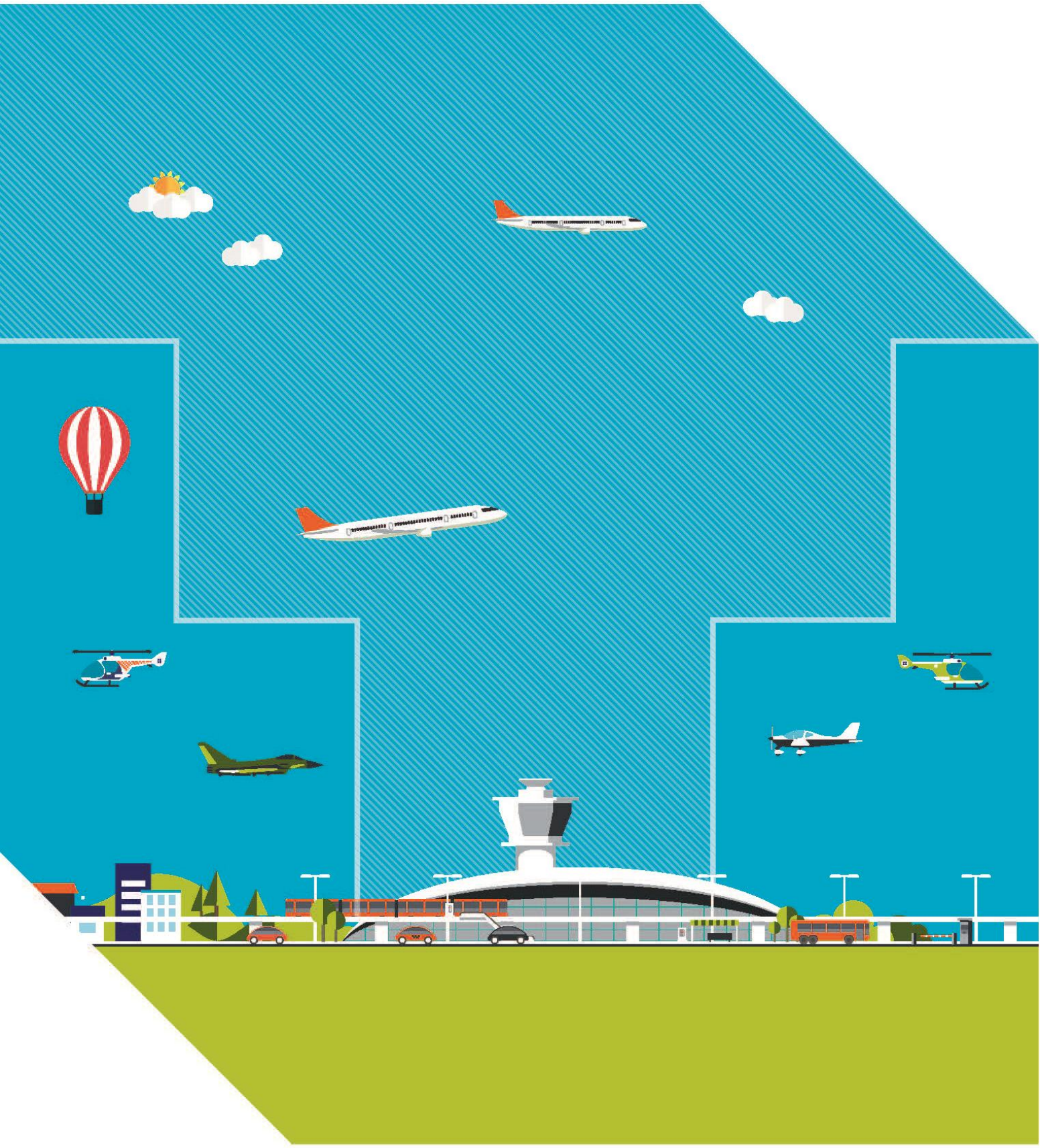
Draft Airspace Modernisation Strategy 2022–2040
Part 2: Delivery elements

CAP 2298b



Published by the Civil Aviation Authority, January 2022

Civil Aviation Authority
Aviation House
Beehive Ring Road
Crawley
West Sussex
RH6 0YR

Enquiries regarding the content of this publication should be addressed to:
airspace.modernisation@caa.co.uk

The latest version of this document is available in electronic format at: www.caa.co.uk/CAP2298b

Contents

Chapter 1

Overview

Airspace Modernisation Strategy

1.1 This document forms **Part 2** to the CAA's Airspace Modernisation Strategy (AMS). As explained in more detail in **Part 1**, the AMS is a refresh of the original 2018 AMS:

- to extend the strategy's focus from 2024 out to 2040, as required by the Air Navigation Directions[1]
- to take account of the latest developments in innovation and technology, placing integration of all airspace users at the core of the strategy, including accommodating new types of aerial craft like drones[2], advanced air mobility (aerial taxis) and spacecraft
- to aim for simpler airspace design and supporting regulations
- to introduce sustainability as an overarching principle to be applied through all modernisation activities, taking account of the latest government policy and environmental guidance, including better managing noise and helping achieve government commitments to net zero emissions
- to meet the UK's international obligations, aligning delivery of the AMS with the ICAO[3] Global Air Navigation Plan (GANP) and ensuring interoperability of the UK network with neighbouring air traffic management areas, including providing a clear strategic path for rulemaking activities, now that the UK has left the EU and the European Aviation Safety Agency

all without undermining the initiatives from the 2018 AMS, delivery of which will continue, and which are subsumed into the refreshed AMS.

---

1 https://www.caa.co.uk/Commercial-industry/Airspace/Airspace-change/Legislative-framework-to-airspace-change/

2 Remotely piloted aircraft systems (RPAS) may be referred to as unmanned aerial vehicles (UAV), uncrewed aircraft, drones, model aircraft or radio-controlled aircraft. For more information see https://www.caa.co.uk/Consumers/Unmanned-aircraft/Our-role/An-introduction-to-unmanned-aircraft-systems/.

3 The International Civil Aviation Organization, a specialist agency of the United Nations responsible for international standards for civil aviation which the UK is bound by international treaty to implement. ICAO's strategic objectives (in respect of global aviation, not just airspace) can be read here https://www.icao.int/about-icao/Council/Pages/Strategic-Objectives.aspx..

1.2 The refreshed strategy therefore pulls together the ICAO GANP, the 2018 AMS initiatives and also new requirements that the CAA has identified through extensive stakeholder engagement in 2021–2022.[4]

Structure of the AMS – ends, ways and means for modernising airspace

1.3 The AMS sets out the **ends**, **ways** and **means** of modernising airspace:

- the **ends** are the policy objectives for achieving the shared vision for airspace modernisation
- having explained those ends, the strategy describes the **ways** of achieving them (the enablers) – such as new airspace design, new operational concepts and implementable new technologies
- to establish the **means** of delivering modernised airspace, such as the resources needed, this strategy requires organised project teams, led by industry and other entities, to draw up delivery plans, with delivery overseen by the CAA.

1.4 The means of delivering some of the ends required for airspace modernisation are still being developed in detail – for example, the approach to integrating operations of drones and crewed aircraft.

Content of each part of the strategy

1.5 The AMS 2022–2040 is split into three parts plus an annex (Figure 1.1 below). **Part 1 (Strategy)** explains the strategy's objectives (the **ends**) and a high-level overview of what will enable those objectives to be fulfilled (the enablers or **ways**). Part 1 is published separately as CAP 2298a.[5] **Parts 2 and 3 (Delivery)** explain how the strategy is being delivered. You are reading **Part 2,** which explains the different **delivery elements** that make up the AMS (the **ways,** in more detail, including a linked **Part 2 database**.[6] **Part 3** sets out progress with **deployment** and related activities for those elements (the **means**).[7]

---

4 This engagement, which included numerous listening, feedback, requirements-gathering, co-creation and review group sessions, is described in CAP 2281 Airspace Modernisation – 2021 Progress Report www.caa.co.uk/cap2281.

5 Currently in draft form as CAP 2298a for the purposes of consultation, which can be viewed at https://consultations.caa.co.uk/policy-development/draft-airspace-modernisation-strategy-2022-2040. Final versions of AMS Part 1 and Part 2 will be published later in 2022.

6 The Part 2 database can be downloaded at www.caa.co.uk/cap2298b.

7 The plans in Part 3 are not being published at this stage until we have consulted on drafts of Parts 1 and 2 of the AMS.

1.6 Parts 2 and 3 describe the short-term ambition. Parts 2 and 3 are likely to be updated more frequently than Part 1 as the elements evolve and mature for delivery. The intent is for stakeholders to be able to readily identify the modernisation themes that are most relevant to them and which will help to deliver their ambitions. As with the 2018 strategy, there is a separate AMS governance annex, published by the Department for Transport and CAA jointly, as co-sponsors of airspace modernisation.

