Innovation Hub

Developing a Regulatory Vision for UK UTM
A Call for Insights

"

The Future Flight Challenge is helping to drive an exciting new future of novel air vehicles better connecting people with transport and services.

The development of new traffic management systems is the most critical aviation system enabler to allow us to bring these exiting capabilities to the public at pace without compromising on our industries excellent safety record.

This CAA paper plays an important role in allowing industry to engage and influence the direction of these systems and their regulatory frameworks.

Gary Cutts, UKRI
Future Flight Challenge Director

Help us with Your Insights

The CAA Innovation Hub is asking you for insights on UAS or Uncrewed Traffic Management (UTM) regarding our draft vision, a new approach to the name, and how UTM could be deployed in the UK.

There are many different approaches globally to the deployment of UTM services and infrastructure, and ICAO has provided guidance to support regulators which we previously explored in CAP1868 "A Unified Approach to the Introduction of UTM". But as we prepare the UK regulatory approach to UTM, the Innovation Hub is exploring its role within our strategy for the future of flight.

Traffic management services for remotely piloted aircraft systems (RPAS) will become increasingly necessary as the number and complexity of operations increase over time. It is important for us to gain insights from you to help the CAA appreciate the scale and breadth of possible ways that UTM could be implemented in support of specific RPAS operations.

At the same time, we have seen some examples of UTM technology being deployed for other airspace users. In this context, we would also like to explore the possibility that the services typically referred to as "UTM" could be used to support non-RPAS operations. Examples include new or existing aircraft flying at low altitudes as well as those operating very close to terrain and obstacles, including advanced air mobility aircraft.
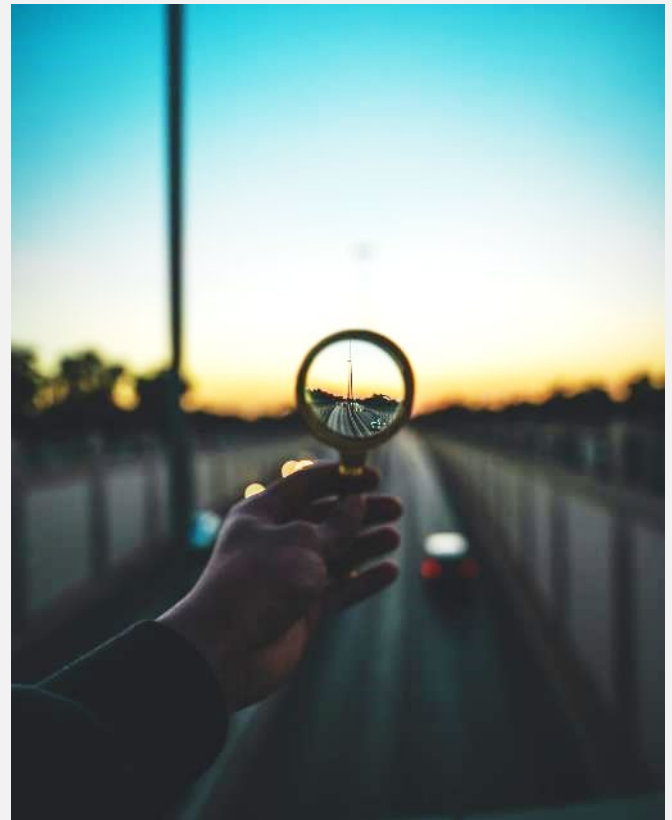
The information gathered by this call for insights will be used to **enhance the understanding and preparedness** of CAA policy and regulatory experts. This is the first step in our development of the UTM regulatory approach for the UK, as explained in CAP2262.

To guide this development, we have drafted a vision for UTM in the UK. This work is non-exhaustive and is intended to provide context. In creating this vision, we have also reflected on the name "UAS/Uncrewed Traffic Management".

We would love to hear your feedback on our draft vision, and on the considerations for the name.

What Do You Think?

Throughout this document we ask questions that will help us to gain your insights.

