for UAV operators to follow with a view for them to be as generic as possible to enable transferability to other detect and avoid surveillance solutions.



Key objectives

To create a long-term solution for safe UAV operations alongside conventional manned aircraft in non-segregated airspace.

Enhance the safety of day-to-day operations in Class G airspace via the broadcast of real-time Flight Information and Traffic Information to enhance situational awareness of all airspace users and stakeholders.

- This is to be achieved through a gradual build up of safety assurances and the development of operating protocols in a controlled, segregated environment.
- Leading to a demonstration in non-segregated airspace (TMZ) with General Aviation access, subject to meeting a minimum level of EC equipage.

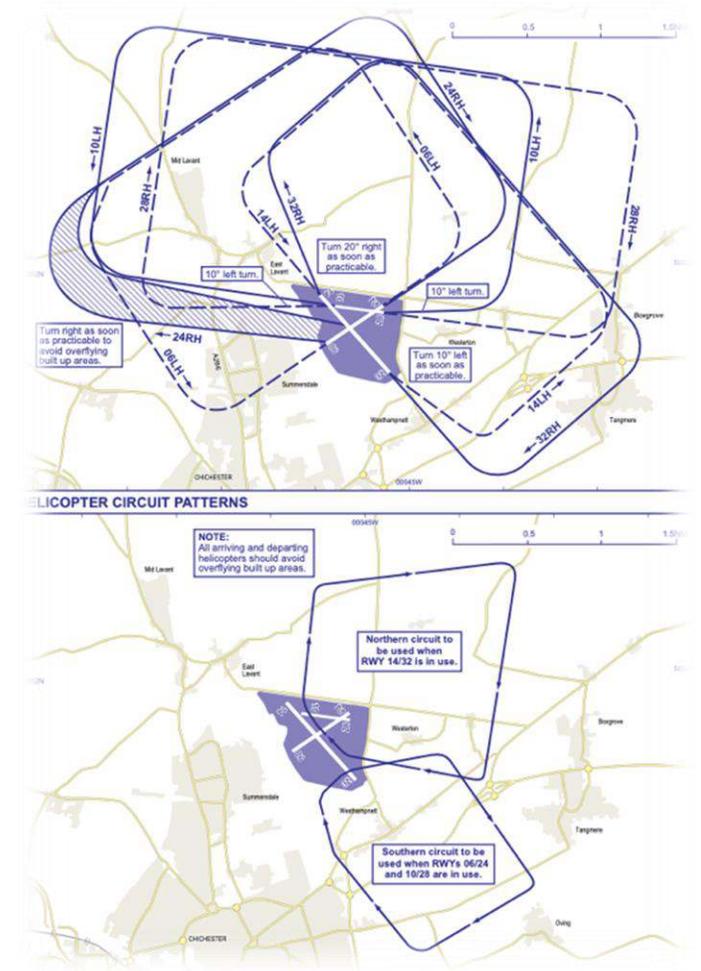


Operating environment

Goodwood is a busy aerodrome in Class G airspace serving a variety of fixed-wing and rotary aircraft.

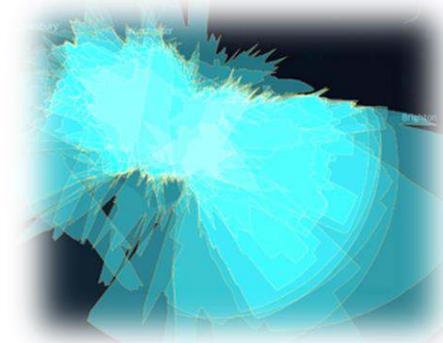
A Flight Information Service Officer(FISO) provides a Flight Information Service to aircraft on frequency within the Aerodrome Traffic Zone(ATZ) and oversees operations to/from their 3 grass runways.

The surrounding airspace is very busy with General Aviation including the gliding community.