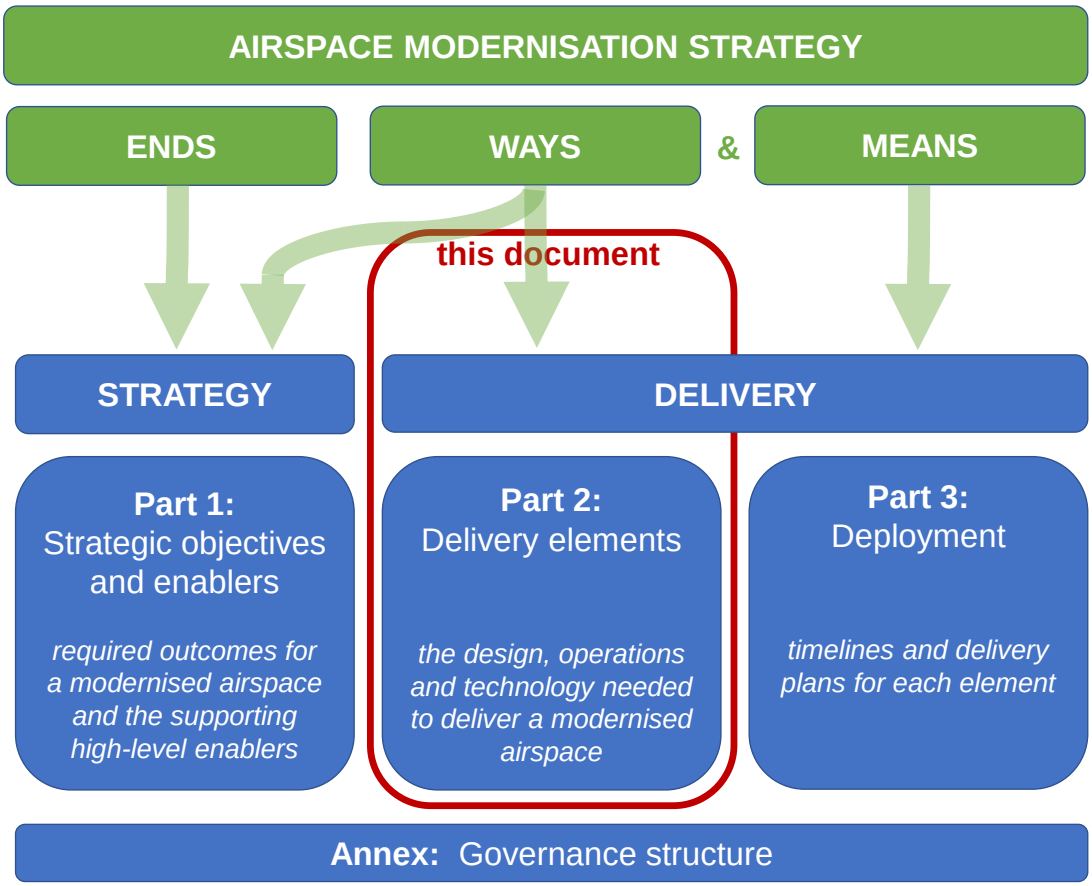


Figure 1.1 Structure of the AMS

1.7 Bearing in mind the 2040 timescale specified by the Government, the CAA will keep the context for the AMS under review and update it where necessary. This particularly applies to Parts 2 and 3 containing the delivery elements, as technological innovations are forthcoming or become ubiquitous, gaps in the policy or regulatory framework emerge that are affecting delivery, or where the Government has signalled upcoming or widescale policy developments (Net Zero being a good example). We will monitor developments, including through our oversight function and our annual AMS progress reports to the Secretary of State, collating aspects that need amendment. The pace of change may mean that for practical reasons we review and update the AMS in stages. In other words, some developments may move on before the CAA is able to review and update the relevant part of the strategy.

1.8 The AMS will guide the delivery of relevant and timely policy and regulation across the whole CAA that supports the delivery of airspace modernisation goals. In particular, it will be used to assist in the prioritisation of UK airspace rulemaking activity to help ensure its timely and coordinated implementation.

Chapter 2

Delivery elements – overview

Introduction

2.1 AMS Part 1 sets out the 'ends' or objectives for airspace modernisation, and gives an overview of the enablers or 'ways' that structure the delivery plans set out in Parts 2 and 3. This is summarised in Figure 2.1 below, which is taken from and explained in more detail in Part 1.

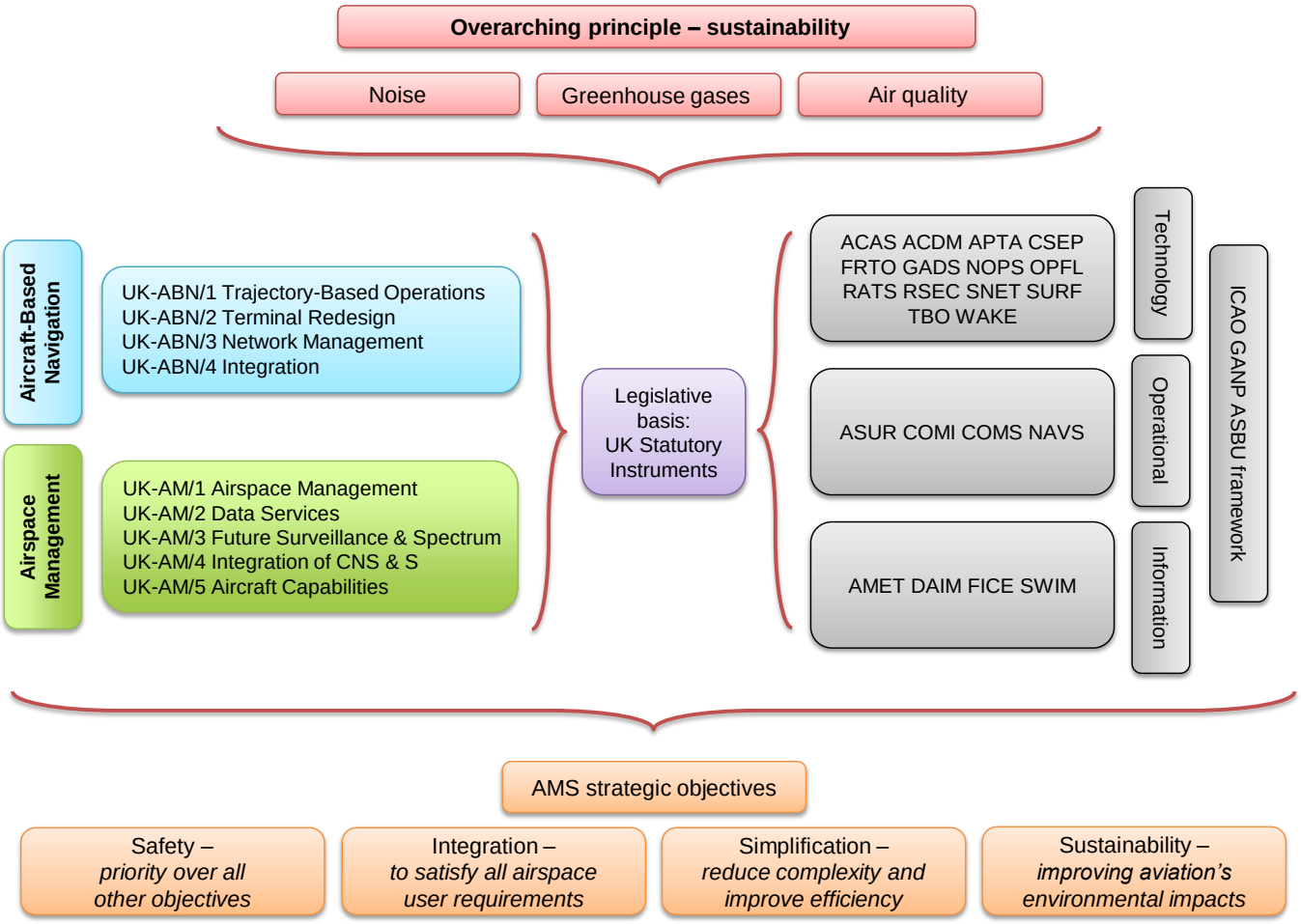


Figure 2.1: Overall summary of the delivery elements aligned with the ICAO ASBU framework in pursuit of the AMS strategic objectives

2.2 This document, Part 2, is more focused on the near term, and will evolve over time, aligned with the ICAO GANP programme. GANP uses a guiding deployment framework known as the Airspace System Block Upgrade (ASBU) with workstreams organised into 'threads' and 'elements' (see Chapter 3 of

Part 1). Part 2 expands on the ASBU threads to provide the essential detail of the development activities – known as 'delivery elements'– making up the strategy.

2.3 While the ASBU threads have extensive operational and technical descriptions, not everything will be wholly applicable to the UK, while some activities necessary for modernisation of UK airspace will be specific to the UK. The delivery elements in the strategy are therefore based on ICAO operational and technical descriptions but tailored to the needs of UK airspace.

2.4 The delivery elements form the basis of research and development activities over the near term in support of deployment, including how those activities are funded. The delivery elements also identify legislative, policy or regulatory gaps that need to be addressed, for example how to accommodate new types of aircraft in UK airspace like drones or spacecraft, or trade-offs between increased capacity, carbon emissions, noise, or other factors.

The nine delivery elements

2.5 As shown in Table 2.1 below, there are nine delivery elements arranged under two headings:

- **aircraft-based navigation**
- **airspace management**.

These nine elements pull together the ICAO GANP, the 2018 AMS initiatives and new requirements identified through extensive stakeholder engagement.

2.6 These elements identify the areas for development by the UK aviation industry and other entities (including the CAA and Department for Transport as co-sponsors of airspace modernisation) over the period to the end of ASBU Block 3 in 2033.

2.7 Work carried out through the Future Airspace Strategy (which preceded the 2018 AMS) and the 15 initiatives from the 2018 AMS was all in service of the ICAO GANP and related to ASBU Block 0 and Block 1. Some of this work will carry on into Block 2 and 3 due to delayed development and delivery.

ASBU series of system upgrades designed to meet GANP objectives

- Block 0 2013 – 2018
- Block 1 2018 – 2023
- Block 2 2023 – 2028
- Block 3 2028 – 2033
- Block 4 2033 +

ASBU threads:

- Information
- Operational
- CNS Technology and Services

Table 2.1: Structure for AMS delivery elements ('ways')

Category	2022 Elements	2018 AMS initiatives further developed through these elements	
Aircraft-Based Navigation	UK-ABN/1. Trajectory-based operations	2, 7, 8, 11, 14	Overarching principle: implementing government policy on minimising the environmental impacts of aviation within the context of supporting a strong and sustainable aviation sector
	UK-ABN/2. Terminal redesign	4, 5, 14	
	UK-ABN/3. Network management	3, 6	
	UK-ABN/4. Integration	3, 9, 10, 11	
Airspace Management	UK-AM/5. Airspace management		
	UK-AM/6. Data services	13, 15	
	UK-AM/7. Future surveillance and spectrum	11, 12	
	UK-AM/8. Integration of communications, navigation, surveillance & spectrum	12, 13, 14, 15	
	UK-AM/9. Aircraft capabilities	New	

Notes: Initiative 1 (Direct Route Airspace) in the 2018 AMS is complete.

Chapter 3

Description of each element

Introduction

3.1 The nine UK elements described in Table 2.1 above contain a number of ICAO elements that support their development and delivery. The intent of this AMS Part 2 is to capture all the relevant elements and sub-elements in their respective ASBU delivery blocks along with any specific delivery timescales required through UK law (in the form of Statutory Instruments).

3.2 In this chapter, we summarise each of the elements and sub-elements in the form of a 'swim-lane' diagram. Full information in respect of each element and sub-element can be downloaded in the form of the **AMS Part 2 database** at www.caa.co.uk/cap2298b. The summaries should be read in conjunction with the database.

Summary of each element

3.3 A summary of each of the nine elements is described below under the two headings, aircraft-based navigation and airspace management. For each element, a swim-lane diagram shows the sequence of capability development and delivery to the end of ASBU Block 3 (2033), and also captures links and dependencies across all the individual sub-elements required to achieve the required UK element outcome.