This call will close on 31st January 2022.

To share your ideas, go to Survey Monkey or email us at innovation@caa.co.uk

A Refresh on UTM

UTM has been defined and implemented in various yet similar ways by different jurisdictions around the world.

In November 2019, the CAA Innovation Hub published a scoping paper that explored the current state of UTM globally, CAP1868. Since then, there have been some major developments which have seen the concepts being further refined, and regulatory frameworks being published.

The Connected Places Catapult (CPC) completed their Open Access UTM research in 2020. They set out in their first and second reports some fundamental assumptions around the actors and services that make up UTM. These are summarised here, and largely correlate with other international frameworks.

In the EU, 22 April 2021 saw the introduction of "Commission Implementing Regulation (EU) 2021/664 on a regulatory framework for the U-space". This is a major step forward for EU Member States by providing a flexible regulatory framework within which local implementations of the U-Space can be introduced.

On 29 July 2021, the FAA published the final report of the UTM Pilot Program (UPP) Phase 2 which saw the demonstration of UTM capabilities intended to support Beyond Visual Line of Sight (BVLOS) operations.

When reflecting on a strategy for the UK, we must consider the significant achievements in Europe and the USA, while also recognising nuances in the UK regulatory and physical space.

As we progress later into identifying the approach to regulation and oversight in the UK, we will also need to consider the purpose of UTM for the UK and so make sure that the approach is proportionate.

UTM Actors

- RPAS Operator
- UTM Service Provider
- ATM Service Provider (or Air Navigation Service Provider)
- Public Authorities
- Supplementary Data Service Providers
- Regulators

The primary purpose of UTM is to facilitate the exchange of data between these actors and across the ecosystem.

UTM Services

- Stakeholder registration (aircraft, remote pilot, operator, service provider)
- Stakeholder validation (the ability to check a stakeholder's credentials)
- Flight Planning
- Flight Noticeboard
- Discovery
- ATM Interface and Permissions
- Dynamic Restrictions Management
- Conflict Management Services (strategic & tactical deconfliction, monitoring & alerting, dynamic re-routing)
- Electronic Identification
- Tracking & Surveillance
- Flight termination
- Audit
- Accident and Incident Reporting

There is a large variety of services, but require or enable the exchange of information. Some may bring safety benefits, others are more concerned with safety or insurance for example.

A Regulatory Vision for UK UTM

The groundwork for any vision for UTM in the UK is built on important strategic context. This includes the UK Airspace Modernisation Strategy (AMS) and the Future Flight Challenge (FFC).

The AMS is a DfT-CAA strategy that responds to the growing volume and breadth of airspace users, with a target of 2040. It also considers the impacts of new technology, new markets, and other new demands. Currently, the CAA is taking a collaborative and open approach to refreshing the strategy that was first published in 2018 (CAP1711). A key part of this activity is to consider the role of UTM.

The goals of the FFC vision and roadmap for 2030 foresees an operating environment that is unified, dynamic, equitable, and seamless. The roadmap to this vision recognises UTM as a viable solution for safe integration of new airspace users into shared airspace by 2024. Over the remaining period of the FFC programme to 2024, we will continue to explore the regulatory challenges associated with reaching these goals.

Long-Term Vision

We will continue to explore the long-term vision for UTM as part of the ongoing AMS refresh. We must make sure that there is a shared goal for 2040, to maximise the consensus and coordination across all components of the modernised airspace. Over time, UTM is expected to form a part of the broader airspace and air traffic ecosystem in the UK. This will allow any aircraft to seamlessly access the appropriate airspace for its desired operation.

The Airspace Modernisation Strategy

The CAA is currently undertaking a period of consultation on a 'refreshed' AMS during the autumn of 2021. To help inform the formal consultation, we are endeavouring to capture and represent the opinions of the broadest possible group of airspace stakeholders through workshops and a Review Group. As part of this activity, we engaged with around 100 individuals, broken into specific groups. We have facilitated the Listening, Feedback and Requirements Gathering sessions with these groups and are continuing with Co-Creation Workshops and a Review Group. The co-creation work is intended to help the CAA filter and form the content of the Requirements Gathering sessions into material that could be included in the formal consultation. The Review Group is there to provide comment, outside of a creative workshop environment, on how the CAA has interpreted and intends to represent this information in its consultation (Q4 2021).

