

UK System Wide Information Management (SWIM) Implementation Framework

CAP 3309

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Preliminary Draft**

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Preface: The UK's SWIM Journey Begins

We are at the beginning of the UK's SWIM journey. Stakeholder feedback to this consultation will play a critical role in shaping the implementation of SWIM for the UK's aviation ecosystem.

Setting the direction for the implementation of SWIM in the UK

The UK CAA is committed to compliance with International Civil Aviation Organization (ICAO) obligations. ICAO requires each state to establish an appropriate framework to support the implementation of System Wide Information Management (SWIM).¹ While global interoperability is essential for a harmonised, future-ready, air traffic management environment, ICAO has not prescribed a specific structure of the framework, recognising that the approach to implementing SWIM must reflect differing national contexts and requirements.

This preliminary draft SWIM Implementation Framework represents the first iteration of the UK's approach to implementing SWIM. It is supported by the SWIM Technical Architecture, which sets out the technical building blocks to enable implementation, and the Example Operational Scenarios that are designed to demonstrate potential applications of SWIM.

We are at the beginning of the UK's SWIM journey. This consultation is the first formal opportunity for industry to help us shape the implementation of SWIM in the UK. We are seeking honest and constructive feedback on the proposed direction of travel and wish to hear from you on the components needed, and the SWIM guidance you are looking for to support the transition to a fully digital, information-centric aviation ecosystem.

We recognise that the Implementation Framework and supporting artefacts will need to evolve over time as SWIM matures and adoption expands across the aviation ecosystem. In line with the delivery roadmap on page 25, we intend to continue developing and refining the SWIM Implementation Framework through consultation, stakeholder engagement and implementation experience, with the aim of publishing updated documentation in 2028. This is expected to align with a rulemaking task to amend air traffic management (ATM) / air navigation services (ANS) requirements to support the implementation of SWIM in the UK, including requirements relating to the establishment of a UK SWIM Implementation Framework and its application by relevant stakeholders. **Stakeholder feedback will play a critical role** in ensuring that the Implementation Framework develops in a way that supports the effective and practical implementation of SWIM in the UK.

¹ICAO. *Procedures for Air Navigation Services — Information Management (PANS-IM)*, Doc 10199, First Edition, 2024.

Preface: A Note on Terminology

Our approach for the purposes of this preliminary draft Implementation Framework has been to adopt gender-neutral terminology where possible.

SWIM Implementation Framework Terminology: Uncrewed Aircraft Systems

In the annex, we have defined several terms to support a shared understanding of key concepts across users of the SWIM Implementation Framework. Nevertheless, the terminology relating to **uncrewed aircraft systems (UAS)** requires clarification at the outset of this document.

The bulk of domestic and assimilated aviation legislation uses “unmanned” rather than “uncrewed”. Our approach for the purposes of this preliminary draft Implementation Framework has been to **adopt gender-neutral terminology where possible**. This approach is consistent with the recently updated British Standards Institution Flex 1903: Future flight systems – Vocabulary. In addition, this approach aligns with the International Civil Aviation Organization (ICAO) Assembly Resolutions: A41-26 promoting gender equality, advocacy and cultural change across aviation.

Although we acknowledge that our use of non-gender specific terminology is a departure from the terminology used in legislation and by some stakeholders, the substance of the terminology is the same. When we refer to UAS in this Implementation Framework, we use the definition which already exists in domestic law²:

“unmanned aircraft system (‘UAS’) means an unmanned aircraft and the equipment to control it remotely”

Our use of gender-neutral terminology is for the purposes of this preliminary draft SWIM Implementation Framework and supporting artefacts only. We do not intend to pre-empt the terminology to be used in the drafting of any subsequent legislation. We are also conscious of the need to ensure domestic law is consistent with the terminology used in international law.

Refer to the annex for the full list of key terms used in this Implementation Framework.

²UK Regulation (EU) 2019/947, Article 2(2)

Preface: A Note on the Aeronautical Fixed Service (AFS)

A comment on the subject of the Aeronautical Fixed Service (AFS).

Aeronautical Fixed Service:

The Aeronautical Fixed Service (AFS) is a telecommunications service used to exchange aviation information between fixed ground locations.

The AFS performs a critical role in the sharing of information globally and is a critical component in the global aviation system.

At this stage, ICAO has not defined the role of AFS in a SWIM based ecosystem. Within the SWIM concept, ICAO references the use of Internet Protocol (IP) based networks to facilitate the sharing of aviation data, but the physical implementation of this is not defined.

The defining of an IP based network can often be interpreted as meaning “the internet” is used for communication. This is not ICAO’s intent; it is the intent to indicate the use of IP based networking for the benefits it can offer over existing communication methods.

At this stage, we have chosen not to reference the physical network that performs the data sharing whilst we await to hear more on the subject from ICAO. In this early iteration of the Implementation Framework, we focus more on the concept rather than the physical delivery.

We recognise that these decisions are crucial to enable the implementation of SWIM. Therefore, we will continue to work closely with ICAO on the subject who are in the process of creating a working group focussed on this subject – the CAA is a member of this working group.

Nevertheless, as part of this consultation, we are keen to hear industry views on this subject, even though we do not directly reference AFS in this preliminary draft of the Implementation Framework.

1

Introduction

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CAA Leadership Foreword

Setting the direction for a safe, secure and interoperable future for UK aviation.

The CAA is entrusted with ensuring the aviation industry meets the highest safety standards. We must also enable the aviation system to evolve so that new technologies, new types of operations and a wider range of airspace users can be introduced safely. System Wide Information Management (SWIM) is a central part of that transition. It supports the direction set by the International Civil Aviation Organization's (ICAO) Global Air Navigation Plan (GANP), the UK Airspace Modernisation Strategy (AMS) and Future of Flight (FoF).

Introducing SWIM will require clear regulatory direction and practical implementation guidance. The CAA will set out what it expects from industry, share our initial thinking and provide a clear path for organisations transitioning to operate in a SWIM-compliant environment. As SWIM services develop and become more widely used, we will continue to review and iterate the regulatory framework.

This is not something the CAA can deliver alone. Organisations that originate information, provide services or consume information are responsible for its quality, security, resilience and appropriate use. Government, regulators, industry and international partners will need to work together to establish a trusted and interoperable aviation information environment.

We are at the beginning of the UK's SWIM journey. Our initial work has focussed on new entrants and integrated Beyond Visual Line of Sight (BVLOS) operations. We are seeking honest and constructive feedback from stakeholders to enable us to evolve the framework and support the transition to a fully digital, information-centric aviation ecosystem.

Sophie O'Sullivan

Director, Future Safety & Innovation

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Regulation



Executive Summary

The case for SWIM and the direction for its implementation across UK aviation.

UK aviation is changing. Crewed and uncrewed aircraft operating in the same airspace, increased dynamic use of airspace, trajectory-based operations and increasingly digital services, will all depend on organisations being able to share and use reliable operational information. The current mix of bespoke interfaces, separate platforms and bilateral exchanges will become harder to manage safely and efficiently as the number of users, systems and services grows.

To support this change, aviation information needs to be accurate, timely, appropriately assured and understood consistently by those who use it. System Wide Information Management (SWIM) provides the common governance, standards, trust arrangements and supporting technical infrastructure needed to make this possible.

SWIM enables authorised participants to publish, discover, access and use interoperable information services. SWIM is not a new air traffic control (ATC) or uncrewed aircraft system traffic management (UTM) system. It is not a single national database, communications network, technology product or prescribed technical implementation. SWIM defines **how** aviation information is managed and exchanged, rather than where it must be stored or which technology must be used.

By improving how information is shared, SWIM will support safe and more coordinated operational decisions, greater efficiency and resilience, international interoperability and innovation. These benefits will extend across aviation organisations and, ultimately, to passengers, air cargo customers and other users of aviation services. SWIM provides the information foundation to enable these outcomes; it does not itself authorise operations, provide tactical separation or guarantee increases in capacity or environmental performance.

The implementation of SWIM in the UK will be underpinned by the UK SWIM Implementation Framework, which sets out the national direction, responsibilities and roadmap for delivery. The UK will introduce SWIM progressively across different stakeholders, regions and operational areas. In line with UK government priorities to enable routine, integrated Beyond Visual Line of Sight (BVLOS) operations, we have prioritised initial work on the implementation of SWIM for uncrewed aviation. We will use feedback from this consultation and experience gained to evolve the framework to encompass all aviation users to support the transition to a fully digital, information-centric aviation ecosystem.

Introduction to the Implementation Framework

Defining the Implementation Framework's purpose, audience and scope.

The UK SWIM Implementation Framework provides the common reference for introducing System Wide Information Management (SWIM) across UK aviation. It turns international standards and national policy into a practical approach that organisations can use to understand their responsibilities, plan investment, develop information services and manage the transition to SWIM.

The framework sets out the UK vision, objectives, implementation principles and roadmap for SWIM. It defines the roles of organisations that originate information, provide services, consume information, regulate the system or provide supporting infrastructure. It also describes the governance, standards and processes needed to publish, discover, operate and use SWIM information services. This common approach is intended to prevent SWIM from developing as a series of disconnected organisational or technology initiatives.

The framework covers both crewed and uncrewed aviation. It is intended for air navigation service providers (ANSP), aeronautical and meteorological information providers, airports, aircraft operators, military and state aviation, UTM service providers, technology suppliers and other authorised participants. What applies to each organisation will depend on the role it performs and the operational criticality of the services it provides or uses.