3.4 For the purpose of this overview, the specific ICAO work elements and combined ICAO and UK sub-elements are shown in plain English, to avoid having to explain each ICAO ASBU abbreviation.

Part 2 database

3.5 The database linked to AMS Part 2 can be downloaded at www.caa.co.uk/cap2298b. The database is intended to be the working tool to help manage industry planning of activities and distribution of available funding, and to support tracking and reporting of deployment activities.

3.6 The database contains a front page ('Part 2 summary') that provides an overview of the relationship between the nine UK elements and the ICAO elements. The Initiatives identified in the 2018 AMS (CAP 1711) are captured against the nine new UK elements along with feedback gleaned from the AMS refresh engagement sessions against each UK element.

3.7 The nine UK elements are then described individually, using the ‘ends, ways and means’ methodology described in AMS Part 1:

- ‘end’ is the UK Element
- ‘ways’ are the steps described against the ICAO ASBU Blocks 1 to 4 (the current Part 2 only covers the period to the end of Block 3)
- ‘means’ captures the sub-elements by ICAO Block needed to achieve the ‘ways’.

3.8 The ‘means’ form the main driver for development and deployment activities. The ICAO elements will link directly to the existing live ICAO GANP portal[8] where the intent behind each of the ICAO elements is explained. The UK-specific elements will be expanded to explain their intent and a link provided to the relevant UK legislative requirements (in the form of Statutory Instruments).

Work in progress note: it is the intent to highlight, through the swim-lane diagrams, the steps relevant to individual stakeholder groups, whether UK industry or those impacted by airspace modernisation.

Work in progress note: the database linked to AMS Part 2 is still under development, but is sufficiently complete to demonstrate the intent. We are hoping to make the database as easy to access and to interpret as we can, within the constraints of the content being primarily of a technical nature.

8 https://www4.icao.int/ganpportal/

Aircraft-Based Navigation (elements UK-ABN/1 to UK-ABN/4)

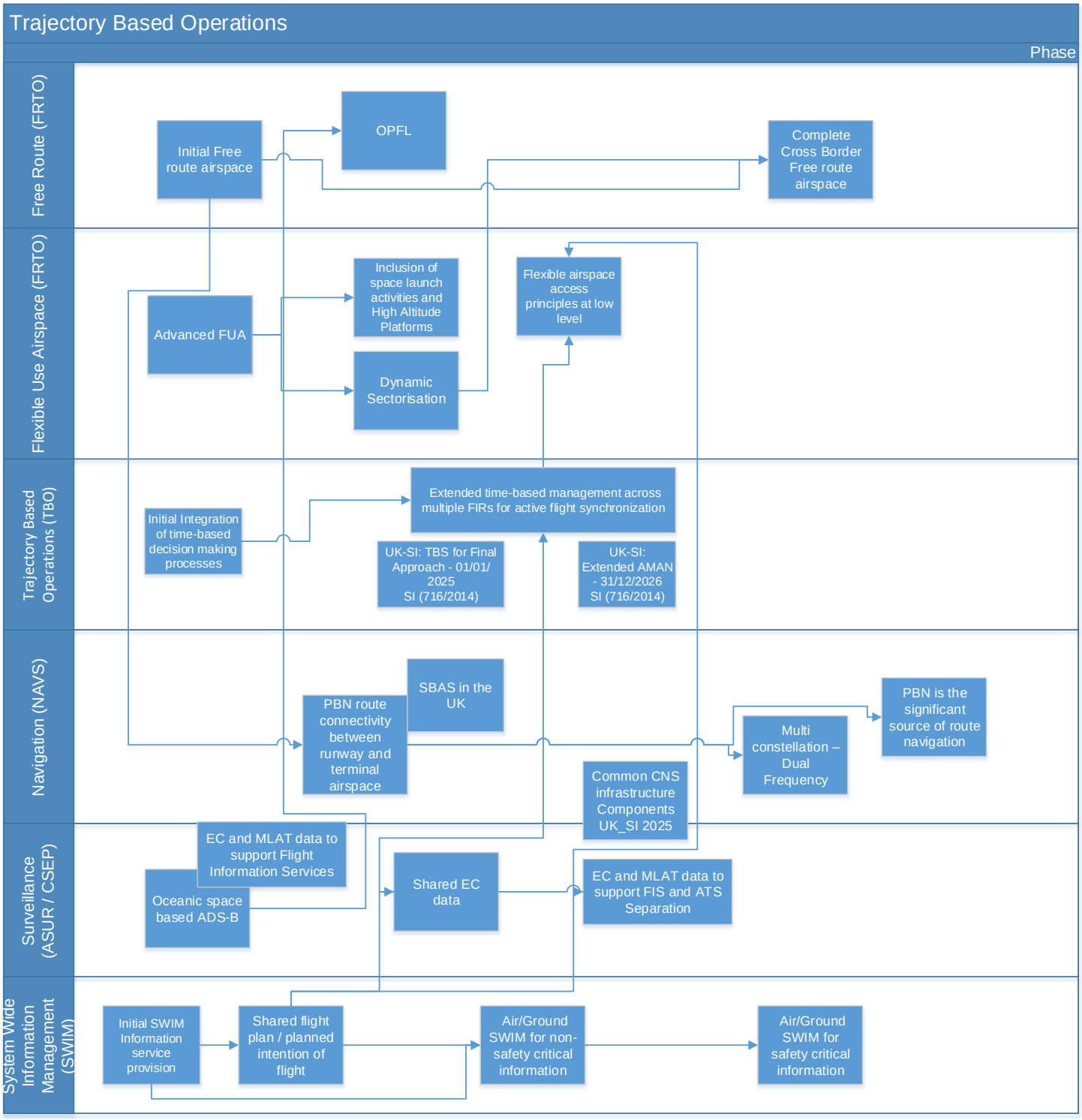
UK-ABN/1. Trajectory-based operations

Trajectory based operations implements the flexibility for airspace operators to plan their operations around their need. This is enabled through:

- structured performance-based navigation routes at lower levels
- flexible access airspace structures that allow for low level integration of different users
- removal of high-level route structures supported by flexible use airspace management techniques that segregate operations where necessary, such as military operations and training, and space launches
- air traffic management support tools.

The summary below is extracted from the AMS Part 1. This is further developed in the swim-lane diagram overleaf summarising the sequence of significant capability deployments to the end of ICAO Block 3 (2033), along with relevant links and dependencies across the delivery elements.

Proposed 2022 AMS elements	Basis		Specific elements
	GANP ASBU	National	
1. Trajectory-based operations	✓		Further use of DCT (direct routeing) and FRA (free route airspace) leading to 4D trajectories PBN (performance-based navigation) in support of the European route network


Trajectory Based Operations
Phase
Free Route (FRTO)
Initial Free route airspace
OPFL
Complete Cross Border Free route airspace
Flexible Use Airspace (FRTO)
Advanced FUA
Inclusion of space launch activities and High Altitude Platforms
Dynamic Sectorisation
Flexible airspace access principles at low level
Trajectory Based Operations (TBO)
Initial Integration of time-based decision making processes
Extended time-based management across multiple FIRs for active flight synchronization
UK-SI: TBS for Final Approach - 01/01/ 2025 SI (716/2014)
UK-SI: Extended AMAN - 31/12/2026 SI (716/2014)
Navigation (NAVS)
PBN route connectivity between runway and terminal airspace
SBAS in the UK
Multi constellation – Dual Frequency
PBN is the significant source of route navigation
Common CNS infrastructure Components UK_SI 2025
Surveillance (ASUR / CSEP)
EC and MLAT data to support Flight Information Services
Oceanic space based ADS-B
Shared EC data
EC and MLAT data to support FIS and ATS Separation
System Wide Information Management (SWIM)
Initial SWIM Information service provision
Shared flight plan / planned intention of flight
Air/Ground SWIM for non-safety critical information
Air/Ground SWIM for safety critical information

UK-ABN/2. Terminal redesign

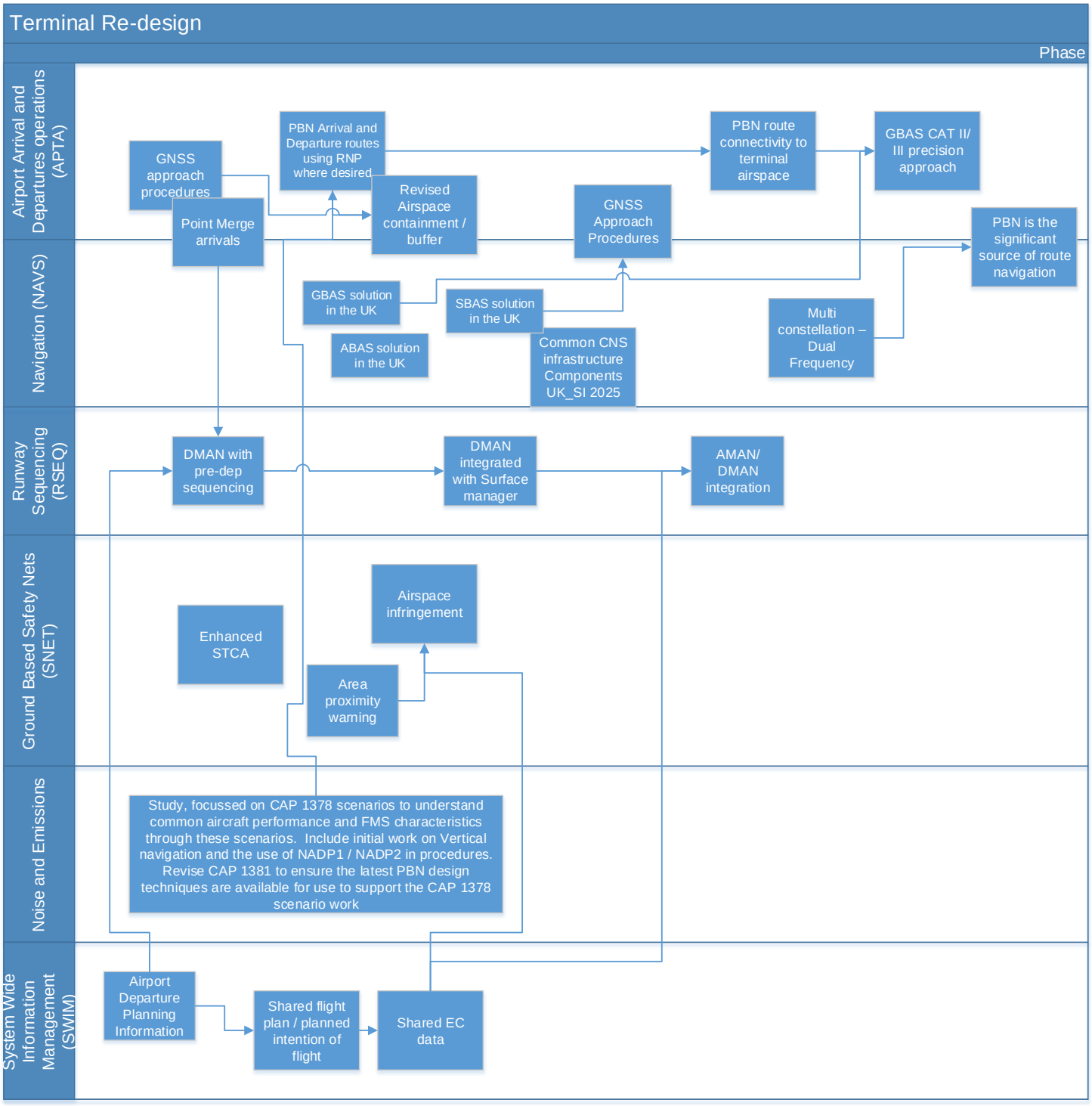
Terminal airspace development includes the arrival and departure operations to individual airports (i.e. it does not need to be captured within a terminal operation that covers multiple airports) and looks to provide a predictable and repeatable arrival and departure route that connects airports to the free route airspace environment.