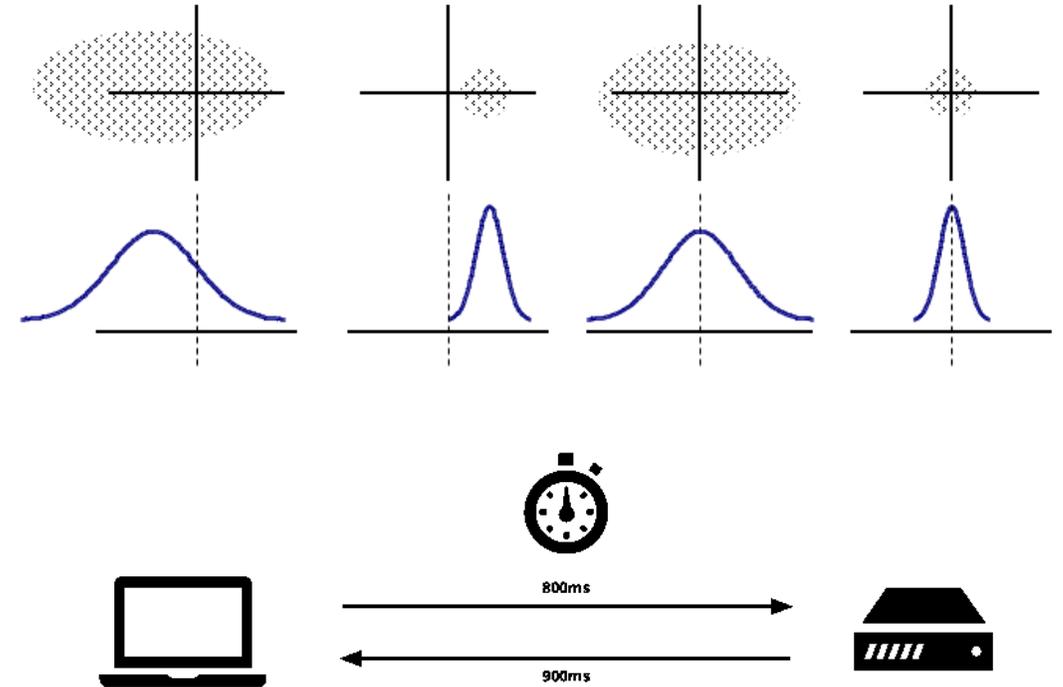
Surveillance & Re-broadcast

- Plane Finder's existing surveillance coverage of Goodwood has been enhanced with additional Plane Finder and uAvionix systems.
- Systems will detect ADS-B, Mode S (MLAT) and FLARM
- TIS-B will re-broadcast Mode S (MLAT) and FLARM position information. FIS-B transmissions will include TMZ location/dimension/status.
- 978Mhz broadcast licenses received from OFCOM.
- Access to TMZ will require Mode S or ADS-B Out as a minimum.
- FLARM will not enable TMZ access.



Gradual build up of safety assurances

- Surveillance system tested for accuracy and latency.
- Limitations of system (inc coverage) understood and mitigated.
- UAV behaviour and limitations tested.
- Initial VLOS testing taking place without TDA (subject to aerodrome approval).
- Operating protocols developed and refined.
- TDA available from 8th April.



Gradual build up of safety assurances

- VLOS and BVLOS testing of pre-defined and obstacle/terrain-safe routes within TDA.
- Routes avoid populated, commercial, residential areas
- Gradual introduction of controlled fixed and rotary traffic to the TDA in simulated scenarios.
- Hazard Identification and Mitigation.



Challenges

UAV operators are not necessarily pilots or ATCOs.

Class G is 'see and avoid', so no defined separation standards.

What can the UAV operator do with the information?

What **can't** the the UAV operator do with the information?

Innovation naturally means there's no policies against which the CAA can regulate.



Questions



The background of the slide is a dark blue, semi-transparent aerial photograph of a city skyline, featuring several prominent skyscrapers. The text is centered and rendered in white.

sees.ai

AERIAL INTELLIGENCE
AT ENTERPRISE SCALE

John McKenna, Co-Founder & CEO
jmckenna@sees.ai +44 7990 588 338

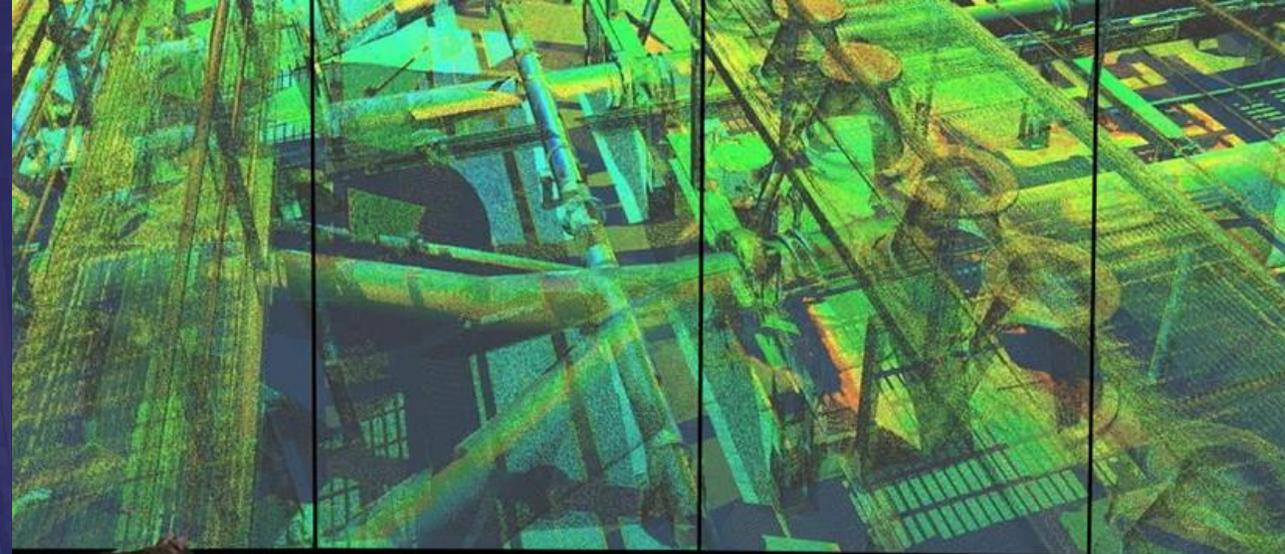
VLOS operations got the
industry started