Rather than prescribing one product, supplier, deployment model or technical solution, the Implementation Framework establishes a consistent set of expectations. It also provides the structure for the UK SWIM architecture and the associated service, technical, security, onboarding, conformance and assurance documentation. Meeting a SWIM standard does not remove the need to demonstrate that an individual service and its consuming systems are safe, secure, resilient and suitable for their intended operational use.

Organisations should use the Implementation Framework to identify the SWIM roles they perform, the services they provide or consume, and the organisational, technical and assurance changes they will need to make. It will support readiness assessments and the controlled transition from existing exchanges, including periods of coexistence, fallback arrangements, reconciliation and the eventual retirement of legacy approaches. Decisions and supporting evidence should remain traceable to the relevant standards, architecture, service requirements and accountable authority.

The Implementation Framework will be maintained and updated as the implementation of SWIM progresses. Changes will be informed by stakeholder consultation, operational experience and developments in international standards and changes to UK policy or regulation. Each release will state its status and make clear what is a current obligation, a proposed future requirement, an implementation expectation, technical guidance or recommended practice.

This document contains 2 types of information which will be called out in each section to support how you engage with this framework.



Information:

Information that is being shared as a position from the CAA. We are not seeking feedback on this material.



Call for Input:

Areas where the CAA is keen to understand the perspectives of industry and are actively seeking input. Stakeholders will be able to provide responses to these questions on Citizen Space.

2

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What is SWIM for the UK?

The UK's SWIM definition and what this means for stakeholders.

The CAA will work with industry to identify and develop technical standards, infrastructure, processes and governance to enable information and data to flow through the aviation system digitally. This will apply for crewed and uncrewed aviation.

To enable industry to continue to innovate in their operations, the CAA will not specify specific technologies but will collate and specify data formats, standards and communication sockets to enable the digital exchange of information.

“

*System Wide Information Management (SWIM) is **standards, infrastructure and governance**, enabling the management of ATM-related information and its exchange between qualified parties via **interoperable***

information services**. The effective implementation of SWIM is the **foundation of the UK's transition to

data-driven, interoperable ATM operations.

”

A service is more than a dataset, it is a way to request, receive and interact with that data. The key delivery mechanism of SWIM in the UK is the transition to an information services environment.

The CAA is committed to enabling and embedding SWIM ways of working through a range of regulatory measures and support. The publication of the SWIM Implementation Framework is the beginning of this process.



Information:

This is the UK's agreed definition of SWIM, which is principally the ICAO formal definition, adjusted slightly to emphasise the UK ambition and the role SWIM will play in the Future of the UK's aviation system. This definition is provided to support stakeholders in understanding what SWIM means for them, their operations and how systems and technologies evolve within the UK aviation landscape.

Why does SWIM matter?

The UK's motivations for transitioning to a SWIM-compliant aviation ecosystem are rooted in the unique context of the UK's Airspace Modernisation Strategy (AMS), Future of Flight (FoF) ambitions and the UK's commitment to strategic alignment with ICAO.

1

DATA DRIVEN APPROACH TO THE FUTURE OF ATM

To deliver the ambitions of the Airspace Modernisation Strategy (AMS), Future of Flight (FoF), and the Global Air Navigation Plan (GANP), the aviation system must transition from legacy, fragmented information exchange to a modern digital, Internet Protocol (IP) based infrastructure.

SWIM is the strategic enabler of this transformation, providing a service-oriented framework for appropriate access to high-quality, standardised data.

This capability unlocks innovation, supports value-added services and fosters market competition. It also empowers new entrants and advanced technologies such as digital twins and AI-driven decision-making.

Beyond its technical benefits, SWIM could enhance regulatory oversight through greater transparency and interoperability. Without SWIM, the UK will not be able to create a scalable, dynamic and future-ready ATM ecosystem.

2

BVLOS INTEGRATION REQUIRES DIGITAL ATM/ UTM INFRASTRUCTURE

To enable safe and scalable Beyond Visual Line of Sight (BVLOS) operations without the requirement of a special use airspace (SUA), the aviation ecosystem must transition to a truly digitally connected, data-driven environment.

While UAS can operate without SWIM, scaling BVLOS in integrated airspace requires real-time coordination, situational awareness and dynamic data feeds to enable both strategic and tactical deconfliction. These capabilities cannot be achieved without modernisation and a technology/information centric approach to aviation, which SWIM directly enables.

SWIM provides the essential architectural foundations for seamless exchange of data (e.g. aeronautical, flight, surveillance and meteorological) between the stakeholders of an integrated aviation ecosystem. Without this digital infrastructure, BVLOS integration will remain inefficient, unsustainable and limited in its ability to scale.

3

ICAO COMPLIANCE AND REGULATORY ALIGNMENT

ICAO establishes SWIM as a foundational enabler of the GANP and its Aviation System Block Upgrades (ASBUs). At least 31 ASBUs depend on the successful implementation of SWIM, including several that are dedicated entirely to SWIM capabilities.

Across all ICAO information domains, existing provisions already require or recommend that specific categories of aeronautical, meteorological, flight and flow and ATM information are provided via information services.

To comply with these provisions, states must implement SWIM at the state or regional level. This requirement is made explicit in ICAO's Procedures for Air Navigation Services – Information Management (PANS-IM), which places direct obligations on states to establish a SWIM Implementation Framework, capturing the essential elements of SWIM deployment for all stakeholders.



Information:

We understand aviation stakeholders will vary in their ambition and appetite to move to a SWIM way of working. For some, a digital, data-driven approach to air traffic management will be a default position; for others, we recognise that the transition may present certain challenges. ICAO and the UK CAA's position is that air traffic management must transition to a digital and data-driven way of operating in order to sustain and evolve operations to meet the global aviation ambition.

What are the benefits of SWIM for the UK?

The CAA will monitor and evaluate the realisation of these benefits as a key measure of success throughout the SWIM implementation lifecycle.

A INNOVATION & COMPETITION

By establishing a flexible, standards-based framework for digital data exchange, SWIM in the UK empowers aviation technology to innovate in the long term by supporting the development of advanced technologies such as digital twins and AI-driven decision-making through available, consistent data. Additionally, by having appropriate access to high-quality, standardised data, this fosters competition and supports the development of value-added services for both crewed and uncrewed aviation, which improves the overall standards and market offering for aviation stakeholders across the ecosystem.

B ENABLING INTEGRATED AIRSPACE

Through its standards-based framework, SWIM facilitates all airspace users to have access to the information to create the same operational picture (e.g. airspace restrictions, flight trajectories and meteorological conditions). This is essential for managing and operating in shared airspace where traditional, advanced and future aviation users coexist, therefore supporting functionality such as dynamic airspace reconfiguration and tactical deconfliction. SWIM delivers the data-driven connectivity required to manage a truly integrated airspace where all users operate under harmonised standards and shared situational awareness.

C UNLOCKING AUTOMATION

SWIM unlocks automation by creating the conditions where data can flow seamlessly between systems to communicate directly using agreed and standardised data models. For example, by using AIXM for aeronautical data, systems can automate and use this data without custom translation or manual checks. Additionally, concepts such as publish/subscribe models mean updates are pushed automatically when events occur (e.g. Flight Plan changes, NOTAMS), enabling systems to automatically trigger workflows such as recalculating routes or updating dashboards without waiting for manual refreshes of data.

D GLOBAL INTEROPERABILITY

SWIM facilitates seamless collaboration between international aviation bodies, such as national aviation authorities (NAAs), ANSPs and regulators by enabling systems to communicate through common standards. For example, ATM systems in another state can instantly receive and understand information issued in the UK because both countries publish aeronautical information using agreed standards and data formats. Global interoperability is essential for harmonised, future-ready airspace management and is key for the UK, as interoperable systems allow the UK to benefit from more accurate, timely and harmonised information across all international flight operations.

E IMPROVED SITUATIONAL AWARENESS

SWIM helps enable seamless, real-time sharing of flight, meteorological and aeronautical data among all stakeholders by using concepts such as publish/subscribe models and standardised data formats. This ensures that any change such as a revised flight plan, updated weather forecast or new NOTAM is instantly distributed to all relevant parties. As a result, airspace users have access to the most current information, reducing uncertainty, enhancing coordination and enabling faster, more informed decision-making. This continuous flow of accurate data significantly improves situational awareness across the entire aviation ecosystem, which in turn reduces risk, delays and operational inefficiency.



Call for Input:

ICAO identifies a range of benefits from the implementation of SWIM, with further benefits highlighted by programmes such as Single European Sky ATM Research (SESAR) and Civil Air Navigation Services Organisation (CANSO). We have outlined the high-level benefits we expect SWIM could deliver for the UK; however, we are keen to understand industry's perspective. We invite stakeholders to identify the benefits and costs they anticipate from supporting the transition to a SWIM environment and, where possible, provide quantitative estimates or supporting evidence.

3

Approach to Implementation

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SWIM Vision and Strategic Objectives

The UK's implementation of SWIM will be focused on achieving the UK's SWIM vision through iterative delivery of Strategic Objectives and Key Outcomes.

UK SWIM VISION

"A digital and data-driven ATM system, enabled by a globally harmonised, service-oriented information exchange framework that supports safe, efficient and sustainable aviation for crewed and uncrewed operations."