This organised structure provides the basis for determining the need for controlled airspace around airports and enables high-performing modern aircraft to deliver sustainable fuel emission reductions through better climb and descent performance. This is enabled through:

- structured performance-based navigation routes at lower levels, initially focussed on lateral performance but ultimately including vertical navigation performance
- flexible access airspace structures that allow for low level integration of different users
- electronic conspicuity sharing accurate navigation position data between airborne devices and with ground systems
- airport management of runway sequencing of traffic and positive links to the network route management through the sharing of the Airport Operational Plan (AOP).

The summary below is extracted from the AMS Part 1. This is further developed in the swim-lane diagram overleaf summarising the sequence of significant capability deployments to the end of ICAO Block 3 (2033) along with relevant links and dependencies across the delivery elements.

Proposed 2022 AMS elements	Basis		Specific elements
	GANP ASBU	National	
2. Terminal redesign	✓	✓	Noise respite – PBN (performance-based navigation) dispersal vs concentration; vertical profiles – developing a 'playbook' of procedure options
	✓	✓	PBN (performance-based navigation) procedures to ensure the right-sized controlled airspace providing suitable containment
	✓	✓	Develop airspace sharing (flexible access)
	✓	✓	Net Zero/Jet Zero targets
	✓	✓	FASI programme (Future Airspace Strategy Implementation) through airspace change masterplan coordinated by ACOG (Airspace Change Organising Group)


Terminal Re-design
Phase
Airport Arrival and Departures operations (APTA)
Navigation (NAVS)
Runway Sequencing (RSEQ)
Ground Based Safety Nets (SNET)
Noise and Emissions
System Wide Information Management (SWIM)
GNSS approach procedures
Point Merge arrivals
PBN Arrival and Departure routes using RNP where desired
Revised Airspace containment / buffer
PBN route connectivity to terminal airspace
GBAS CAT II/ III precision approach
GNSS Approach Procedures
PBN is the significant source of route navigation
GBAS solution in the UK
SBAS solution in the UK
ABAS solution in the UK
Common CNS infrastructure Components UK_SI 2025
Multi constellation – Dual Frequency
DMAN with pre-dep sequencing
DMAN integrated with Surface manager
AMAN/ DMAN integration
Airspace infringement
Enhanced STCA
Area proximity warning
Study, focussed on CAP 1378 scenarios to understand common aircraft performance and FMS characteristics through these scenarios. Include initial work on Vertical navigation and the use of NADP1 / NADP2 in procedures. Revise CAP 1381 to ensure the latest PBN design techniques are available for use to support the CAP 1378 scenario work
Airport Departure Planning Information
Shared flight plan / planned intention of flight
Shared EC data

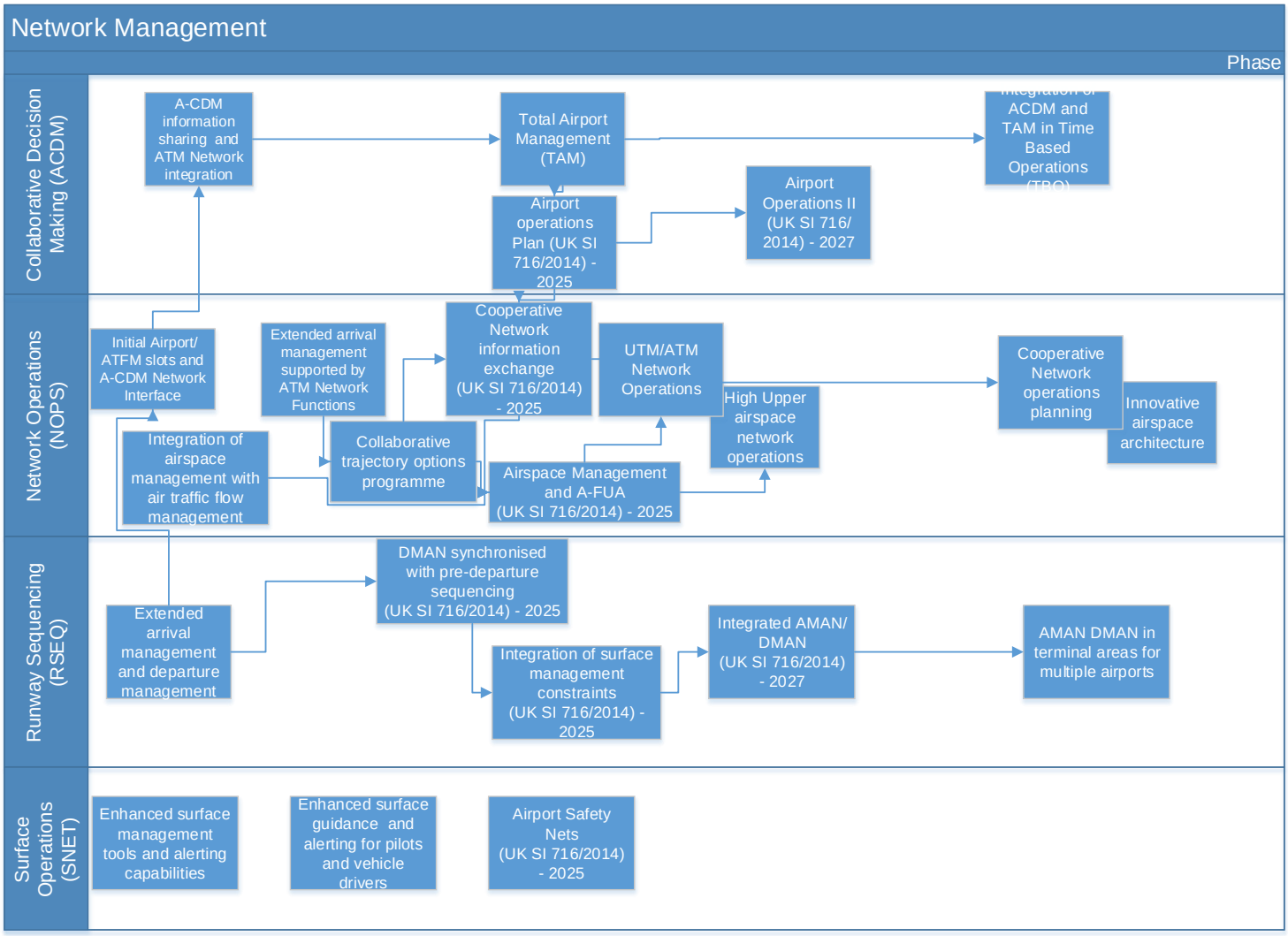
UK-ABN/3. Network management

Network Management looks to balance the capacity of the operational network with the demand from users through the sharing of accurate plan information. Importantly the airport operational decisions and planning information is a key component; this is enabled through:

- airport management of runway sequencing of traffic and positive links to the network route management through the sharing of the Airport Operational Plan (AOP)
- arrival and departure management techniques that can utilise the runway capacity efficiently while reducing the need for airborne holding of aircraft.

The summary below is extracted from the AMS Part 1. This is further developed in the swim-lane diagram overleaf summarising the sequence of significant capability deployments to the end of ICAO Block 3 (2033) along with relevant links and dependencies across the delivery elements.

Proposed 2022 AMS elements	Basis		Specific elements
	GANP ASBU	National	
3. Network management	✓		Queue management (arrival and departure management)


Network Management
Phase
Collaborative Decision Making (ACDM)
A-CDM information sharing and ATM Network integration
Total Airport Management (TAM)
ACDM and TAM in Time Based Operations
Airport operations Plan (UK SI 716/2014) - 2025
Airport Operations II (UK SI 716/ 2014) - 2027
Network Operations (NOPS)
Initial Airport/ ATFM slots and A-CDM Network Interface
Extended arrival management supported by ATM Network Functions
Cooperative Network information exchange (UK SI 716/2014) - 2025
UTM/ATM Network Operations
Cooperative Network operations planning
Innovative airspace architecture
High Upper airspace network operations
Integration of airspace management with air traffic flow management
Collaborative trajectory options programme
Airspace Management and A-FUA (UK SI 716/2014) - 2025
Runway Sequencing (RSEQ)
DMAN synchronised with pre-departure sequencing (UK SI 716/2014) - 2025
Extended arrival management and departure management
Integration of surface management constraints (UK SI 716/2014) - 2025
Integrated AMAN/ DMAN (UK SI 716/2014) - 2027
AMAN DMAN in terminal areas for multiple airports
Surface Operations (SNET)
Enhanced surface management tools and alerting capabilities
Enhanced surface guidance and alerting for pilots and vehicle drivers
Airport Safety Nets (UK SI 716/2014) - 2025