A Regulatory Vision for UK UTM

In the short term, we must set goals that are ambitious yet feasible. They must lead to the long-term vision. This is where your insights will help shape the approach and pace of regulatory development.

The CAA recognises the ambition to achieve routine operations of RPAS beyond visual line of sight (BVLOS) in non-segregated airspace. By 2024, we aim to have regulatory tools available to allow some flights of this nature to occur in shared airspace. At the same time, we must also recognise the range of risks associated with BVLOS operations. Some types of BVLOS operations will be relatively simple and may achieve this goal sooner than 2024. Conversely, more complex operations will require further regulatory and technological development before they can be allowed to operate without the protection of segregated airspace.

Regulatory Vision for UTM

By 2024, there will be…

- A commonplace appreciation of the role of UTM services within the future aviation ecosystem, and its benefits for safety.

- A comprehensive understanding of the regulatory challenges associated with UTM in the UK.

- A regulatory framework and oversight regime, providing assurance to the public and investors.

- A clear strategy that will chart the course to airspace integration, and a roadmap to increasingly complex UTM roles.

One of the key enablers for this goal is the existence of robust Detect & Avoid (DAA) solutions that enable RPAS to perform an equivalent "see-and-avoid" function to a piloted aircraft. Our approach to the Detect & Avoid ecosystem (CAP1861A) describes that UTM can form part of a DAA solution, and that DAA information can feed back into UTM. There is therefore a role that UTM will play in mitigating the safety risks associated with RPAS operations.

The Innovation Hub's Detect & Avoid Challenge (CAP2238) will include a Traffic Management Technology Demonstrator sandbox. The safety performance of UTM, and the contribution it could make to the safety case for BVLOS operations, will be tested there. Your insights on possible UTM scenarios will help us to identify use cases that can be explored within this sandbox.

By 2024 we also expect to see some non-RPAS use cases being made available. UTM services will potentially provide similar safety risk mitigations directly to piloted aircraft, including general aviation, recreational and advanced air mobility. It is worth noting that Ofcom's 2021/22 work plan describes its aspiration to enable "wireless innovation across a variety of industry sectors", including for aviation and RPAS. This may have a role to play in further enabling UTM services across both RPAS and other aircraft.

What Do You Think?

Question 1
What are your reactions to the preliminary vision statement for 2024? Is there anything you would change, add, or remove from the 2024 vision?

Question 2
What safety, or other, benefits do you see UTM providing to RPAS operations?

Question 3
Do you agree that 'UTM' services could also directly benefit crewed aircraft?

To share your ideas, go to Survey Monkey

The Implications of a Name

A name tells a story. It communicates across cultures, industries, and countries. Finding the right name for a new technology can be a creative task that requires dealing with competing interests.

In aviation this is also complicated by the implications of selecting a particular term or phrase in a context where there is already a precedence set by other countries and organisations.

Why is this important for UTM?

UAS/Uncrewed Traffic Management (UTM) was a concept first popularised by the Federal Aviation Authority (FAA) in the United States. Since then, the European framework has adopted "U-Space", in Canada it is referred to as "RPAS Traffic Management", and many other jurisdictions remain with "UAS or Uncrewed Traffic Management".

As the concept has evolved and strategies have developed, variations have emerged such as "Unified Traffic Management". This reflects the desire to move away from a focus on "UAS" and towards a future that incorporates a shared ecosystem between multiple airspace users. It also shows that even by referring to the term "UTM", its actual meaning as well as the definition and regulations it represents can vary, sometimes significantly.

We believe that "UAS/Uncrewed Traffic Management" does not accurately reflect the vision we are aiming for.