The UK will achieve its SWIM vision through realising the following Strategic Objectives and Key Outcomes:

1

SWIM for New Users & Integrated BVLOS

Enable the introduction and integration of new users (primarily UA focussed initially) into the UK airspace through the phased implementation of SWIM, and through the onboarding of services composed of core infrastructure components, operating in line with performance expectations.

A

Standards & Services Adoption: Standards-based information services are adopted to enable secure, interoperable digital exchange of operational information for uncrewed aviation.

B

Conformance and Compliance Monitoring: Risk-based conformance and compliance monitoring is enabled to support regulatory oversight, safety management and scalable uncrewed operations.

C

Governance: A proportionate SWIM governance framework is established for uncrewed aviation, defining roles, responsibilities and accountabilities to support BVLOS operations.

D

Infrastructure: Core SWIM infrastructure (e.g. registry and security framework) is available and used to support service discovery and secure information exchange in a SWIM environment.

2

SWIM for Crewed Aviation in an Integrated Environment

Enable secure, service-based information exchange in an integrated environment for crewed aviation through a digital framework of interoperable data.

E

Enhanced Situation Awareness: All aviation stakeholders have access to real-time, consistent data, therefore, reducing uncertainty and improving decision-making and safety.

F

Support for Advanced Concepts: Improved data sharing through SWIM will enable concepts such as trajectory-based operations and integration with uncrewed users.

G

Improved Airspace Efficiency: Optimised airspace utilisation, reduced delays and smoother traffic flows through improved predictability and situational awareness.

3

SWIM for International Interoperability

Establish a fully interoperable, secure and standards-based SWIM infrastructure that aligns with ICAO global standards to enable seamless, secure and real-time information exchange with international aviation partners.

H

Seamless Data Exchange: All crewed and uncrewed aviation stakeholders can exchange data seamlessly across borders using common standards.

I

Governance: UK SWIM governance will be fully aligned with internationally agreed frameworks, procedures and operations for the oversight of all SWIM exchanges.

J

Security: European and global cyber security standards and procedures are embedded within UK systems to support safe, secure information exchange across jurisdictions.



Call for Input:

All technical material, strategic direction and policy documentation will be written with the intention of enabling the following Strategic Objectives and Key Outcomes to be delivered. We ask for feedback from any stakeholders impacted by SWIM for New Users, Crewed Aviation or International Interoperability to reflect on what they require from the CAA to enable the Strategic Objectives and Key Outcomes to be achieved.

Key Enablers in the Implementation of SWIM

The implementation of SWIM requires mobilisation of three key groups of stakeholders.



REGULATORY DIRECTION

As the regulator, we will provide direction through stakeholder engagement, guidance and formal regulation as necessary to support the development of both crewed and uncrewed aviation systems, operations and practices, in line with the UK's SWIM vision and strategic objectives.

HOW THIS APPLIES IN OUR DELIVERY:

- Through validation, consultation and testing, the CAA will publish Acceptable Means of Compliance (AMC) and Guidance Material (GM) in Civil Aviation Publications (CAPs) to help establish requirements that are essential for the delivery of the UK SWIM vision. The CAA will also work with the DfT to implement legislation as appropriate.
- The CAA is taking steps to enshrine SWIM within formal regulation through ongoing rulemaking tasks. We intend that the SWIM Implementation Framework will be the home for all supporting policy to guide industry on the means with which to comply with this regulation.



INDUSTRY SUPPORT

The transformation to SWIM across industry is, and will be, at varying levels of maturity. The successful implementation of SWIM relies on a wide range of actors, including ANSPs, UTMSPs and aerodromes, to work in line with the long-term vision of SWIM and transition to this way of working.

HOW THIS APPLIES IN OUR DELIVERY:

- We recognise that many stakeholders are already implementing SWIM in their operations, and we encourage the sharing of knowledge and expertise.
- Therefore, the CAA will consult industry on the strategic direction of the Implementation Framework and the technical and regulatory detail of each iteration of SWIM's technical material.
- We will require industry to share feedback on the UK's SWIM direction, and once appropriate, be compliant with SWIM policy and regulation.



INTERNATIONAL ALIGNMENT

To ensure the benefits of SWIM are realised internationally, it is essential that countries across the globe continue to progress the development of SWIM in their nation in line with ICAO timelines, as noted in the GANP, ASBUs and SARPs, and work collaboratively between states to enable a globally interoperable SWIM environment.

HOW THIS APPLIES IN OUR DELIVERY:

- SWIM information exchange is not limited by state or regional boundaries. UK aviation stakeholders both provide and consume operational information beyond the UK and European context, making global interoperability essential.
- The CAA works with ICAO and EUROCONTROL to ensure alignment with internationally agreed standards and principles, while supporting stakeholders and their information service providers and consumers to coordinate the transition to a globally interoperable, service-based information environment.



Call for Input:

The achievement of the Global, European and UK SWIM Vision requires a range of parties to contribute to the transition to a digital and data-driven aviation system over the coming years. We seek feedback on whether the key enablers identified are sufficient to deliver this vision, and what further support the CAA could provide. We also welcome views on our regulatory direction, and on what additional input may be needed to drive progress.

Strategic Alignment of SWIM

The UK SWIM Approach in national, European and international contexts.

CAA APPROACH

The implementation of SWIM for the UK sits at the intersection of national, European and international priorities. The UK is committed to achieving a modernised aviation ecosystem in line with the Airspace Modernisation Strategy, which will remain in step with European and international regulatory and strategic direction.

NATIONAL CONTEXT

SWIM is a key enabler of the CAA and Department for Transport's Airspace Modernisation Strategy and Future of Flight programme. In line with the SWIM delivery approach, the CAA is committed to establishing SWIM for uncrewed aviation first, following the UK SWIM principles, while working towards the UK's overall ambition of modernised airspace.

Under the Pilot Common Project (PCP), SWIM is embedded within UK law. The legislation is currently under review. The CAA intends to retain an effective legislative hook within domestic regulation to guide the implementation of SWIM across the aviation ecosystem. The CAA is currently working through the rulemaking process to move towards SWIM being within domestic regulation. Stakeholders will be able to input into this process through a future public consultation.

EUROPEAN CONTEXT

The CAA intends to continue its close co-operation with Europe to ensure international alignment and interoperability. The CAA has a close working relationship with the SESAR programme and EUROCONTROL and is well informed of developments in Common Project One (CP1) and CP2 regulation.

The CAA intends to align to the EUROCONTROL SWIM Technical Infrastructure Profiles, which define standards for interoperability in different domains, including between air navigation stakeholders, civil-military and air-ground exchange.

While the UK is not subject to European Union (EU) regulation, for the purposes of international alignment, we intend to remain in proximity with Europe and coordinated with provisions that enable interoperability. This is supported by our role as a EUROCONTROL member.

INTERNATIONAL CONTEXT

The UK CAA is committed to compliance with ICAO obligations.

SWIM is formally recognised within the ICAO GANP as foundational for the ASBU framework and for modern ATM, with a target date of implementation of 2034. This is a key date for the UK's implementation of SWIM, and will be a focus for later versions of this framework and associated documents.

The ICAO Manual on SWIM Implementation defines SWIM principles, architecture and governance for consistent service discovery, which have all guided the CAA's approach to delivering SWIM.

The UK will remain an active member of the appropriate governance and direction setting panels and working groups.



Information:

The CAA recognises the importance of our national context, while staying aligned to our international stakeholders, both our close neighbours and those outside our immediate borders. We share this context not because it is novel, but to support industry's understanding of why the implementation of SWIM is a strategic priority within the UK, considering national, European and international contexts.

Technical Stakeholders, Roles & Responsibilities

In policy documentation, the UK CAA will refer to the following stakeholders in developing a SWIM environment, aligned to the ICAO definition of roles and responsibilities.

REGULATOR

ROLE:

Sets and oversees standards, and ensures safe, secure and interoperable information exchange.

RESPONSIBILITIES:

- Define and enforce SWIM governance policies.
- Monitor adherence to SWIM documentation, legislation and SWIM specifications.
- Certify service providers and validate data quality as appropriate.
- Manage cybersecurity and contingency requirements.

ORIGINATOR

ROLE:

The entity that creates or owns the original source of aeronautical, flight or meteorological information within a SWIM ecosystem.

RESPONSIBILITIES:

- Ensure the accuracy, integrity and timeliness of the data.
- Provide updates when information changes (e.g. NOTAMs, flight plans).
- Conform with data quality requirements and standards (e.g. conformance with IWXXM exchange model).

INFORMATION SERVICE PROVIDER (ISP)

ROLE:

Publishes and distributes information services to consumers via SWIM-compliant interfaces.

RESPONSIBILITIES:

- Implement information services in accordance with applicable SWIM standards for data exchange (e.g. XML, AIXM, FIXM, IWXXM).
- Maintain service availability, security and performance.
- Publish metadata and service descriptions in the SWIM registry.
- Ensure data consistency and proper versioning.

INFORMATION SERVICE CONSUMER (ISC)

ROLE:

Uses information services provided by ISPs for operational or decision-making purposes.

RESPONSIBILITIES:

- Discover and subscribe to SWIM services through the registry.
- Consume data in conformance with agreed formats and protocols.
- Validate and integrate received data into operational systems.
- Respect usage constraints and security requirements.



Call for Input:

ICAO states that a SWIM Implementation Framework needs to outline the roles and responsibilities of stakeholders in a SWIM environment. It is the UK CAA's intention to use these definitions of stakeholders, roles and responsibilities to support policy direction moving forward. We are keen to gain feedback on whether these definitions align with industry expectations, as well as other NAAs to ensure global alignment.