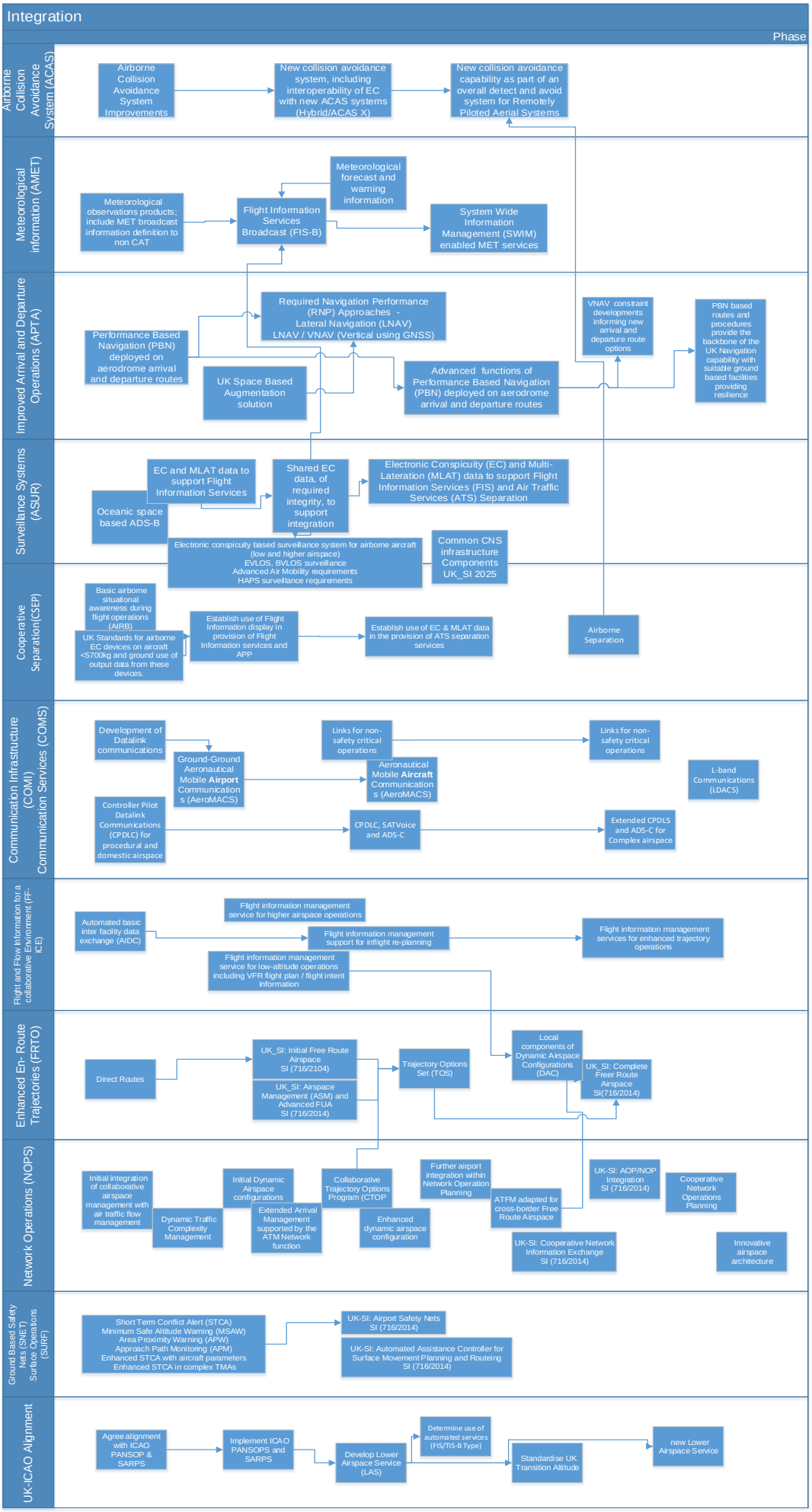
UK-ABN/4. Integration

The demand from existing and new types of aviation operations for access to UK airspace; demand for UK airspace is not purely about the numbers but also the complexity of the interactions created through different performance capabilities. This means we must be more innovative and flexible in our approach to the structures and procedures we put in place to ensure the safe integration of these different operations. This is enabled through:

- flexible access airspace structures that allow for low level integration of different users
- electronic conspicuity sharing accurate navigation position data between airborne devices and with ground systems
- sharing of digitised airspace availability information and broadcast of relevant operational information such as meteorological information
- delivery of a new ICAO-aligned lower airspace service to deliver services that enable more flexible and efficient operations for users such as General Aviation, Ministry of Defence, remotely piloted aircraft systems and advanced air mobility.
- procedures and processes to manage high-altitude airspace for integration of high-altitude platform systems and supersonic/hypersonic passenger operations.

The summary below is extracted from the AMS Part 1. This is further developed in the swim-lane diagram overleaf summarising the sequence of significant capability deployments to the end of ICAO Block 3 (2033) along with relevant links and dependencies across the delivery elements.

Proposed 2022 AMS elements	Basis		Specific elements
	GANP ASBU	National	
4. Integration	✓	✓	Lower airspace flexible access (airspace switched on when required)
	✓	✓	Access for drones (BVLOS – beyond visual line of sight), advanced air mobility, high-altitude platform systems (HAPS) and space
	✓		AFUA (Advanced Flexible Use Airspace)


Integration
Phase
Airborne Collision Avoidance System (ACAS)
Airborne Collision Avoidance System Improvements
New collision avoidance system, including interoperability of EC with new ACAS systems (Hybrid/ACAS X)
New collision avoidance capability as part of an overall detect and avoid system for Remotely Piloted Aerial Systems
Meteorological information (AMET)
Meteorological forecast and warning information
Meteorological observations products; include MET broadcast information definition to non CAT
Flight Information Services Broadcast (FIS-B)
System Wide Information Management (SWIM) enabled MET services
Improved Arrival and Departure Operations (APTA)
Required Navigation Performance (RNP) Approaches - Lateral Navigation (LNAV) LNAV / VNAV (Vertical using GNSS)
Performance Based Navigation (PBN) deployed on aerodrome arrival and departure routes
UK Space Based Augmentation solution
Advanced functions of Performance Based Navigation (PBN) deployed on aerodrome arrival and departure routes
VNAV constraint developments informing new arrival and departure route options
PBN based routes and procedures provide the backbone of the UK Navigation capability with suitable ground based facilities providing resilience
Surveillance Systems (ASUR)
EC and MLAT data to support Flight Information Services
Shared EC data, of required integrity, to support integration
Electronic Conspicuity (EC) and Multi-Lateration (MLAT) data to support Flight Information Services (FIS) and Air Traffic Services (ATS) Separation
Oceanic space based ADS-B
Electronic conspicuity based surveillance system for airborne aircraft (low and higher airspace) EVLOS, BVLOS surveillance Advanced Air Mobility requirements HAPS surveillance requirements
Common CNS infrastructure Components UK_SI 2025
Cooperative Separation(CSEP)
Basic airborne situational awareness during flight operations (AIRB)
UK Standards for airborne EC devices on aircraft <5700kg and ground use of output data from these devices.
Establish use of Flight Information display in provision of Flight Information services and APP
Establish use of EC & MLAT data in the provision of ATS separation services
Airborne Separation
Communication Infrastructure (COMI) Communication Services (COMS)
Development of Datalink communications
Ground-Ground Aeronautical Mobile Airport Communications (AeroMACS)
Links for non-safety critical operations
Aeronautical Mobile Aircraft Communications (AeroMACS)
Links for non-safety critical operations
L-band Communications (LDACS)
Controller Pilot Datalink Communications (CPDLC) for procedural and domestic airspace
CPDLC, SATVoice and ADS-C
Extended CPDLS and ADS-C for Complex airspace
Flight and Flow Information for a collaborative Environment (FF-ICE)
Automated basic inter facility data exchange (AIDC)
Flight information management service for higher airspace operations
Flight information management support for inflight re-planning
Flight information management services for enhanced trajectory operations
Flight information management service for low-altitude operations including VFR flight plan / flight intent information
Enhanced En- Route Trajectories (FRTO)
Direct Routes
UK_SI: Initial Free Route Airspace SI (716/2104)
UK_SI: Airspace Management (ASM) and Advanced FUA SI (716/2014)
Trajectory Options Set (TOS)
Local components of Dynamic Airspace Configurations (DAC)
UK_SI: Complete Freer Route Airspace SI(716/2014)
Network Operations (NOPS)
Initial integration of collaborative airspace management with air traffic flow management
Dynamic Traffic Complexity Management
Initial Dynamic Airspace configurations
Extended Arrival Management supported by the ATM Network function
Collaborative Trajectory Options Program (CTOP
Enhanced dynamic airspace configuration
Further airport integration within Network Operation Planning
ATFM adapted for cross-border Free Route Airspace
UK-SI: AOP/NOP Integration SI (716/2014)
Cooperative Network Operations Planning
UK-SI: Cooperative Network Information Exchange SI (716/2014)
Innovative airspace architecture
Ground Based Safety Nets (SNET) Surface Operations (SURF)
Short Term Conflict Alert (STCA) Minimum Safe Altitude Warning (MSAW) Area Proximity Warning (APW) Approach Path Monitoring (APM) Enhanced STCA with aircraft parameters Enhanced STCA in complex TMAs
UK-SI: Airport Safety Nets SI (716/2014)
UK-SI: Automated Assistance Controller for Surface Movement Planning and Routeing SI (716/2014)
UK-ICAO Alignment
Agree alignment with ICAO PANSOP & SARPS
Implement ICAO PANSOPS and SARPS
Develop Lower Airspace Service (LAS)
Determine use of automated services (FIS/TIS-B Type)
Standardise UK Transition Altitude
new Lower Airspace Service

Airspace Management (elements UK-AM/5 to UK-AM/9)