**But this approach has now
reached its limit**



Control room based BVLOS operations is the inevitable next step

Economies of scale =
greater range of services at higher
quality and lower cost



Software is the key

BVLOS today

Autonomy tomorrow



We are spearheading this transition

In both the UK Civil Aviation Authority Innovation Sandbox and the UK Government Drone Pathfinder

One of only 12 entities selected into the Civil Aviation Authority Innovation Sandbox



One of only four entities selected into the UK Government Drone Pathfinder



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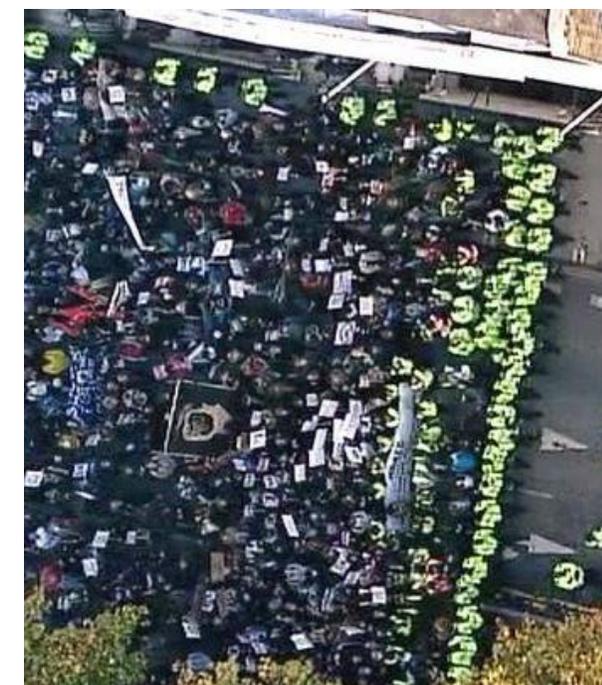
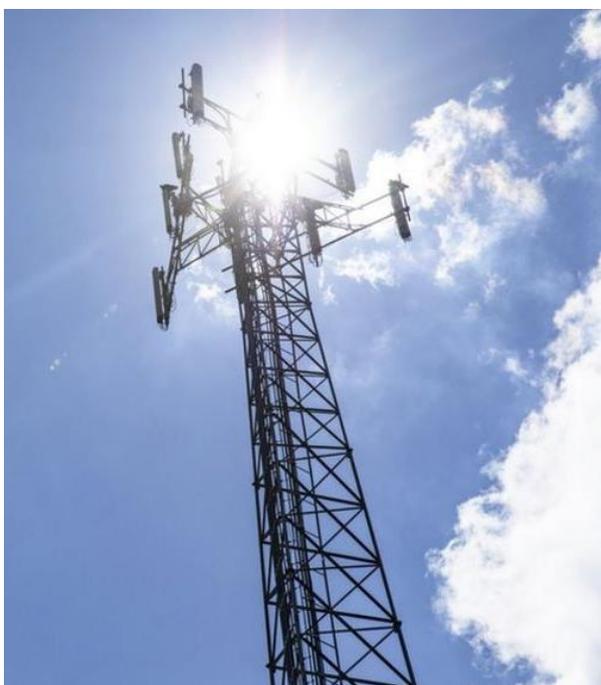
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Initial focus

Close visual inspection

Industrial environments





BVLOS > Autonomy

Machine builds its own 3D map of the world in real-time.

System can navigate autonomously, GNSS-denied.