We would like to explore the potential that UTM services can provide safety benefits for more than just RPAS.

In the short to mid-term, new piloted aircraft may be flying in lower airspace in areas that do not currently see much aviation traffic. This may require the provision of information that existing air traffic services are not able to provide. In the long term, we would also expect that highly automated and autonomous aircraft will strongly rely on UTM services.

A name that reflects this multi-user, multi-functional approach could also help to soften tensions between RPAS and other airspace users. Considering a new name would also allow us to move away from unnecessary gendered language.

The Definition of UTM

UTM is generally defined as a system designed to enable the integration of drones into airspace, including that used by other aircraft (CPC, 2019).

However, ICAO apply a more specific logic in their definition, tying it specifically to Air Traffic Management (ATM), as per Edition 3 of their guidance:

"A specific aspect of air traffic management which manages UAS operations safely, economically and efficiently through the provision of facilities and a seamless set of services in collaboration with all parties and involving airborne and ground-based functions."

Image: UKRI

The Implications of a Name

It may be appropriate to determine that UTM is a subordinate function of Air Traffic Management (ATM). But does this have unnecessary implications on the regulatory approach to UTM?

ICAO's definition of Air Traffic Management (ATM) within Doc 9882 is broad. Some UTM services could fall within this definition. With that in mind, UTM could be interpreted as being a component of ATM.

However, does this interpretation mean that policy decisions previously made regarding ATM automatically apply to UTM? For example, in the UK there is an open market for Air Navigation Service Providers (ANSP), and a single licenced provider of the UK's en-route traffic service.

If we were to carry forward the assumption that "UTM is a component of ATM", we will need to consider the implications this may have on how UTM is operated and regulated as a result. We will be doing some further analysis on this assumption, to reflect in our next publication.

Definitions of Air Traffic Management (ATM)

The dynamic, integrated management of air traffic and airspace – safely, economically and efficiently – through the provision of facilities and seamless services in collaboration with all parties.

– ICAO Doc 9882, Manual on Air Traffic Management System Requirements

The dynamic, integrated management of air traffic and airspace including air traffic services, airspace management and air traffic flow management – safely, economically and efficiently – through the provision of facilities and seamless services in collaboration with all parties and involving airborne and ground-based functions.

– ICAO Doc 4444, The Procedures for Air Navigation Services – Air Traffic Management, 16th edition, 2016

'Air traffic management (ATM)' means the aggregation of the airborne and ground-based functions (air traffic services, airspace management and air traffic flow management) required to ensure the safe and efficient movement of aircraft during all phases of operations.

– Regulation (EC) No 549/2004 as retained in UK

What Do You Think?

Question 4
Do you think UAS/Uncrewed Traffic Management (UTM) is the right name?

Question 5
Following ICAO's definitions of ATM, do you agree with the assumption that UTM is a component of ATM, and why?

Question 6
Do you agree with the belief that the name "UAS/Uncrewed Traffic Management" does not reflect the vision for airspace integration that the UK should be aiming for, and why?

Question 7
What other considerations should be included in selecting a name?

Question 8
What proposals would you make for renaming "UTM", and why?

To share your ideas, go to Survey Monkey

There are some further aspects to bear in mind when considering an alternative name for UTM:

- What is unique about UTM, and what separates it from ATM as we know it today?

- How does the name impact the market, both in the UK and internationally?

- Are there any legal implications of selecting a name?

We would value your thoughts and debate, but in the meantime, we will continue to refer to UTM and Uncrewed Traffic Management for simplicity.

Understanding "UTM" with Scenarios

We are at an early stage of developing a concept regulatory approach for UTM. CAP2262 provides an outline of the activities within our UTM programme. These will support and inform the formal definition of the regulatory framework.

To help us in this process, we would like to gather your insights on realistic example scenarios of UTM deployment in the UK. The template provided below gives several pointers that will help us to understand the context, role, and outcomes of each scenario. We also request that scenarios do not rely too much on the technical detail, but instead provide a narrative.