Introduction to the SWIM Governance Framework

This high-level governance framework serves as a starting point for how SWIM governance **may** be structured.

UK SWIM Governance Framework

The UK SWIM governance framework will build on ICAO SWIM governance principles, international governance models such as FAA and European models and learnings from established governance practices in airspace change, surveillance, AIM and safety management communities. The finalised governance model will, as a minimum, align with the governance expectations defined in PANS-IM, support collaboration across the SWIM ecosystem, enabling trust and confidence in the SWIM approach.

Executive Summary:

The UK SWIM governance framework adopts a federated model, in which information remains under the responsibility of its originators, while common governance arrangements across industry-wide stakeholder representation support interoperability, assurance and trust across the network.

The UK SWIM governance framework will support the following objectives:

- 1 Establish common rules for information sharing across ATM, UTM, airports, airlines, meteorology, AIS and future digital aviation services.
- 2 Define clear regulatory and industry responsibilities.
- 3 Govern technical standards, information models, service quality and cybersecurity.
- 4 Provide assurance that SWIM services are interoperable and conformant.
- 5 Enable continuous evolution as airspace modernisation, BVLOS operations, UTM and future ATM capabilities emerge.



Call for Input:

We recognise that this governance framework is high-level and will require further development as SWIM matures. We are keen to understand what stakeholders would like to see in the governance framework, including the role of **industry in shaping standards and decision-making**, and whether governance should be delivered through stakeholder-specific forums, collaborative working groups, regulator-led processes or a combination of these.

Principles for UK SWIM Governance

The UK SWIM Governance Framework is designed to support implementation of the ICAO SWIM principles and to enable interoperable, secure and trusted information exchange across UK aviation stakeholders.



Federated Information Management: Information remains under the control of originators, while common governance ensures interoperability.



Operationally Driven: SWIM governance should support operational information exchange requirements.



Collaborative Governance: Governance should enable coordination and cooperation between SWIM stakeholders.



Open Standards first approach: SWIM implementation should adopt internationally recognised standards and information exchange models.



Interoperability Assurance: Governance should support consistent implementation and interoperability across stakeholders.



Continuous Evolution: Governance must accommodate changing operational concepts, technologies, SWIM capabilities, standards, services and stakeholders.

Note: ICAO specifically notes that SWIM will require continuous improvements to the governance of rules, principles and processes.



Call for Input:

We recognise that this governance framework is high-level and will require further development as SWIM matures. We are keen to understand what stakeholders would like to see in the governance framework, including the role of **industry in shaping standards and decision-making**, and whether governance should be delivered through stakeholder-specific forums, collaborative working groups, regulator-led processes or a combination of these.

SWIM Governance Structure

We are proposing a hierarchical four tier governance structure. The table provides our initial thinking on the potential members, responsibilities and outputs.

	Tier 1: UK SWIM Executive Board Strategic Decision-Making Authority	Tier 2: SWIM Architecture and Standards Board Technical Authority for UK SWIM	Tier 3: SWIM Service Governance Group Focus on Operational Service Implementation	Tier 4: Communities of Practice Working Level Industry Collaboration Groups
Participants	Chair: CAA Members: CAA, NATS, major airports, Airlines UK representation, Met Office, Defence, UTM/UAS representatives, General Aviation representatives, Future service providers	TBC	SWIM Service providers and consumers	TBC
Responsibilities	• Approve UK SWIM strategy • Approve governance policies • Resolve major stakeholder conflicts • Prioritise strategic investment • Ensure alignment with Airspace Modernisation Strategy • Represent UK interests internationally	Information Standards Maintain UK adoption profiles for: • AIXM • FIXM • WXXM • Digital NOTAM • Aeronautical Information standards Technical Standards Govern: • APIs • Service interfaces • Messaging profiles • Security requirements • Service registry requirements Architecture Maintain: • Target SWIM architecture • Reference architectures • Interoperability patterns	• Service onboarding • Service lifecycle management • Service quality monitoring • Service assurance • Change control • Consumer/provider issue resolution	Possible Communities: Information Modelling Community • Maintains data models. Technical Implementation Community • API and infrastructure implementation. Cybersecurity Community • Identity, trust and information protection. UTM & Emerging Airspace Community • Ensures future concepts are integrated consistently. Operational Users Community • Airlines, airports, controllers and operators providing operational feedback.
Outputs	• UK SWIM Strategy • Annual SWIM Roadmap • Investment Priorities • Governance Charter	• UK SWIM Technical Framework • Standards Catalogue • Reference Architecture • Data Exchange Profiles • SWIM policies and implementation guidance	• Service Definitions • Service Catalogues • Service Conformance Reports • Service Performance Metrics	

Note: The proposed SWIM governance structure will be revised and developed further through consultation, stakeholder engagement and implementation experience.

SWIM Decision-making Model and Compliance & Assurance Framework

Defining governance accountability and a maturity-led approach to implementing SWIM.

Decision-making Model:

Aligned with the governance structure, we are proposing the following decision-making model to be in place.

Decision Type	Accountable Body
Strategy	SWIM Executive Board
Policy	SWIM Executive Board
Technical Standards	Architecture and Standards Board
Service Onboarding	Service Governance Group
Compliance Disputes	CAA and SWIM Executive Board
International Alignment	CAA

Compliance and Assurance Framework:

Our view is that a maturity-based model is more effective in the early stages of SWIM implementation than a purely regulatory based model. As a result, a maturity level approach seems appropriate, looking at the following assessment areas: **Standards Conformance, Data Quality, Security, Service Availability, Operational Effectiveness** and indicating maturity through levels 1-5, these being, **Awareness, Standards Adoption, Interoperable Services, Assured Service Quality and Optimised Digital Ecosystem.**



Call for Input:

We recognise that this governance framework is high-level and will require further development as SWIM matures. We are keen to understand what stakeholders would like to see in the governance framework, including the role of **industry in shaping standards and decision-making**, and whether governance should be delivered through stakeholder-specific forums, collaborative working groups, regulator-led processes or a combination of these.

SWIM Governance Roles & Responsibilities

Examples of the respective roles and responsibilities of the CAA and industry within the governance framework.

Role of the CAA as the Regulator:

Policy Authority

Establish SWIM regulatory policy, compliance expectations
And interoperability objectives.

Governance Sponsor & Market Steward

Provide chairmanship and governance oversight and ensure
governance remains open, fair and innovation-friendly.

Assurance Authority

Monitor conformance, interoperability, information quality and
safety outcomes.

International Coordination

Coordinate with ICAO, EUROCONTROL, EASA and international
SWIM initiatives.

Industry Roles:

ANSPs

- Provide operational SWIM services
- Maintain service quality
- Participate in standards development
- Support interoperability testing

Airports

- Publish airport operational data
- Participate in service harmonisation
- Consume SWIM services

Airlines & Operators

- Provide operational requirements
- Consume SWIM services
- Participate in user acceptance activities
- Report service performance issues

UTM/UAS Providers

- Align emerging services to SWIM policies
- Participate in interoperability testing
- Support integrated airspace operations

Met Office

- Govern weather information services
- Maintain weather information model adoption
- Support WXXM implementation



Call for Input:

We recognise that this governance framework is high-level and will require further development as SWIM matures. We are keen to understand what stakeholders would like to see in the governance framework, including the role of **industry in shaping standards and decision-making**, and whether governance should be delivered through stakeholder-specific forums, collaborative working groups, regulator-led processes or a combination of these.

4

Delivery View

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Strategic Objective 3: SWIM for International Interoperability	28

SWIM High Level Roadmap

Key technical, policy and rulemaking activity.

Activity to meet Strategic Objectives & Iterate the Implementation Framework

Key:

AMS Milestone

CAP or AMC/GM

SI Laid

Future of Flight Milestone

Activity to support rulemaking

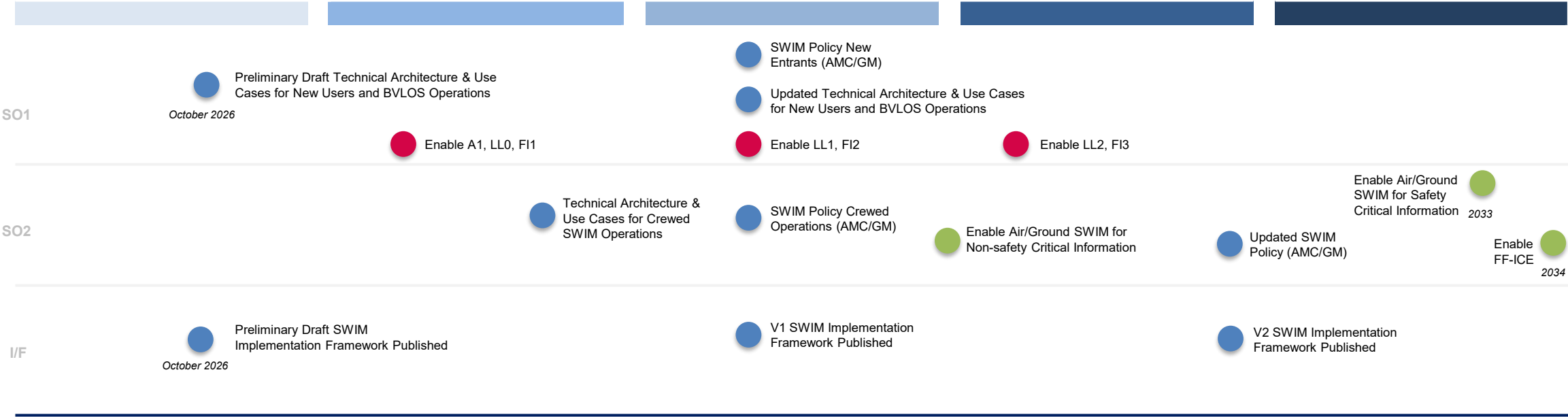
2026

2027

2028

2029

2034



Rulemaking timelines



Call for Input

This roadmap shows the technical, policy and legal milestones the CAA is planning to deliver and the AMS and FoF milestones they will enable. We are keen to understand how this aligns with industry's expectations, and welcome feedback on what the CAA is intending to deliver, and the outcomes it is intending to enable.