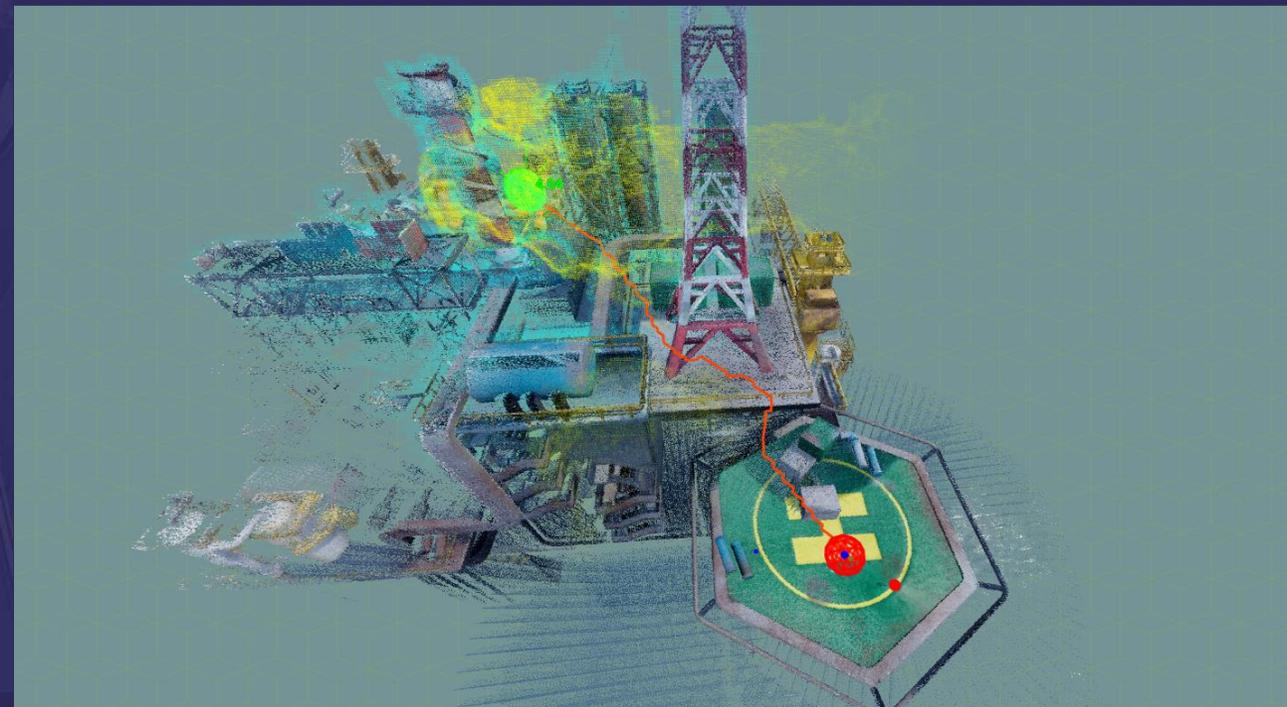
Command & control over cellular

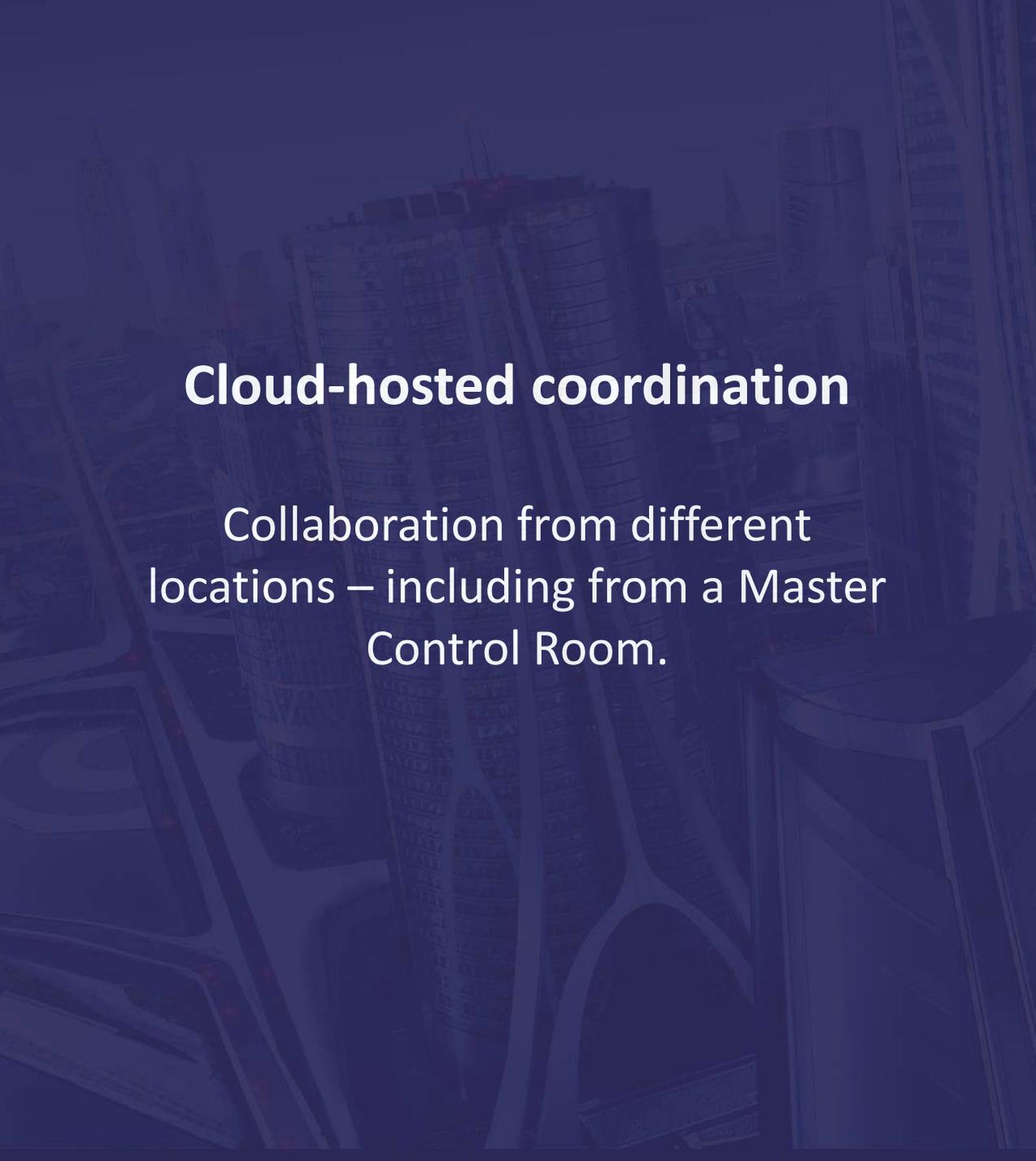
3D world synchronized between
drone and pilot



Full spatial awareness & control from BVLOS

GCS gives pilot optimal insight and machine supported control.





Cloud-hosted coordination

Collaboration from different locations – including from a Master Control Room.



Safety Management System

Telemetry data used to inform system development and ensure safe operation.





Future Flight Challenge

Government funding will accelerate the development of new aviation technology, such as electric and automated planes.



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Collaborating technically with:

NATS

BAE SYSTEMS

 **Met Office**

**SKY
-FUTURES**

 **vodafone**

FLOCK 



TerraDrone

 **nVIDIA**

SLAMCORE

Tests lined up in 2021 with:

SKANSKA

HS2



COSTAIN



ATKINS

STRABAG



Any questions?

John McKenna, Co-Founder & CEO

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Drone Demonstration & Development Pathfinder Community Event



Maritime and
Coastguard Agency

Safer Lives, Safer Ships, Cleaner Seas

MCA Current Portfolio



Current Tasking Statistics

Search and Rescue Helicopters:

- Over 2000 tasks per year
- Land and Maritime
- Approximately half of our taskings are in support of the Emergency Services

Aerial Surveillance:

- Over 900 hours flown last year
- SAR missions
- Counter Pollution