What Do You Think?

Sharing example scenarios of UTM implementations with us will not just help the CAA to appreciate the potential benefits and risks of UTM, but also provide a library of use cases that can be tested against policy and regulatory proposals.

To share your ideas, go to Survey Monkey, or email us as innovation@caa.co.uk.

We invite you to submit example scenarios of what UTM deployment in the UK could look like in 2024-2030 timeframe. For each scenario, please provide the following information where applicable. Alternatively, if you have documentation or media that you believe provides the below information already, please share that with us.

- A short, descriptive title for the scenario.

- The purpose or mission of the flight(s) involved in the example.

- A narrative of the use case, or storyboard, to help us understand the scenario.

- The location or environment of the example operation(s) conducted.

- The UTM services that are used in the example.

- A description of the type and number of aircraft involved, either directly or indirectly.

- Any information from other sources injected to the UTM ecosystem (e.g. Met Office weather).

- Whether there is a single or multiple UTMSPs involved.

- Any engagement, dependency, or other linkage with existing ANSP(s) as part of the scenario.

- What, if any, safety benefit is gained from deploying UTM in this scenario.

- What infrastructure is used to produce, share, and distribute information between UTM actors.

- A rough indication of technical maturity and deployment timeframe of this scenario. [0-5yr, 5-10yr, 10+yr]

An Illustrative Example of a Scenario

"An RPAS is flying from a docking station, securely positioned within a field, to a location on a local farm where a fire has been reported. A flight plan is immediately created using the UTM flight planning service that considers existing local flight plans for both piloted and remotely piloted aircraft. The UTM Service Provider accepts the proposed flight plan and submits it to other UTMSPs operating in the local area, who respond to confirm receipt and then again to confirm that there are no conflictions. The UTMSP then verifies the operator's identification, insurance, authorisations, and remote pilot licences, before approving the flight plan. The UTMSP provides the operator with information regarding weather condition and mobile network signal quality in the area, obtained from supplementary data service providers. The operator then confirms that the remote pilot has commenced the BVLOS flight and the UTMSP provides approval for take-off after surveying proximate airspace for potential traffic. Shortly after take-off, the UTMSP relays information to the remote pilot notifying them that an aircraft approaching at 800ft AGL has been detected using ground-based non-cooperative sensors. The UTMSP calculates the possible trajectories and suggests an amendment to the flight plan to mitigate the loss of safe separation. The operator accepts the proposal and the updated flight plan is securely transmitted across the local UTM network. The flight continues with the amended course and the aircraft arrives at the destination, capturing images of the fire and sending them directly to the operator. Shortly after, the National Police Air Service submits a temporary airspace restriction surrounding the area of the fire via the central UTM service, which is broadcast through to the operator's UTMSP. It notifies the remote pilot and suggests immediate repositioning of the RPAS. The remote pilot accepts and carries out the suggested manoeuvre and later decides to return to base. Once landed, the UTMSP records completion of the flight, and submits the flight report to the CAA via the central UTM service. Throughout all phases of the mission, the remote pilot is connected via a secure mobile cellular network to the UTMSP, which communicates with other UTMSPs, the central UTM Service and other data sources via standardised and secure protocols (e.g. APIs) across the internet."

Where Do We Go Next?

The information gathered from this Call for Insights will be used by the CAA Innovation Hub and our colleagues across the rest of the CAA to build a stronger understanding of the potential applications of UTM.

This will help us to steer our programme and will feed into considerations for ongoing strategy development. We will also continue to share what we learn with the Department for Transport.

We will continue to develop the regulatory concept of UTM for the UK, and will be publishing what we learn on the CAA Innovation Hub website, under Regulatory Challenges and Our Thinking. We also hope to extend invitations to various workshops in the coming months, allowing us to explore specific areas in detail.

What Do You Think?

We look forward to receiving your thoughts and contributions. We will close the call on 31 January 2021.