SO1: SWIM for New Users and Integrated BVLOS

Delivery Summary

OBJECTIVES & KEY OUTCOMES

1 SWIM for New Users & Integrated BVLOS

Enable the introduction and integration of new users (primarily UA focussed initially) into the UK airspace through the phased implementation of SWIM, and through the onboarding of services composed of core infrastructure components, operating in line with performance expectations.

A Standards & Services Adoption: Standards-based information services are adopted to enable secure, interoperable digital exchange of operational information for uncrewed aviation.

B Conformance & Compliance Monitoring: Risk-based conformance and compliance monitoring is enabled to support regulatory oversight, safety management and scalable uncrewed operations.

C Governance: A proportionate SWIM governance framework is established for uncrewed aviation, defining roles, responsibilities and accountabilities to support BVLOS operations.

D Infrastructure: Core SWIM infrastructure (e.g. registry and security framework) is available and used to support service discovery and secure information exchange in a SWIM environment.

Target Implementation Date: 2028

DELIVERY SUMMARY:

The SWIM for New Users and Integrated BVLOS Technical Architecture and Example Operational Scenarios have been drafted to enable the Future of Flight ambition of enabling routine BVLOS operations at scale. This follows the BVLOS Delivery Roadmap (CAP3182) and the Future ATM-ANS testing approach, providing:

- A vision of how information can flow through the airspace architecture in line with SWIM principles.
- Standards and infrastructure for the exchange of operational data/ information in line with CAP3182.
- SWIM Technical Architecture, which outlines infrastructure, bindings, security and assurance.
- Governance, assurance and conformance for uncrewed SWIM stakeholders consistent with ICAO guidance.
- SWIM testing requirements aligned to CAP3182 operational scenarios.

	Now	2026	2027	2028+
Atypical	Atypical operations with single operator Example operations - Inspection on railway, seeding farmland, perimeter patrols A0	Atypical operations with multiple operators Example operations - Multiple, consecutive, operations on the same length of railway A1	The definition of an Atypical Air Environment will be continually reviewed. This means over time, it may be possible to operate Atypical in more locations and greater volumes	
Low level Urban	Single operator with bespoke entry conditions Shift from bespoke entry conditions to increasing reliance on Con Ops/Policy Concepts to mitigate risk. Example operations - Last mile delivery operations or between hospitals in a TRA/TMZ LL0	Multiple operators in controlled airspace Example operations - Multiple last mile delivery over an urban area, small packages delivered over longer distance. No longer requires a temporary airspace structure. LL1	Multiple Operators in uncontrolled airspace Example operations - Multiple last mile delivery in villages, small packages delivered over longer distance. LL2	
Fully integrated	Segregated operations Example operations - Offshore monitoring in a TDA F10	Specific volumes with bespoke entry conditions Example operations - TRA & TMZ for maritime operations F11	Operations in controlled airspace Example operations - Point to point freight deliveries. No longer requires a temporary airspace structure. F12	Operations in controlled and uncontrolled airspace Example operations - Middle mile logistics across the UK. No longer requires a temporary airspace structure. F13

*Dates are based on the CAA continuing to receive the required level of funding needed to deliver the capabilities detailed within the Future of Flight Portfolio.

To support the development of New User operations in a SWIM-compliant way, this version of the Implementation Framework provides illustrative examples of how SWIM could be implemented for uncrewed users in Section 5, providing the following information:

- A summary of the SWIM services, information models, bindings, runtime monitoring and assurance evidence needed to execute the BVLOS operational scenarios.
- A summary of the key building blocks required to enable the implementation of SWIM in the UK aligned with the BVLOS Roadmap.



Call for Input:

We would like to understand how achievable the SWIM for New Users and Integrated BVLOS Objectives & Key Outcomes are for the New User community. It would be helpful if this could be considered in light of the other content in the Section 5 of the SWIM Implementation Framework, the SWIM Technical Architecture and Example Operational Scenarios.

SO2: SWIM for Crewed Aviation in an Integrated Environment

Delivery Summary

OBJECTIVES & KEY OUTCOMES

2

SWIM for Crewed Aviation in an Integrated Environment

Enable secure, service-based information exchange in an integrated environment for crewed aviation through a digital framework of interoperable data.

E

Enhanced Situation Awareness: All aviation stakeholders have access to real time, consistent data, therefore, reducing uncertainty, improving decision-making and safety.

F

Support for Advanced Concepts: Improved data sharing through SWIM will enable concepts such as trajectory-based operations and integration with uncrewed users.

G

Improved Airspace Efficiency: Optimised airspace utilisation, reduced delays and smoother traffic flows through improved predictability and situational awareness.

Target Implementation Date: 2034

DELIVERY SUMMARY:

APPROACH: The technical architecture and example scenarios for crewed aviation will set out the technical building blocks for how SWIM could be executed within the UK airspace. The CAA recognises the move to a SWIM environment affects crewed aviation users differently. As such, the SWIM SO2 documentation will be nuanced in how it envisions SWIM being adopted for General Aviation (GA) and Commercial Aviation.

HIGH LEVEL SUMMARY OF SUPPORTING CAPS/AMC :

- Calls out technically how the General and Commercial Aviation communities can move to a SWIM way of working, in the light of the UK's SWIM Vision, FoF programme and AMS.
- Defines how General and Commercial Aviation stakeholders will provide, exchange and consume information in a trusted and interoperable manner in line with SWIM principles.
- Enables a clear path for industry's compliance with key GANP and AMS dates.

ALIGNMENT WITH EXISTING GUIDANCE:

The CAA is committed to enabling operations in line with existing guidance from a range of international bodies; it is the intention that key provisions from these sources evolve into policy positions.

- **Pilot Common Project (PCP):** As communicated in January 2026, the CAA is conducting a change mandate to address how key provisions of the PCP can be made UK-specific and fit for purpose within domestic UK law. The intent of the legislation remains the same and industry is asked to continue with that intent. Further information will follow on this as the work develops.
- **PANS- IM:** The CAA is aligning with ICAO's PANS-IM (Doc 10199) by incorporating its provisions on SWIM architecture, governance and data exchange standards into UK policy and implementation plans.
- **Information Domain Specific:** The CAA intends to support developments made in information domains such as the development of domain-specific information services (e.g. Digital Operational Reporting Information Service information service in AIM).



Call for Input:

We welcome feedback from stakeholders impacted by the implementation of SWIM for Crewed Aviation Users on the UK CAA's approach, the scope of its forthcoming Technical Architecture and Use Cases and alignment with existing guidance.

SO3: SWIM for International Interoperability

Delivery Summary

OBJECTIVES & KEY OUTCOMES:

3

SWIM for International Interoperability

Establish a fully interoperable, secure and standards-based SWIM infrastructure that aligns with ICAO global standards to enable seamless, secure and real-time information exchange with international aviation partners.

H

Seamless Data Exchange: All crewed and uncrewed aviation stakeholders can exchange data seamlessly across borders using common standards.