- Patrols in support of environmental protection and maritime safety and compliance.
- One third of all flights have been undertaken on behalf of other Government Departments.



The Future of MCA Aviation

- SAR-H and ASV contracts end at approximately the same time.
- **UKSAR2G** will incorporate both services
- Focus on outcomes and effects
- Capability based requirements
- Continuation of cross Government support
- Utilise innovation and emerging technologies, such as unmanned aerial vehicles to conduct searches



Drones – MCA Benefits

- Increase the effectiveness of search
- Reduce risk to personnel, on land, sea and air
- Greater flexibility of operation, e.g. operators can be positioned in a more effective location.
- Decrease reliance on traditional rescue assets to perform search



Drone Demonstration & Development Project (3DP)

- Contract with Elbit Systems
- Objectives
 - Work with the regulator to identify route to routine and regular use of BVLOS drones in unsegregated airspace – without need for special permissions.
 - To be demonstrated against specific MCA time critical use cases.
 - Work with the regulator to develop regulation.
- Output
 - To ascertain the feasibility of the use of drones as a capability enhancement for SAR2G
 - Provide draft MCA SOPS and CONOPS
 - Provide a report detailing:
 - how to achieve BVLOS flight and/or;
 - identify timelines for the implementation and;
 - minimum equipment required.