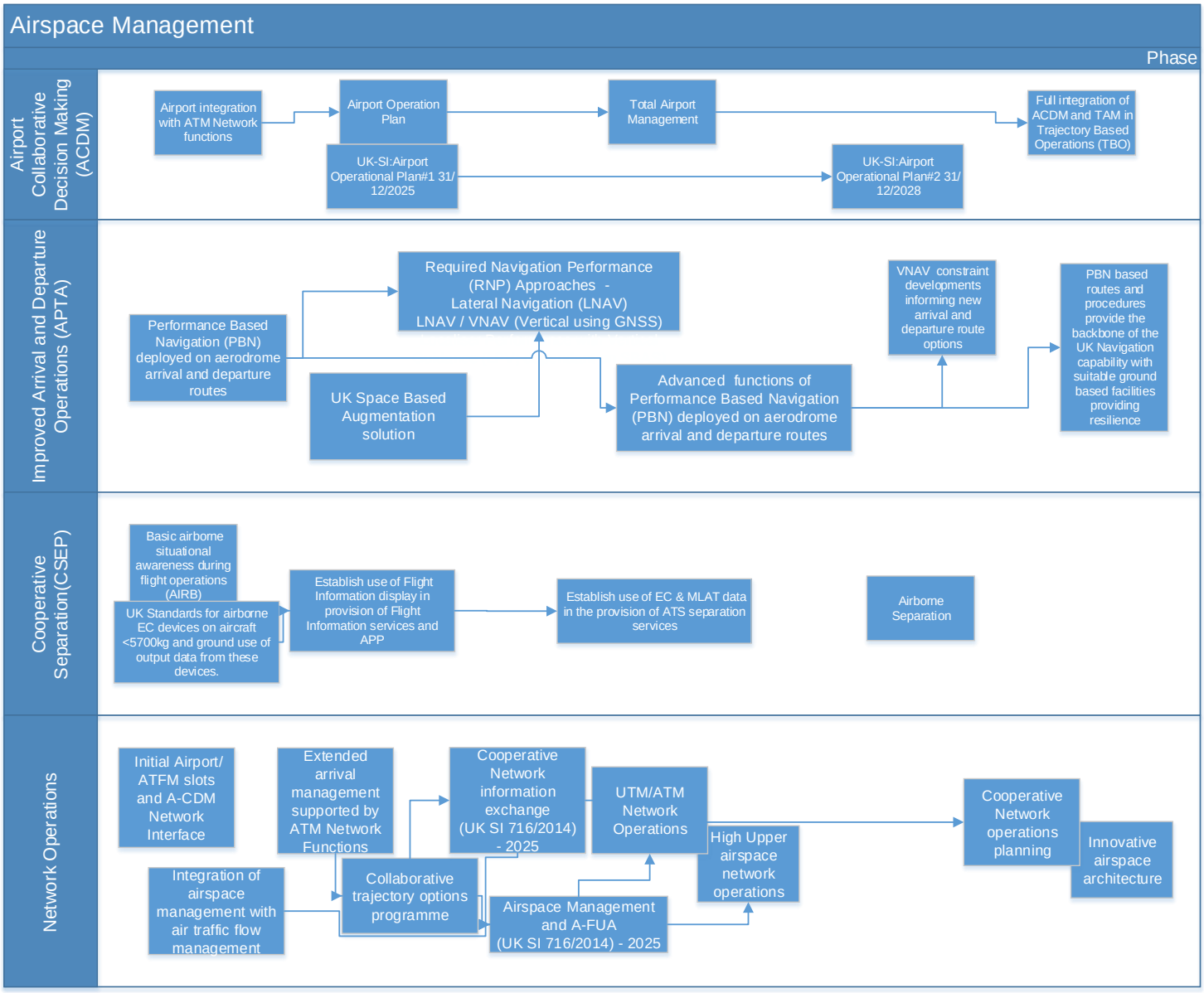
UK-AM/5. Airspace management

Airspace management brings together a combination of the above elements to enable a more efficient use of UK airspace that enables operation from high-altitude to low-level operations. This is enabled through:

- flexible access airspace structures that allow for low level integration of different users procedures and processes to manage high altitude airspace
- flexible use airspace management techniques that safely segregate operations where necessary such as military operations and training, and space launches
- electronic conspicuity sharing accurate navigation position data between airborne devices and with ground systems
- sharing of digitised airspace availability information and broadcast of relevant operational information such as meteorological information.

The summary below is extracted from the AMS Part 1. This is further developed in the swim-lane diagram overleaf summarising the sequence of significant capability deployments to the end of ICAO Block 3 (2033) along with relevant links and dependencies across the delivery elements.

Proposed 2022 AMS elements	Basis		Specific elements
	GANP ASBU	National	
5. Airspace management	✓		Air and space management – traffic management system for the UK combining ATM (Air Traffic Management), UTM (UAS Traffic Management) and developing procedures for space activity
	✓	✓	New Lower Airspace Service – replace LARS (Lower Airspace Radar Service) and London/Scottish Information Service with a bespoke, surveillance-based flight information service. Planned to be service delivery and enabler for flexible access to airspace – intermediate service until technology and equipment update allows autonomous flight
	✓	✓	Airspace Management Cell – lower airspace management through Lower Airspace Service aligned with existing Airspace Management Cell
		✓	Air traffic service use of electronic conspicuity information for service provision and airspace management


Airspace Management
Phase
Airport Collaborative Decision Making (ACDM)
Airport integration with ATM Network functions
Airport Operation Plan
UK-SI:Airport Operational Plan#1 31/ 12/2025
Total Airport Management
UK-SI:Airport Operational Plan#2 31/ 12/2028
Full integration of ACDM and TAM in Trajectory Based Operations (TBO)
Improved Arrival and Departure Operations (APTA)
Performance Based Navigation (PBN) deployed on aerodrome arrival and departure routes
Required Navigation Performance (RNP) Approaches - Lateral Navigation (LNAV) LNAV / VNAV (Vertical using GNSS)
UK Space Based Augmentation solution
Advanced functions of Performance Based Navigation (PBN) deployed on aerodrome arrival and departure routes
VNAV constraint developments informing new arrival and departure route options
PBN based routes and procedures provide the backbone of the UK Navigation capability with suitable ground based facilities providing resilience
Cooperative Separation(CSEP)
Basic airborne situational awareness during flight operations (AIRB)
UK Standards for airborne EC devices on aircraft <5700kg and ground use of output data from these devices.
Establish use of Flight Information display in provision of Flight Information services and APP
Establish use of EC & MLAT data in the provision of ATS separation services
Airborne Separation
Network Operations
Initial Airport/ ATFM slots and A-CDM Network Interface
Extended arrival management supported by ATM Network Functions
Cooperative Network information exchange (UK SI 716/2014) - 2025
UTM/ATM Network Operations
High Upper airspace network operations
Cooperative Network operations planning
Innovative airspace architecture
Integration of airspace management with air traffic flow management
Collaborative trajectory options programme
Airspace Management and A-FUA (UK SI 716/2014) - 2025

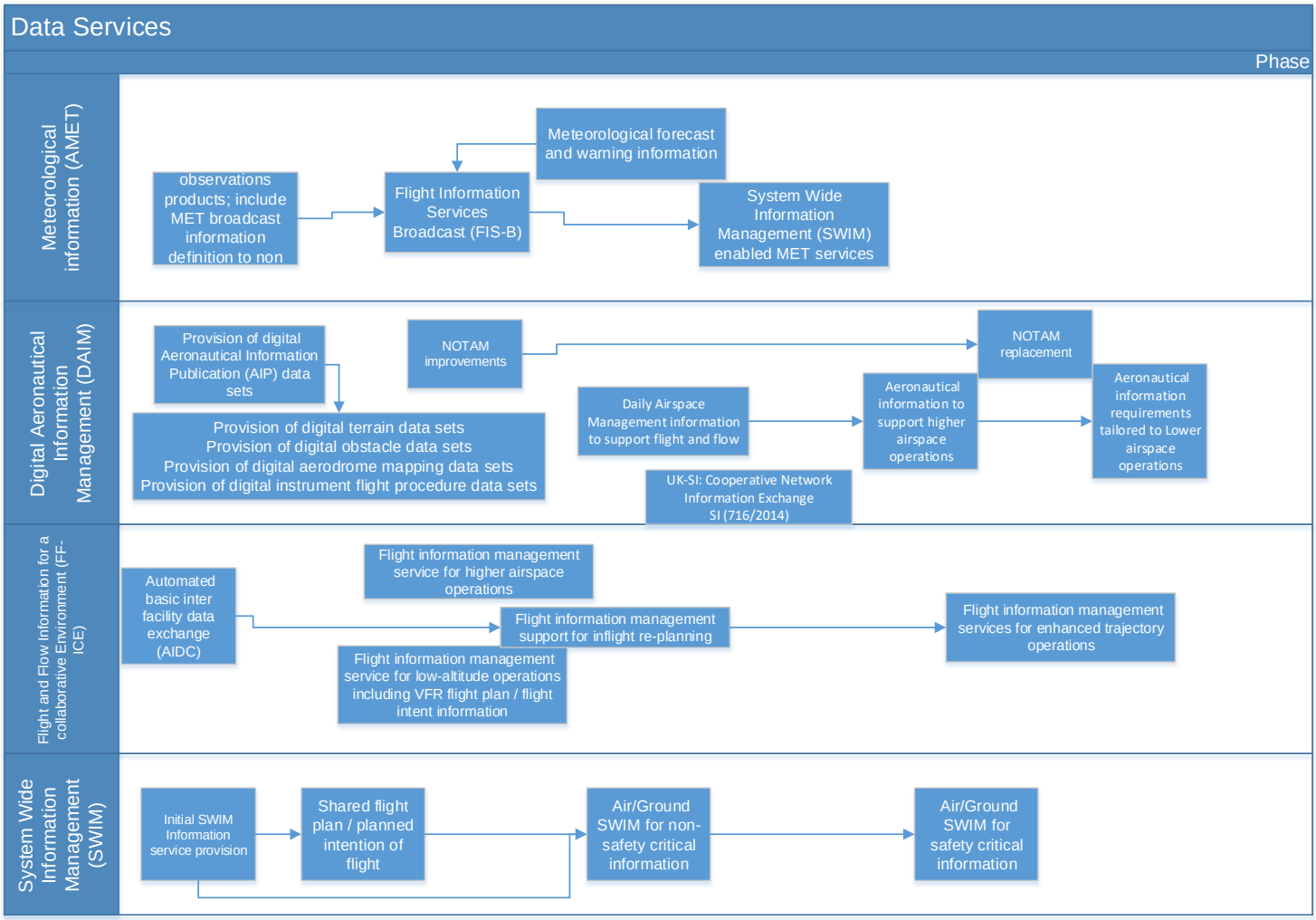
UK-AM/6. Data services

Accurate data delivered to the right operation at the right time is key to enabling much of the modernisation ambition. This is enabled through:

- digitised aeronautical data that can be consumed by users through various market developed tools and applications.
- meteorological products that allow inflight updates of information that help with re-planning
- timely and accurate broadcast and re-broadcast from the ground services
- a system that supports the exchange of aviation data in a secure way while allowing access across a wide range of operational resources.

The summary below is extracted from the AMS Part 1. This is further developed in the swim-lane diagram overleaf summarising the sequence of significant capability deployments to the end of ICAO Block 3 (2033) along with relevant links and dependencies across the delivery elements.