I

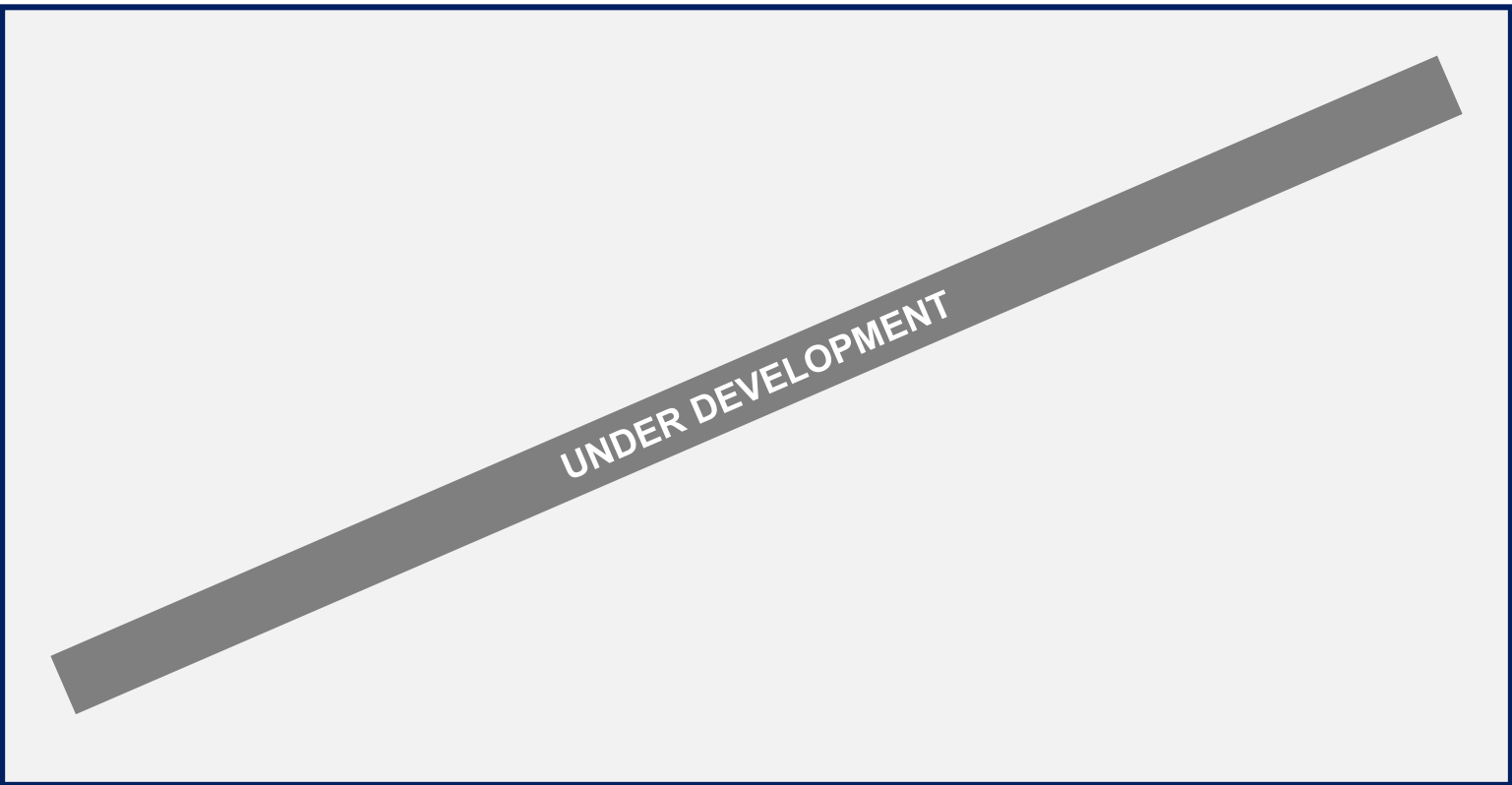
Governance: UK SWIM governance will be fully aligned with internationally agreed frameworks, procedures and operations for the oversight of all SWIM exchanges.

J

Cyber Security: European and global cyber security standards and procedures are embedded within UK systems to support safe, secure information exchange across jurisdictions.

Target Implementation Date: 2034

DELIVERY SUMMARY:



Call for Input:

We would welcome input from other NAAs and impacted stakeholders on how they are approaching the development of SWIM to ensure international interoperability. The CAA are currently developing our approach and welcome cross sharing with global states as an enabler for international interoperability.

5

Uncrewed SWIM: BVLOS Roadmap

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SWIM for New Users and Integrated BVLOS – Low Level Urban Execution View	32
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Future of Flight BVLOS Roadmap (CAP3182) Overview

The BVLOS Roadmap outlines how operational pathways will support the scaling of safe BVLOS operations.

Introduction to the Future of Flight BVLOS Roadmap (CAP3182)

The CAA's Future of Flight BVLOS Roadmap (CAP3182) sets out how routine BVLOS operations will be achieved in the UK. The roadmap is structured around operational pathways, which aim to provide industry with a clear and transparent path to scaled BVLOS operations. An operational pathway is a group of scenarios with similar Concept of Operations (ConOps), a common regulatory approach (e.g. require the same authorisations) and is aligned to industry demand.

The following pages summarise the SWIM services, information models, bindings, runtime monitoring and assurance evidence needed to execute each BVLOS operational scenario. The pre-flight, during flight and post-flight activities described in the example scenarios demonstrate the role SWIM could play in enabling the operational pathways. The following scenarios are designed to demonstrate potential applications of SWIM in enabling the example operational scenarios. **They are illustrative only and may not be fully representative of how SWIM will be implemented in practice, given the evolving nature of the UK aviation ecosystem.**

Atypical Air Environment (AAE)

BVLOS operations in airspace in close proximity to specific ground infrastructure within Atypical Air Environments.

- > Linear infrastructure inspection e.g. power lines, railways and wind turbines
- > Security and surveillance
- > Agriculture e.g. crop spraying

Integrated Low Level BVLOS Over Urban Area

BVLOS operations integrated with other airspace users in low level airspace (<500 ft agl) over populated areas.

- > Last mile deliveries (to end customers) e.g. medical supplies, pathology samples and consumer goods
- > Inspection

Fully Integrated BVLOS

BVLOS operations integrated with other airspace users in all airspace types.

- > Emergency air services
- > Offshore asset inspection
- > Middle mile deliveries (between warehouse / distribution centres)



Information:

The purpose of this page is to provide an introduction to the Future of Flight BVLOS Roadmap (CAP3182) in the context of SWIM. We are not seeking feedback on this material as these are the agreed operational pathways published by the CAA.

SO1: SWIM for New Users and Integrated BVLOS – AAE Execution View

Overview of the SWIM services, information models, bindings, runtime monitoring and assurance evidence needed to execute the Atypical Air Environment (AAE) BVLOS operational scenarios.

	Pre-Tactical (Planning/Authorisation) 	During Flight (Tactical) 	Post-Flight (Assurance) 
Atypical Operations with a Single Operator (A0)	- ANSP publishes AAE volume and conditions (when AAE is in controlled airspace) via SWIM-compliant AIXM service, making them available to operators and, where applicable, UTMSPs. - ANSP issues mandatory Digital NOTAM (or other forms of appropriate notifications that may be used in the future, such as an AIC) via ATM gateway, exposed through SWIM-compliant interfaces for stakeholder access and via UAS Operator request.	- Surveillance & EC: Where required, UAS data service providers (UDSP)* publish ASTERIX surveillance feeds via SWIM-compliant services (data provisioned from ground infrastructure). Where used, UTMSPs consume and fuse these data into an operational picture when multiple cooperative surveillance systems are available, as part of the Traffic Information Service. - Conformance Monitoring (CM): Where applicable, UTMSPs perform Conformance Monitoring services, tracking position and deviation thresholds, and generate alerts for off-nominal conditions (e.g. loss of electronic conspicuity).	- Exporting: ANSPs and, where applicable, UTMSPs export SWIM-compliant logs (schemas/latency), with Catalogue snapshots supporting safety case evidence. - Models & bindings: All models and bindings are exposed via SWIM-compliant interfaces to ensure standardised data exchange. - Execution key performance indicators (KPIs): These KPIs are derived from SWIM-compliant monitoring and assurance data collected during execution.
Atypical Operations with Multiple Operators (A1)	- ANSP or authorised entities publish airspace management data via SWIM-compliant CISP (AIXM) services, making them available to UTMSPs. - Competent authorities or ANSPs load priority traffic advisories via SWIM-compliant Common Information Service Provider (CISP)/authority feeds, which are consumed by UTMSPs. - Discovery and Synchronisation Service (DSS) service providers enable interoperability for operational intent via SWIM-compliant REST/SOAP interfaces, with UTMSPs publishing and subscribing to flight data.	- DSS service providers maintain cross-provider consistency of active flights and temporary restrictions via SWIM-compliant interfaces, with UTMSPs publishing and subscribing to operational intent data. - Surveillance data providers publish electronic conspicuity (EC) updates via SWIM-compliant ASTERIX streams, while UTMSPs generate and distribute flight plan conformance alerts to operators (AMQP1.0). - Malformed or late messages are rejected at the SWIM-compliant messaging broker edge.	- UTMSPs and service providers retain SWIM-compliant evidence (e.g. alerts, access decisions and schema validations) to support claimed residual air risk class (ARC) and delivery of a minimal-UTM configuration. - All models and bindings are exposed via SWIM-compliant interfaces to ensure interoperability across providers. - These KPIs are derived from SWIM-compliant monitoring, messaging and interoperability performance data.

*The term "UDSP" is being reviewed as part of the UTM consultation (CAP3271).



Call for Input:

The execution view highlights the SWIM services, information models, bindings, runtime monitoring and assurance evidence needed to execute the Atypical Air Environment BVLOS operational scenarios. We welcome feedback on the achievability of these actions and whether these actions would successfully enable the BVLOS operational scenarios.

SO1: SWIM for New Users and Integrated BVLOS – Low Level Urban Execution View

Overview of the SWIM services, information models, bindings, runtime monitoring and assurance evidence needed to execute the Low Level Urban BVLOS operational scenarios.