Lessons Learned

- Airspace infringement and subsequent MOR.
- Early stakeholder engagement is key
 - Local stakeholders were content
 - Engagement with MOD was missed causing issues.
- Placement of the 'Casualty' for the coastal search – angle of view
- Slow Airspeed in airspace where normal manned operations take place.

Challenges

- Airspace Change Request – Changes to EASA procedures and Covid 19
- Ofcom Licence delay – Pathfinder assistance
- CoA issues with non-EASA
- Multiple country airspace
- What we do now?

Questions?





Unlocking BVLOS

Dave Pankhurst – Head of Drone Solutions

31st March 2021

Project Xcelerate

BT's Future Flight consortium

- Project Xcelerate - a pathway for the future of drone flight to unlock BVLOS flights at scale
- Proving how automated drones and manned aviation can safely co-exist
- Flight trials include medical deliveries, infrastructure inspection and rapid response for the emergency services
- The BT Led Consortium will conduct flight trials along an 8km-long corridor.



The Role of Cellular

A Key Enabler for BVLOS

- Project XAccelerate provides a vehicle for BT to demonstrate the use of a commercial mobile network to enable safe BVLOS flight.
- Mobile networks provide readily scaled reliable, secure, high bandwidth and low latency connectivity for C2, identity and payload
- Through the EE mobile network – the biggest and fastest network in the UK, and the trusted provider behind the critical Emergency Services Network (ESN), BT will ensure that a safe commercial drone corridor can be established with optimal mobile coverage at altitude.



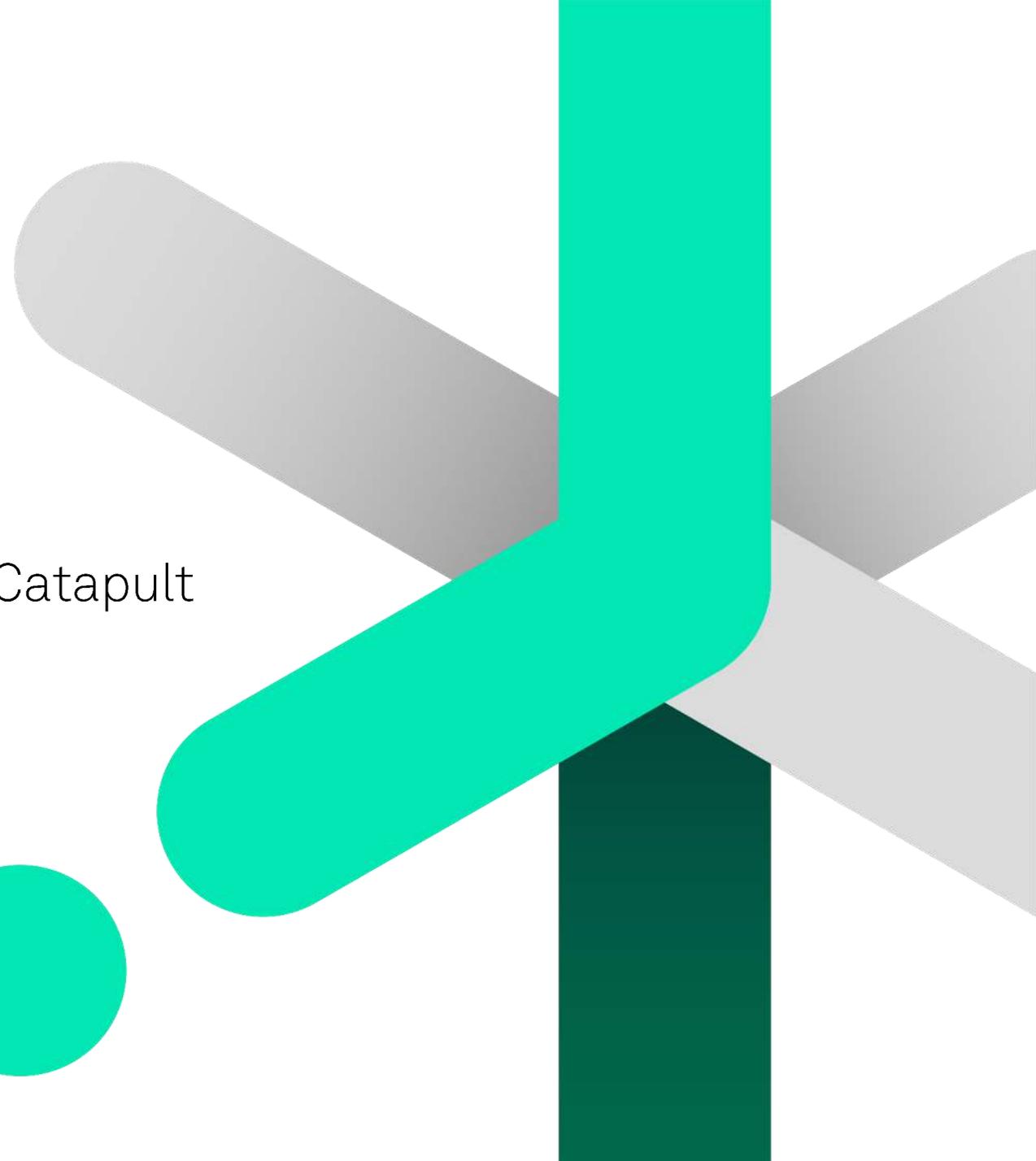
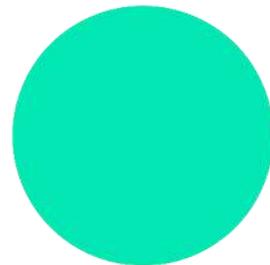
Q&A