Proposed 2022 AMS elements	Basis		Specific elements
	GANP ASBU	National	
6. Data services	✓		SWIM (System-Wide Information Management) enabling 'the one truth' (AIM/MET/NOTAM etc) and Cyber considerations
	✓		Autonomous flight including remotely piloted aircraft systems


Data Services
Phase
Meteorological information (AMET)
observations products; include MET broadcast information definition to non
Meteorological forecast and warning information
Flight Information Services Broadcast (FIS-B)
System Wide Information Management (SWIM) enabled MET services
Digital Aeronautical Information Management (DAIM)
Provision of digital Aeronautical Information Publication (AIP) data sets
Provision of digital terrain data sets
Provision of digital obstacle data sets
Provision of digital aerodrome mapping data sets
Provision of digital instrument flight procedure data sets
NOTAM improvements
NOTAM replacement
Daily Airspace Management information to support flight and flow
Aeronautical information to support higher airspace operations
Aeronautical information requirements tailored to Lower airspace operations
UK-SI: Cooperative Network Information Exchange SI (716/2014)
Flight and Flow Information for a collaborative Environment (FF-ICE)
Automated basic inter facility data exchange (AIDC)
Flight information management service for higher airspace operations
Flight information management support for inflight re-planning
Flight information management service for low-altitude operations including VFR flight plan / flight intent information
Flight information management services for enhanced trajectory operations
System Wide Information Management (SWIM)
Initial SWIM Information service provision
Shared flight plan / planned intention of flight
Air/Ground SWIM for non-safety critical information
Air/Ground SWIM for safety critical information

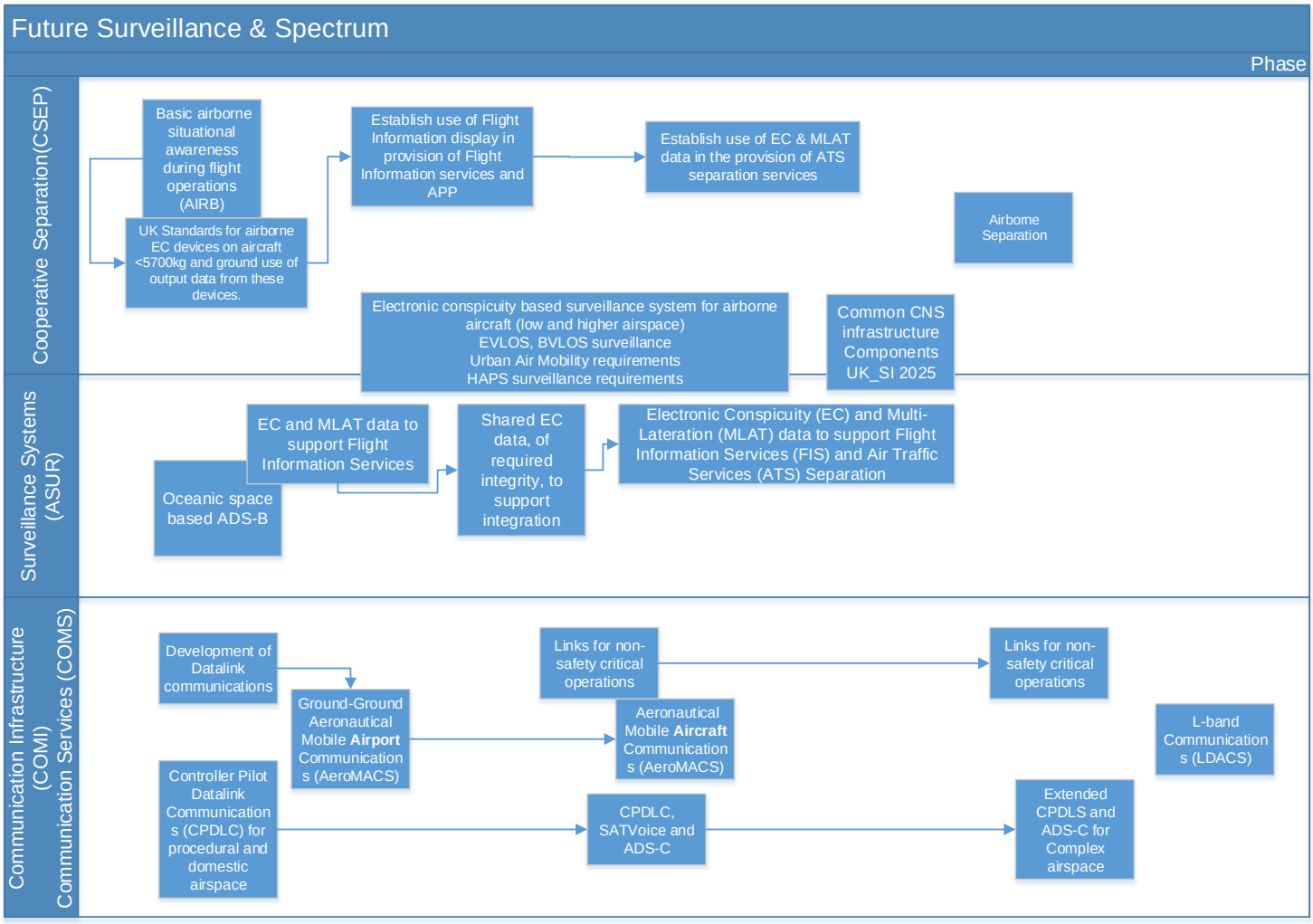
UK-AM/7. Future surveillance and spectrum

Future surveillance and spectrum focussed on enabling the replacement of traditional surveillance with more cost-effective and safe solutions that greatly reduce the need for extensive ground-based surveillance. Greater emphasis will need to be placed on the security of the spectrum to protect it from interference, but the newer solutions will require a smaller footprint overall. Options are:

- wider use of cooperative surveillance, including low-cost solutions to provide an accurate air picture
- better spectrum management and increased security to reduce interference in respect of cyber and GNSS (Global Navigation Satellite System) issues
- increased use of data link services to pass time-critical aeronautical information.

The summary below is extracted from the AMS Part 1. This is further developed in the swim-lane diagram overleaf summarising the sequence of significant capability deployments to the end of ICAO Block 3 (2033) along with relevant links and dependencies across the delivery elements.

Proposed 2022 AMS elements	Basis		Specific elements
	GANP ASBU	National	
7. Future surveillance and spectrum	✓	✓	Cooperative surveillance including low-cost solutions
	✓	✓	Spectrum management and spectrum interference, security needs – cyber, GNSS (Global Navigation Satellite System) issues
	✓	✓	Datalink applications
	✓	✓	Long-term future surveillance (ground- and space-based)


Future Surveillance & Spectrum
Phase
Cooperative Separation(CSEP)
Basic airborne situational awareness during flight operations (AIRB)
UK Standards for airborne EC devices on aircraft <5700kg and ground use of output data from these devices.
Establish use of Flight Information display in provision of Flight Information services and APP
Establish use of EC & MLAT data in the provision of ATS separation services
Airborne Separation
Electronic conspicuity based surveillance system for airborne aircraft (low and higher airspace)
EVLOS, BVLOS surveillance
Urban Air Mobility requirements
HAPS surveillance requirements
Common CNS infrastructure Components UK_SI 2025
Surveillance Systems (ASUR)
EC and MLAT data to support Flight Information Services
Oceanic space based ADS-B
Shared EC data, of required integrity, to support integration
Electronic Conspicuity (EC) and Multi-Lateration (MLAT) data to support Flight Information Services (FIS) and Air Traffic Services (ATS) Separation
Communication Infrastructure (COMI) Communication Services (COMS)
Development of Datalink communications
Ground-Ground Aeronautical Mobile Airport Communications (AeroMACS)
Controller Pilot Datalink Communications (CPDLC) for procedural and domestic airspace
Links for non-safety critical operations
Aeronautical Mobile Aircraft Communications (AeroMACS)
CPDLC, SATVoice and ADS-C
Links for non-safety critical operations
L-band Communications (LDACS)
Extended CPDLS and ADS-C for Complex airspace

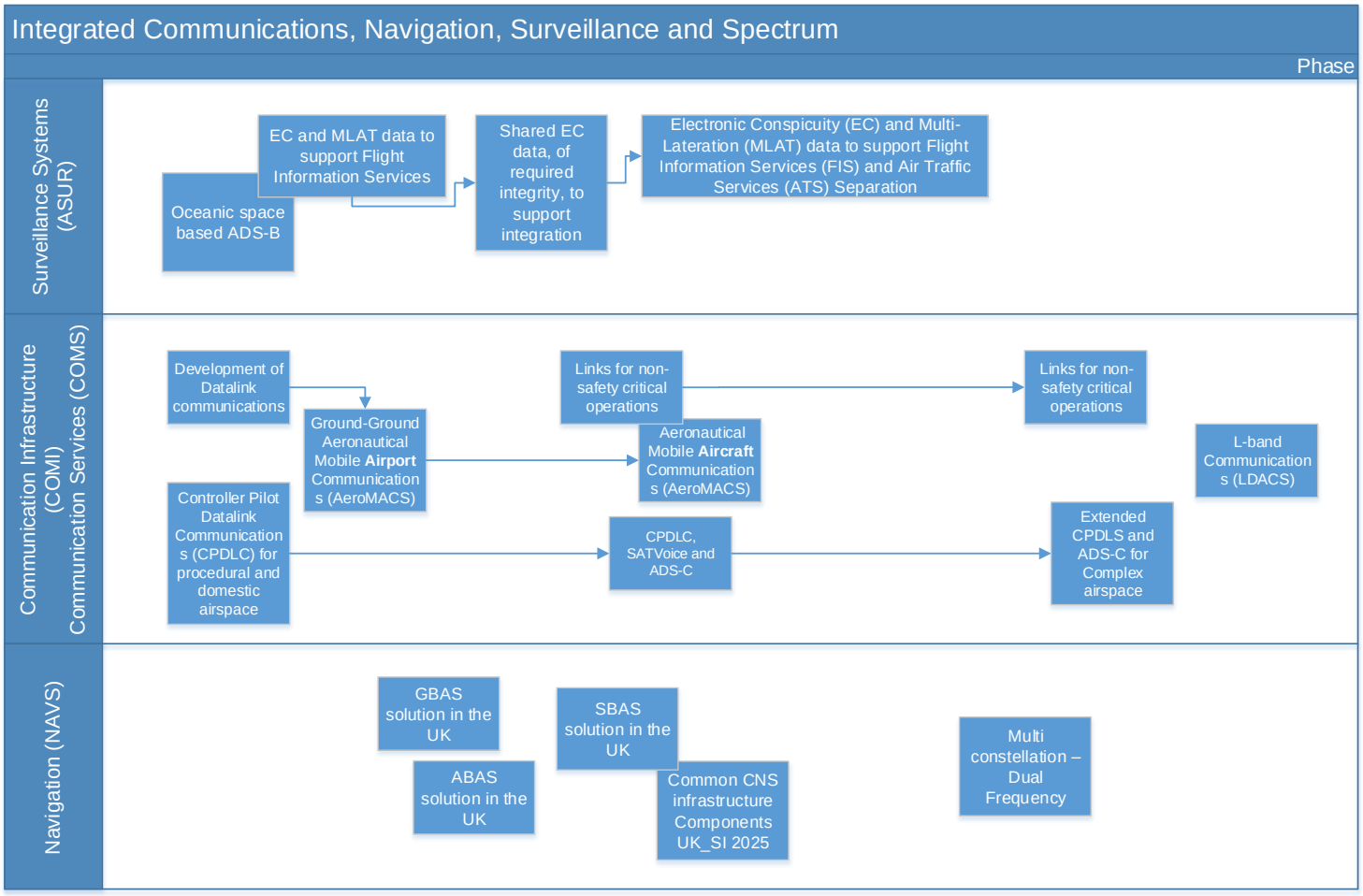
UK-AM/8. Integration of communications, navigation, surveillance & spectrum

Integration of communications, navigation, surveillance (CNS) and spectrum to introduce new and integrated CNS technologies while utilising the available spectrum both securely and efficiently. These changes will be enabled through:

- modernisation of the CNS infrastructure to allow greater use of space-based technologies
- alternate technologies provided through core ground-based systems
- introduction of a UK space-based augmentation system.