	Pre-Tactical (Planning/Authorisation) 	During Flight (Tactical) 	Post-Flight (Assurance) 
Single Operator with Bespoke Entry Conditions (LL0)	- ANSP or authorised entities publish appropriate airspace constraints via SWIM-compliant AIXM service (ATM gateway), making the information available to operators and, where applicable, UTMSPs, through Geo-consciousness Service. - DSS service providers enable interoperability for operational intent via SWIM-compliant REST/SOAP interfaces, with UTMSPs publishing and subscribing to flight data.	- UDSP publishes EC data via SWIM-compliant ASTERIX streams, which are consumed by operators and, where applicable, UTMSPs for situational awareness. - Conformance Monitoring (CM) tracks deviation thresholds from flight plans. Where applicable, UTMSPs will provide adequate alerts. - UTMSPs utilise ground-based EC information, based on SWIM-ingested surveillance data, supporting situational awareness without active tactical deconfliction. - DSS service providers maintain cross-provider consistency for active flights and temporary restrictions via SWIM-compliant interfaces (REST/SOAP).	- ANSPs and, where applicable, UTMSPs provide airspace constraints data consumption logs, and detect-and-avoid (DAA) / EC event timelines, recorded via SWIM-compliant logging and monitoring services. - Models & bindings. AIXM for airspace constraints, ASTERIX for surveillance; REST/SOAP for request/update and AMQP 1.0 for streams. - These KPIs are derived from SWIM-compliant monitoring and assurance data collected during execution.
Multiple UAS Operators in Controlled Airspace (LL1)	- ANSP or authorised entities publish airspace constraints via SWIM-compliant CISP service, making the airspace constraints available to UTMSPs and operators. - UTMSPs perform flight plan authorisation via SWIM-compliant REST/SOAP interfaces, based on constraints provided by ANSPs. - DSS service providers enable interoperability for operational intent via SWIM-compliant REST/SOAP interfaces, with UTMSPs publishing and subscribing to flight data.	- UDSP publishes EC data via SWIM-compliant ASTERIX streams, while UTMSPs send flight alerts to UAS operators using SWIM-compliant messaging (AMQP 1.0). - UTMSPs provide tactical deconfliction information to UAS operators via SWIM-compliant messaging services (AMQP1.0). - DSS service providers maintain cross-provider consistency for active flights and temporary restrictions via SWIM-compliant interfaces (REST/SOAP). - UTMSPs and service providers perform CM. - Onboard DAA supports detection and avoidance procedures using a combination of onboard sensors and, where available, SWIM-ingested traffic information.	- UTMSPs and ANSPs provide airspace constraints data consumption logs, DAA/EC event timelines and conformance monitoring alerts, recorded via SWIM-compliant logging and monitoring services. - All models and bindings are exposed via SWIM-compliant interfaces to ensure interoperability across ATM and UTM stakeholders. - These KPIs are derived from SWIM-compliant monitoring, messaging and interoperability performance data.
Multiple UAS Operators in Uncontrolled Airspace (LL2)	- ANSP or authorised entities publish airspace constraints via SWIM-compliant AIXM service, making the information available to UTMSPs and operators. - UTMSPs perform flight plan authorisation via SWIM-compliant REST/SOAP interfaces, based on shared airspace constraints. - DSS service providers enable interoperability for operational intent via SWIM-compliant REST/SOAP interfaces, with UTMSPs publishing and subscribing to flight data.	- DSS service providers maintain cross-provider consistency of active flights and temporary restrictions via SWIM-compliant interfaces (REST/SOAP), ensuring synchronised operational intent across UTMSPs. - UDSPs publish EC updates via SWIM-compliant ASTERIX streams, while UTMSPs generate and distribute flight plan conformance alerts to UAS operators via SWIM-compliant messaging (AMQP1.0). - UTMSPs perform CM and generate alerts for off-nominal conditions.	- UTMSPs and ANSPs export airspace constraints data consumption logs, EC presence, DAA alerts and SWIM-compliant logs (schemas/latency), with catalogue snapshots supporting safety case evidence. - All models and bindings are exposed via SWIM-compliant interfaces to ensure interoperability across multiple UTMSPs. - These KPIs are derived from SWIM-compliant monitoring, messaging and interoperability performance data.



Call for Input:

The execution view highlights the SWIM services, information models, bindings, runtime monitoring and assurance evidence needed to execute the Low Level Urban BVLOS operational scenarios. We welcome feedback on the achievability of these actions and whether these actions would successfully enable the BVLOS operational scenarios.

SO1: SWIM for New Users and Integrated BVLOS – Fully Integrated Execution View

Overview of the SWIM services, information models, bindings, runtime monitoring and assurance evidence needed to execute the Fully Integrated BVLOS operational scenarios.

	Pre-Tactical (Planning/Authorisation) 	During Flight (Tactical) 	Post-Flight (Assurance) 
Segregated Operations (FI0)	- ANSP or authorised entities publish appropriate airspace constraints via SWIM-compliant AIXM service, making the information available to operators and, where applicable, UTMSPs. - If UTM services are used, UTMSPs handle flight plan notification via SWIM-compliant REST/SOAP interfaces. - DSS service providers enable interoperability for operational intent, with UTMSPs publishing and subscribing to flight data.	- DSS service providers maintain cross-provider consistency of active flights and temporary restrictions via SWIM-compliant interfaces (REST/SOAP). - Surveillance and EC: UDSPs publish ASTERIX feeds from ADS-B in/out via SWIM-compliant services. Where UTM services are used, UTMSPs consume these data and provide an operational picture via SWIM-compliant messaging (AMQP1.0). - Where applicable, UTMSPs or service providers perform CM and generate alerts for off-nominal conditions.	- ANSPs and, where applicable, UTMSPs provide airspace constraints data consumption logs and EC event timelines, recorded via SWIM-compliant logging and monitoring services. - All models and bindings are exposed via SWIM-compliant interfaces to ensure standardised data exchange. - These KPIs are derived from SWIM-compliant monitoring and assurance data collected during execution.
Specific Volumes with Bespoke Entry Conditions (FI1)	- ANSP or authorised entities publish appropriate airspace constraints via SWIM-compliant CISP service (REST/SOAP), making them available to UTMSPs and operators. - Operators submit flight plans to UTMSPs via SWIM-compliant REST/SOAP interfaces for processing and authorisation. - DSS service providers enable interoperability for operational intent, with UTMSPs publishing and subscribing to flight data.	- DSS service providers maintain cross-provider consistency of active flights and temporary restrictions via SWIM-compliant interfaces (REST/SOAP). - Surveillance and EC: UDSPs publish ASTERIX feeds from ADS-B in/out via SWIM-compliant services. UTMSPs consume these data and provide an operational picture via SWIM-compliant messaging (AMQP1.0). - UTMSPs and service providers perform CM. - UTMSPs provide information-only DAA display as a tactical mitigation, based on SWIM-ingested surveillance data.	- UTMSPs and ANSPs provide airspace constraints data consumption logs, and EC/DAA event timelines, recorded via SWIM-compliant logging and monitoring services. - All models and bindings are exposed via SWIM-compliant interfaces to ensure standardised data exchange. - These KPIs are derived from SWIM-compliant monitoring and assurance data collected during execution.
UAS Operations in Controlled Airspace (FI2)	- ANSP or authorised entities publish appropriate airspace constraints via a SWIM-compliant CISP service, making them available to UTMSPs and operators. - UTMSPs perform flight plan authorisation via SWIM-compliant REST/SOAP interfaces, based on airspace constraints provided by ANSPs. - DSS service providers enable interoperability for operational intent, with UTMSPs publishing and subscribing to flight data.	- DSS service providers maintain cross-provider consistency of active flights and temporary restrictions via SWIM-compliant interfaces (REST/SOAP). - Surveillance and EC: UDSPs publish ASTERIX feeds from ADS-B in/out and/or radar data via SWIM-compliant services. UTMSPs consume this data to provide an operational picture and generate alerts distributed via SWIM-compliant messaging (AMQP1.0). - UTMSPs and service providers perform CM and generate alerts for off-nominal conditions. - UTMSPs provide tactical deconfliction instructions based on SWIM-ingested surveillance and operational intent data.	- UTMSPs and ANSPs provide airspace constraints data consumption logs, and EC/tactical deconfliction event timelines, recorded via SWIM-compliant logging and monitoring services. - All models and bindings are exposed via SWIM-compliant interfaces to ensure standardised data exchange. - These KPIs are derived from SWIM-compliant monitoring and assurance data collected during execution.
UAS Operations in Controlled and Uncontrolled Airspace (FI3)	- ANSP or authorised entities publish appropriate airspace constraints via SWIM-compliant CISP service while operating in controlled airspace - UTMSPs perform flight plan authorisation via SWIM-compliant REST/SOAP interfaces. - DSS service providers enable interoperability for operational intent via SWIM-compliant REST/SOAP interfaces, with UTMSPs publishing and subscribing to flight data across controlled and uncontrolled airspace.	- DSS service providers maintain cross-provider consistency of active flights and temporary restrictions via SWIM-compliant interfaces (REST/SOAP). - UDSPs publish ASTERIX feeds from ADS-B in/out via SWIM-compliant services. UTMSPs consume this data to provide an operational picture and generate alerts via SWIM-compliant messaging (AMQP1.0). - UTMSPs and service providers perform CM. - UTMSPs provide tactical deconfliction instructions based on SWIM-ingested surveillance and operational intent data.	- UTMSPs and ANSPs provide airspace constraints data consumption logs, and EC/tactical deconfliction/DAA event timelines, recorded via SWIM logging and monitoring services. - All models and bindings are exposed via SWIM-compliant interfaces to ensure standardised data exchange. - These KPIs are derived from SWIM-compliant monitoring and assurance data collected during execution.



Call for Input:

The execution view highlights the SWIM services, information models, bindings, runtime monitoring and assurance evidence needed to execute the Fully Integrated BVLOS operational scenarios. We welcome feedback on the achievability of these actions and whether these actions would successfully enable the BVLOS operational scenarios.

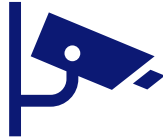
SO1: SWIM for New Users and Integrated BVLOS – Building Blocks

Key focus areas to enable the effective of implementation of SWIM.