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Open Access UTM

Chris Gee

Principal Engineer, Connected Places Catapult



Introduction to Unmanned Traffic Management (UTM)



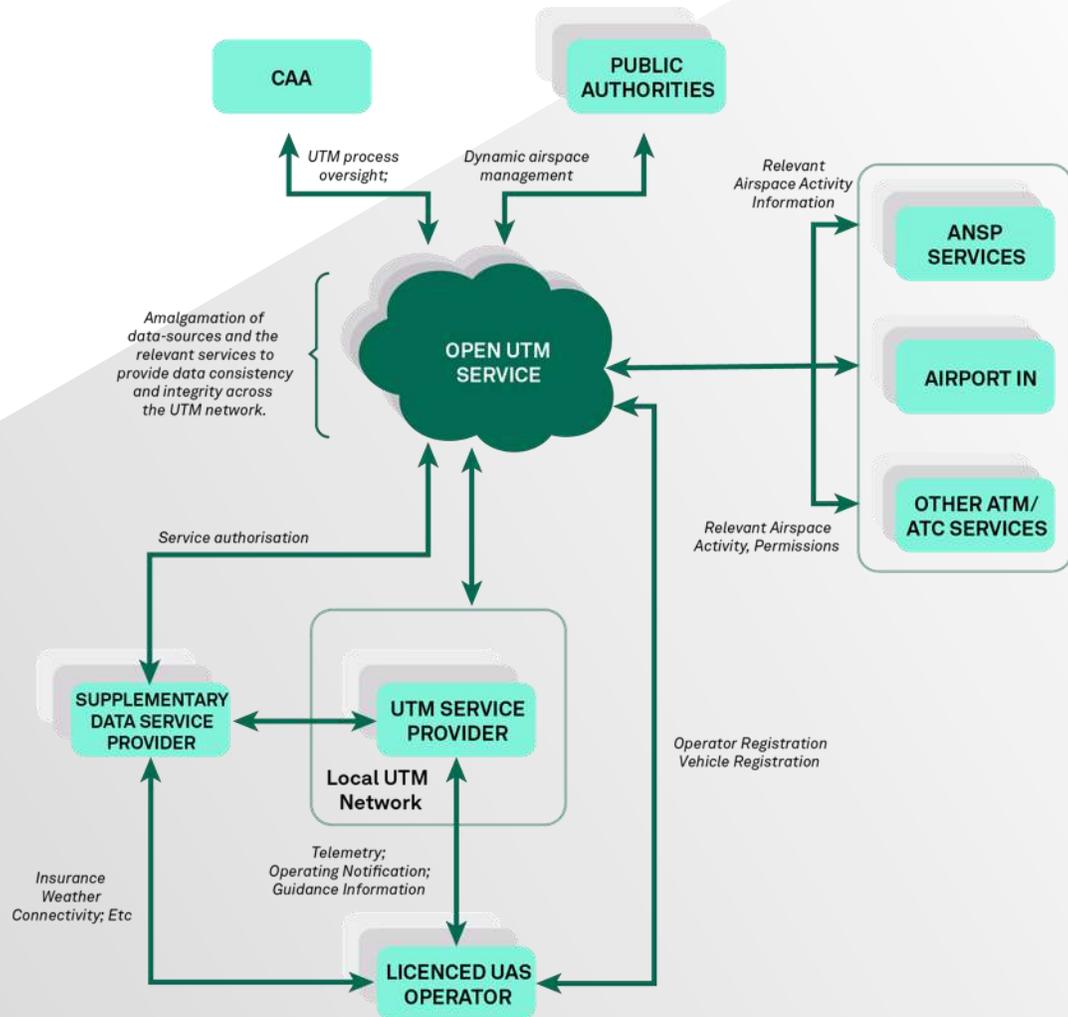
Why do we need UTM?