To share your ideas, go to Survey Monkey, or email us as innovation@caa.co.uk with the subject "UTM Call for Insights: Scenarios"

The Legal Bit

The Innovation Hub does not provide regulatory approvals or define CAA Policy. Approvals will be assessed independently by our regulatory teams and their decision about whether or not to grant an authorisation or approval will be subject to current regulatory requirements. Whilst the Innovation Hub endeavours to ensure the accuracy of its guidance and materials, the nature of innovation is one of forecasting, continuous development and change and you should seek independent advice on your specific circumstances.
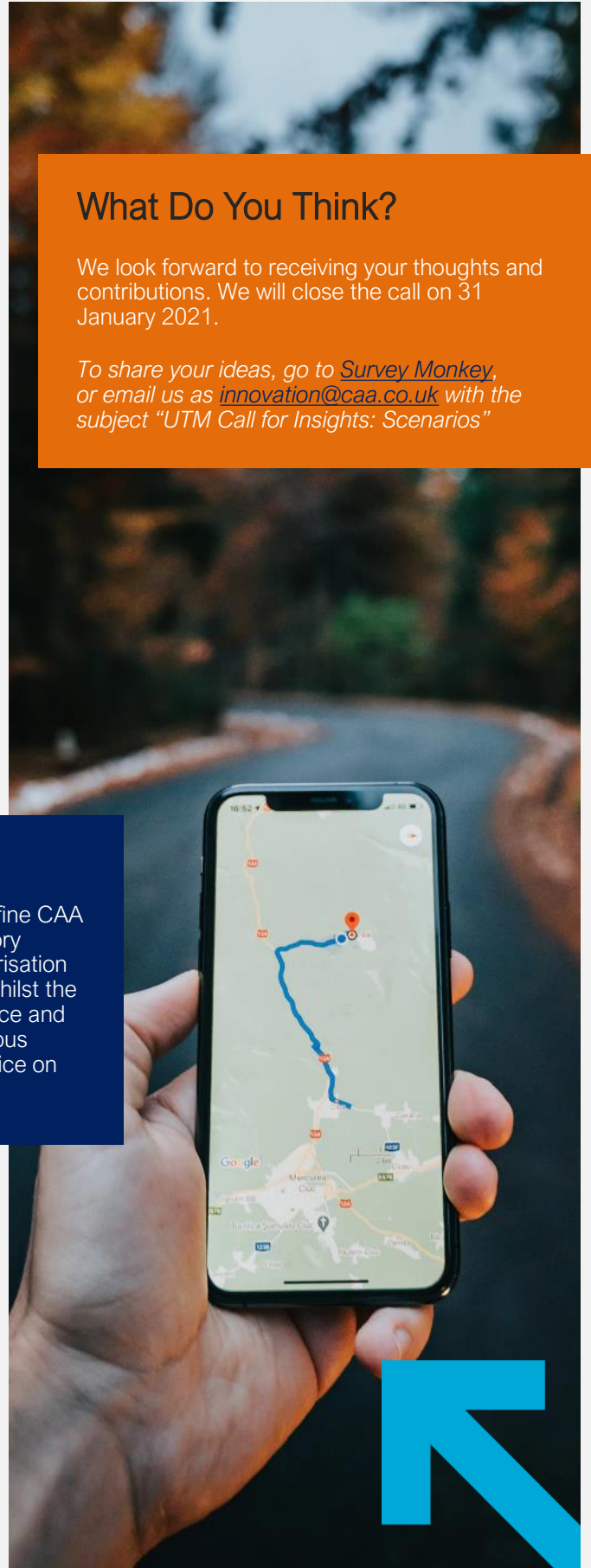
UK Research and Innovation

This document has been created by the CAA Innovation Hub in association with the Future Flight Challenge from UK Research and Innovation

Images: CAA; UKRI; Unsplash.com, Pixabay.com

UK Research
and Innovation

UK
Civil Aviation
Authority

Visit the CAA Innovation Hub
for latest updates, guidance and challenges
www.caa.co.uk/innovation