The summary below is extracted from the AMS Part 1. This is further developed in the swim-lane diagram overleaf summarising the sequence of significant capability deployments to the end of ICAO Block 3 (2033) along with relevant links and dependencies across the delivery elements.

Proposed 2022 AMS elements	Basis		Specific elements
	GANP ASBU	National	
8. Integration of communications, navigation, surveillance & spectrum	✓	✓	Modernisation of Communications, Navigation and Surveillance infrastructure to support the migration to a space-based technology and provide contingency through multi-frequency multi-constellation capabilities as well as a core ground-based infrastructure to provide resilience across CNS
		✓	UK Space-Based Augmentation System initiative


Integrated Communications, Navigation, Surveillance and Spectrum
Phase
Surveillance Systems (ASUR)
EC and MLAT data to support Flight Information Services
Oceanic space based ADS-B
Shared EC data, of required integrity, to support integration
Electronic Conspicuity (EC) and Multi-Lateration (MLAT) data to support Flight Information Services (FIS) and Air Traffic Services (ATS) Separation
Communication Infrastructure (COMI) Communication Services (COMS)
Development of Datalink communications
Ground-Ground Aeronautical Mobile Airport Communications (AeroMACS)
Controller Pilot Datalink Communications (CPDLC) for procedural and domestic airspace
Links for non-safety critical operations
Aeronautical Mobile Aircraft Communications (AeroMACS)
CPDLC, SATVoice and ADS-C
Links for non-safety critical operations
L-band Communications (LDACS)
Extended CPDLS and ADS-C for Complex airspace
Navigation (NAVS)
GBAS solution in the UK
ABAS solution in the UK
SBAS solution in the UK
Common CNS infrastructure Components UK_SI 2025
Multi constellation – Dual Frequency

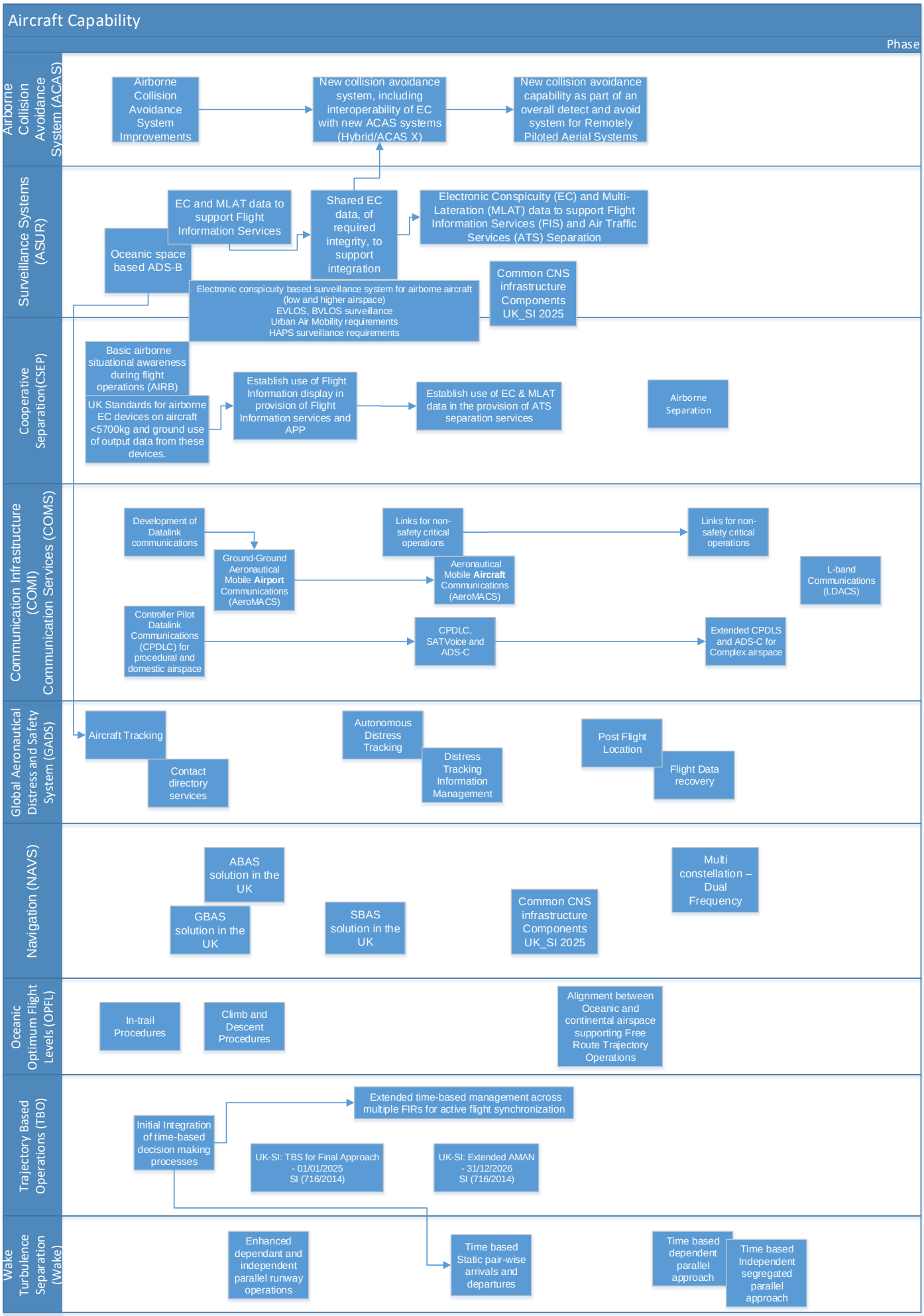
UK-AM/9. Aircraft capabilities

Aircraft capabilities implement the necessary changes to aircraft capabilities that are not necessarily captured through other changes. Capabilities such as:

- carriage of electronic conspicuity on aircraft <5700kg
- updates to the Airborne Collision Avoidance System to include electronic conspicuity data
- and equipment necessary to receive autonomous aeronautical information through datalink connectivity.

The summary below is extracted from the AMS Part 1. This is further developed in the swim-lane diagram overleaf summarising the sequence of significant capability deployments to the end of ICAO Block 3 (2033) along with relevant links and dependencies across the delivery elements.

Proposed 2022 AMS elements	Basis		Specific elements
	GANP ASBU	National	
9. Aircraft capabilities		✓	Electronic conspicuity on aircraft <5700kg (including drones, advanced air mobility and high-altitude platform systems)
	✓	✓	Airborne collision avoidance system updates to integrate electronic conspicuity data
	✓	✓	MFMC (Multi-Frequency Multi-Constellation) capabilities
	✓	✓	Datalink equipage
	✓	✓	Performance-based navigation capabilities


Aircraft Capability
Phase
Airborne Collision Avoidance System (ACAS)
Airborne Collision Avoidance System Improvements
New collision avoidance system, including interoperability of EC with new ACAS systems (Hybrid/ACAS X)
New collision avoidance capability as part of an overall detect and avoid system for Remotely Piloted Aerial Systems
Surveillance Systems (ASUR)
EC and MLAT data to support Flight Information Services
Shared EC data, of required integrity, to support integration
Electronic Conspicuity (EC) and Multi-Lateration (MLAT) data to support Flight Information Services (FIS) and Air Traffic Services (ATS) Separation
Oceanic space based ADS-B
Common CNS infrastructure Components UK_SI 2025
Electronic conspicuity based surveillance system for airborne aircraft (low and higher airspace)
EVLOS, BVLOS surveillance
Urban Air Mobility requirements
HAPS surveillance requirements
Cooperative Separation(CSEP)
Basic airborne situational awareness during flight operations (AIRB)
UK Standards for airborne EC devices on aircraft <5700kg and ground use of output data from these devices.
Establish use of Flight Information display in provision of Flight Information services and APP
Establish use of EC & MLAT data in the provision of ATS separation services
Airborne Separation
Communication Infrastructure (COMI) Communication Services (COMS)
Development of Datalink communications
Ground-Ground Aeronautical Mobile Airport Communications (AeroMACS)
Links for non-safety critical operations
Aeronautical Mobile Aircraft Communications (AeroMACS)
Links for non-safety critical operations
L-band Communications (LDACS)
Controller Pilot Datalink Communications (CPDLC) for procedural and domestic airspace
CPDLC, SATVoice and ADS-C
Extended CPDLS and ADS-C for Complex airspace
Global Aeronautical Distress and Safety System (GADS)
Aircraft Tracking
Contact directory services
Autonomous Distress Tracking
Distress Tracking Information Management
Post Flight Location
Flight Data recovery
Navigation (NAVS)
ABAS solution in the UK
GBAS solution in the UK
SBAS solution in the UK
Common CNS infrastructure Components UK_SI 2025
Multi constellation – Dual Frequency
Oceanic Optimum Flight Levels (OPFL)
In-trail Procedures
Climb and Descent Procedures
Alignment between Oceanic and continental airspace supporting Free Route Trajectory Operations
Trajectory Based Operations (TBO)
Extended time-based management across multiple FIRs for active flight synchronization
Initial Integration of time-based decision making processes
UK-SI: TBS for Final Approach - 01/01/2025 SI (716/2014)
UK-SI: Extended AMAN - 31/12/2026 SI (716/2014)
Wake Turbulence Separation (Wake)
Enhanced dependant and independent parallel runway operations
Time based Static pair-wise arrivals and departures
Time based dependent parallel approach
Time based Independent segregated parallel approach