This will lead to a significant increase in the volume of drones that will become increasingly more autonomous and flying beyond visual line of sight of the remote pilot

What is UTM?

UTM is a scalable, digital air traffic management system that can monitor and manage drone operations and keep them safely separated using services such as deconfliction and restricting access to volumes of airspace.

Open Access UTM architecture and services

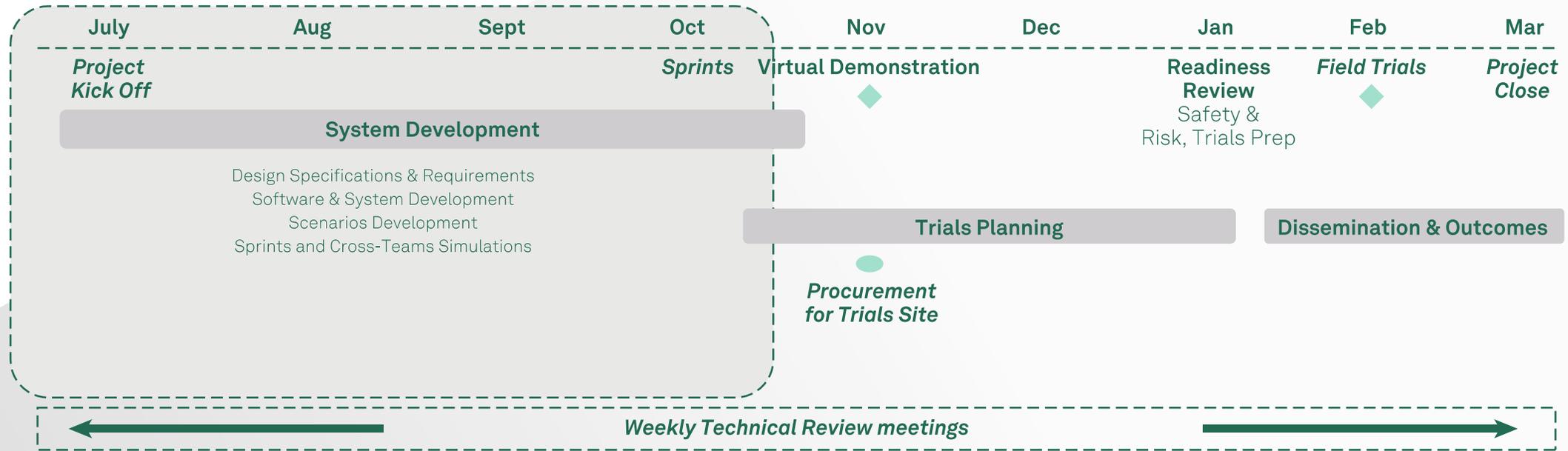


The project demonstrated the following core UTM services:

1. Registration
2. Strategic deconfliction
3. Monitoring and alerting
4. Inflight replanning
5. Dynamic constraint
6. Remote identification

In addition to these UTM services we also implemented an enabling service known as the Discovery and Synchronisation Service (DSS).

Overview of the programme



UTMSPs



OUTMSP



Drone Operator

SKYLIFT



Real world scenarios to demonstrate UTM services

We demonstrated the core UTM services and interoperability between UTM service providers using real-world scenarios:

- Drone delivery
- Emergency service response
- Windfarm inspection

Open-Access UTM programme outcomes



- UK first demonstrating interoperability of multiple UTM service providers
- Proved the concept of a federated UTM architecture
- Demonstrated the availability of existing technology capable of implementing UTM standards
- Evidence base to inform the development of UTM policy and regulations
- Investment in Open Access UTM can be exploited by other programmes e.g. Future Flight
- An approach for testing and certifying new Open Access UTM services and providers will be required
- CPC has developed the capability to manage large scale, complex field trials

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Open Access UTM

Q&A



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Drone Pathfinder Catalyst Programme UK Sectors & Industry Roadmap

Q&A Panel:

Fozia Chughtai (DfT),
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Wrap Up & Close

David Pounder

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Thank you for attending the Pathfinder Community Event

Please visit the [Pathfinder webpage](#) to gain access to all the programme information, upcoming events and past presentations

You can also email us at
drones@cp.catapult.org.uk



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