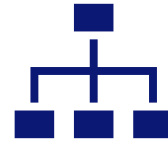
Standards & Services Adoption

- The use of standards to enable the accurate and secure digital exchange of information (e.g. AIXM).
- The development and adoption of Information Services for the exchange of information.



Conformance Monitoring & Alerts

- The expectations of operators to enable or perform conformance monitoring to support regulatory oversight and safety management.
- Proactive conformance alerts to support operations by enabling rerouting and tactical deconfliction.



Governance

- The design and rollout of a SWIM governance framework made up of defined mechanisms and processes to manage accountability and ensure consistent, secure operations in a SWIM environment.



Core Infrastructure

- Core SWIM infrastructure refers to two components:
 - **SWIM Registry:** how services are found, accessed and monitored.
 - **Security Framework:** mechanisms and practices to ensure the secure exchange of information



Information:

As SWIM for uncrewed users is implemented, maturity will develop in the 4 key areas above in line with the SWIM High-Level Roadmap on page 25 and the FoF BVLOS Roadmap. This preliminary draft version of the SWIM Implementation Framework outlines how SWIM capabilities should be delivered in line with the FoF BVLOS scenarios. Future iterations of the SWIM Implementation Framework will explore the building blocks to enable the evolution of an information centric aviation ecosystem for all aviation users.

SO1: SWIM for New Users and Integrated BVLOS – Enabling the BVLOS Roadmap

High-level roadmap identifying roles of industry and the CAA in enabling the development of SWIM for SO1 and the BVLOS Roadmap.

	 Standards & Services	 Conformance Monitoring	 Governance	 Core Infrastructure
Initial Capability 2026 - 2027 (A0, A1, LL0, FI1)	The CAA provides standards for SWIM-compliant exchange of information by uncrewed aviation users via the SWIM Technical Architecture. Industry will ensure, where technology is available, information is exchanged in a SWIM compliant way.	The CAA will set standards for when and where conformance monitoring for the exchange of information is required to be shared for oversight.	The CAA has set up the SWIM governance vision (for all users) and model for uncrewed aviation. The CAA will communicate the levels of operational use where SWIM governance needs to be performed and evidenced.	Industry will use the EUROCONTROL SWIM Registry for service discoverability. Industry will follow security standards set out in the EUROCONTROL SWIM Yellow Profile, which is a technical specification that defines the requirements for system interfaces and IT infrastructure capabilities.
Mobilisation at Scale 2028 (LL1, FI2)	(As above in A0, A1, LL0, FI1) The CAA will determine thresholds for mandating SWIM based on testing, communicating these and, where necessary, mandating them.	(As above in A0, A1, LL0, FI1) The CAA will have a clear process for how conformance monitoring is used to manage the overall airspace risk picture. Industry will be required to supply conformance monitoring data in line with regulator expectations.	(As above in A0, A1, LL0, FI1) <i>For functions where the SWIM-compliant exchange of information is either mandated or BAU:</i> The CAA will communicate terms of reference for key SWIM governance artefacts and begin oversight.	(As above in A0, A1, LL0, FI1) The CAA will establish a clear cyber security framework to support uncrewed users. Industry will be required to follow the cyber security framework set out by the CAA.
Full SWIM Operational Environment 2029+ (LL2, FI3)	(As above in LL1, FI2) The CAA will set standards for SWIM-compliant exchange of information for crewed users in an integrated environment to be set by the regulator.	(As above in LL1, FI2)	(As above in LL1, FI2) The CAA will set up the SWIM governance framework for crewed aviation, and will set out how it works for integrated operations.	(As above in LL1, FI2) The CAA will ensure cyber security framework supports integrated operations.

Note: SWIM-compliant means data is exchanged in line with the SWIM principles – see Annex for definition.



Call for Input:

The roadmap highlights where action is expected from industry and from the regulator. We welcome feedback on the achievability of these actions and whether the proposed sequencing appropriately reflects industry capability and maturity.

6

Annex

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Key Documents, Purpose & Development

SWIM has a range of existing and future documentation with key purposes.

Document	Implementation Framework	Technical Architecture	Operational Scenarios	AMC/GM
Purpose	Delivery focused view of what SWIM is, and what it means for those implementing it. Sets out SWIM's vision, targets for its development and roadmap for delivering this. There is an ICAO requirement for each state to have a SWIM Implementation Framework.	Technical perspective on SWIM, its key technical building blocks and how it will function. Document sets out detail on standards, infrastructure and governance for the deployment of SWIM.	Demonstrates examples of how building blocks of SWIM could be deployed in specific operational scenarios. For uncrewed SWIM, these scenarios are aligned with the BVLOS Roadmap (CAP3182). The illustrative examples are designed to demonstrate potential applications of SWIM in enabling the operational scenarios.	AMC/GM sets out a specific accepted way to comply with Implementing Regulations. Therefore, AMC/GM will be published once rulemaking is complete in 2028.
Development	As outlined on page 25, the SWIM Implementation Framework is planned to be updated every 18 months, to account for and reflect the technical work that has occurred in the period before. In 2028, the V1 SWIM Implementation Framework will cover SO2 (i.e. SWIM for Crewed Aviation in an Integrated Environment).	The SWIM Technical Architecture for Crewed Users in an Integrated Environment (SO2) will be released in 2027.	A use cases document covering Crewed Users in an Integrated Environment, demonstrating how SWIM operates in specific operational scenarios, will be published alongside each Technical Architecture.	The SWIM Technical Architecture and Use Cases will evolve through testing, iteration and consultation to help provide evidence and technical input for AMC/ GM.



Information:

The documents described on this slide collectively support the delivery of the UK SWIM vision by linking strategic intent, technical architecture, operational use cases and regulatory guidance, and will evolve iteratively as SWIM capability matures.

Key Terms

These terms are defined to support a shared understanding of key concepts across users of the Implementation Framework.

SWIM-Compliant -

Information, systems or services that conform to the agreed *SWIM principles, applicable standards, security requirements and governance expectations* set out in the UK CAA SWIM Technical Architecture and are aligned with ICAO guidance.

Security Framework -

The set of technical and procedural controls, such as identity, authentication, authorisation, encryption, and assurance, that protect the confidentiality, integrity and availability of information exchanged in a SWIM-compliant way.

SWIM Standard -

An agreed specification that defines how a specific element of aviation information is structured, exchanged, secured and governed, in alignment with the UK CAA SWIM Technical Architecture, resulting in interoperable, service-based, digital information exchange.

BVLOS (Beyond Visual Line of Sight) -

A type of UAS operation which is not conducted in visual line of sight (VLOS). VLOS means a type of operation in which the remote pilot is able to maintain continuous unaided visual contact with the UA, allowing the remote pilot to control the flight path of the unmanned aircraft in relation to other aircraft, people and obstacles for the purpose of avoiding collisions.

Performance Expectations -

Defined service-level characteristics (e.g. availability, latency, reliability and data quality) that SWIM information services are expected to meet, proportionate to operational risk and use case.

Core SWIM Infrastructure -

Foundational technical components required to enable SWIM operations. For the UK, this is the SWIM Registry and security framework. Network connectivity is not included in the scope of ICAO's definition of core SWIM Infrastructure. Nonetheless, the UK CAA considers the network that enables information services to be supplied and consumed to be a core component of SWIM infrastructure.

Information Service -

A structured, standards-based mechanism for the supply and consumption of aviation information in a service-oriented architecture. An information service includes interfaces, data models, metadata, access controls and performance expectations, not just the underlying dataset.



Information:

The terms defined in this glossary are used frequently throughout the SWIM Implementation Framework and may have different interpretations across stakeholders. These definitions are provided to support a common understanding of key concepts, roles and expectations. They are intended as explanatory guidance rather than new policy or regulatory requirements.

Bibliography

Documents that have been referred to directly within this document.

No.	Document
1	International Civil Aviation Organization (ICAO). <i>Global Air Navigation Plan (GANP)</i> , Doc 9750.
2	International Civil Aviation Organization (ICAO). <i>Aviation System Block Upgrades (ASBU) Framework</i> (part of GANP, Doc 9750).
3	International Civil Aviation Organization (ICAO). <i>Procedures for Air Navigation Services — Information Management (PANS-IM)</i> , Doc 10199, First Edition, 2024.
4	International Civil Aviation Organization (ICAO). <i>Manual on the System-Wide Information Management (SWIM) Concept</i> , Doc 10039.
5	International Civil Aviation Organization (ICAO). <i>Manual on the System-Wide Information Management (SWIM) Implementation</i> , Doc 10203.
6	Civil Aviation Authority (CAA). <i>Airspace Modernisation Strategy 2023–2040</i> , CAP 1711 series.
7	Department for Transport (DfT). <i>Future of Flight Action Plan</i> , 2024.
8	Civil Aviation Authority (CAA). <i>Future of Flight: BVLOS Roadmap</i> , CAP 3182.
9	SESAR Joint Undertaking. <i>European ATM Master Plan</i> , 2025 Edition.
10	EUROCONTROL. <i>Specification for SWIM Technical Infrastructure (TI) – Yellow Profile</i> , EUROCONTROL-SPEC-170.
11	Civil Air Navigation Services Organisation (CANSO). <i>An industry global strategy and roadmap for future skies</i> , 2025



Information:

The documents listed provide context and alignment with existing ICAO, European and UK frameworks and are referenced to support understanding of the UK SWIM Implementation Framework.