UK Civil Aviation Authority

Airspace Modernisation – 2022 Progress Report

CAP 2494

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Executive Summary

1. In 2017, the Government updated the Civil Aviation Authority's (CAA's) strategic role for airspace modernisation by issuing new Air Navigation Directions. Consistent with our role as specialist aviation regulator and our statutory responsibilities, we are required to prepare and maintain a co-ordinated strategy and plan for the use of UK airspace for air navigation, including for the modernisation of the use of such airspace. Our Airspace Modernisation Strategy (CAP 1711)[1] responds to that requirement, setting out the detailed initiatives that industry must deliver to achieve the objectives envisaged in current Government policy.

2. The strategy sets out the ends, ways and means of modernising airspace, initially focusing on the period until the end of 2024.[2] The ends are derived from UK Government and relevant international policy and the ways of achieving them are set through fifteen initiatives that include new airspace design, new operational concepts and new technologies. To establish the means of delivering modernised airspace, such as the resources needed, the strategy requires the entities responsible for delivering the initiatives to draw up delivery plans, with progress overseen by the CAA.

3. The CAA must report to the Secretary of State annually on the delivery of the strategy. The update provided within the following chapters of this report comprises of detail on the progress made by the industry, as well as on the work the CAA have conducted in 2022.

4. The structure of this report relates to the 2018 version of the AMS and its initiatives' content. Subsequent progress reports will be readjusted to align with the structure of the elements within the refreshed version of the AMS, published in January 2023.

5. In Chapter 1 we provide an overview of the current initiatives and our assessment of progress towards completion of each one. This has been done in the form of a 'RAG' status and compared against progress made in 2021.

6. 6 out of 15 initiatives have been marked as requiring attention, a change from 3 in the previous year. That is primarily driven by complexity and risks in delivery of

[1] Following the publication of the refreshed Airspace Modernisation Strategy in January 2023, the 2018 strategy will be available on request by email to airspace.modernisation@caa.co.uk.

[2] 2024 corresponds to the end of the next Single European Sky Performance Scheme reference period (RP3). We expect to publish our refreshed Airspace Modernisation Strategy shortly, extending its outlook to 2040.

the Masterplan Programme under initiatives 4 and 5. Dependency of initiatives related to Performance Based Navigation (7, 8 and 14), with the Masterplan Programme and ongoing work regarding further legislation may impact delivery timescales against the baseline outlined within the 2018 Airspace Modernisation Strategy. It is expected timescales and delivery plans will be re-assessed and re-baselined, as a result of publication of the refreshed Airspace Modernisation Strategy, planned for early next year.

7. Key areas of progress have been noted under the Free Route Airspace (initiative 2), which remains on track for deployment in Q1 2023 across southwest England and Wales.

8. Implementation of NATS/MoD Joint Future Air Traffic Management Development Team sponsored airspace change proposals, including modernisation, enhancement and simplification of airspace management procedures across several Special Use Airspace took place under initiative 3 – Advanced Flexible Use of Airspace.

9. Under the FASI Programme (initiatives 4 and 5), a critical milestone was achieved through the formal acceptance by the CAA of the Iteration 2 of the Masterplan, prepared by the Airspace Change Organising Group (ACOG), which allowed for a focused delivery direction for the programme. A key enabler to this work was continued financial support from the Government, allowing investment of £9.2m towards Stage 2 activities undertaken by airport sponsors, under the CAP 1616 airspace change process.

10. Significant progress has been made under initiative 10 – Airspace Classification Review, with the publication of the findings to the review of the Cotswold Region. Daventry CTA 6 has been taken forward to the Amend phase of the CAP 1991 Process, whilst the review has also enabled further positive changes to UK airspace beyond a change to airspace classification.

11. Under the Deployment of Electronic Surveillance Solution initiative 11, the CAA and DfT established the Surveillance Standards Task Force to work with industry on developing surveillance specifications, including a national, voluntary specification for electronic conspicuity. This work, conducted in three phases, resulted in the production of three reports, which will form the basis of future work to deliver a new electronic conspicuity specification in the UK, aligned to the aims of the refreshed Airspace Modernisation Strategy.

12. Work under initiative 15 (Air Traffic Management) originally envisaged for 2022 has not been achieved, with iTEC and the deployment of tools in lower airspace being postponed. However, the AIM Digital datasets project, has started to deliver ICAO Digital Datasets, enabling development of products and services through access to aeronautical information in standard industry format. Initial

deployment is expected by the end of 2023 with the remaining scope delivered in 2024.

13. In Chapter 2 we provide an update from the co-sponsors on the policy and regulatory process, with a particular emphasis on stakeholder engagement activity undertaken as part of the Airspace Modernisation Strategy Refresh and progress made under the Airspace Modernisation Strategy Support Fund. Strategic risks have also been flagged within this chapter, predominantly concerning the future delivery model, financing, and resourcing of the modernisation programme.

14. The key achievement noted in this section is CAA's consultation on a draft, refreshed Airspace Modernisation Strategy, which extends the strategy out to 2040, placing integration of all airspace users within the core of the strategy. That includes accommodating new aerial vehicles like drones, advanced air mobility and spacecraft. Another key aim provides for simpler airspace design and supporting regulations, while introducing sustainability as an overarching principle, to be applied through all modernisation activities. Within its focus, the refreshed Airspace Modernisation Strategy includes better noise management, while helping to achieve government commitments to net zero emissions. It also aligns its delivery objectives with the ICAO Global Air Navigation Plan and provides a clear strategic path for rulemaking[3] activities now that the UK has left the European Union and the European Aviation Safety Agency.

15. We have now published the consultation response document and will publish the refreshed Airspace Modernisation Strategy in January 2023.

16. Chapter 3 provides updates related to areas of particular interest to communities, general aviation and innovation stakeholders.

[3] CAA: Introduction to UK aviation safety policy and rule development

Chapter 1

Delivery plans and progress in 2022

1.1 This chapter is an overview of the 2018 Airspace Modernisation Strategy (CAP 1711)[4] initiatives and delivery plans.

1.2 The tables under each initiative assess the level of progress made, indicated by a **green**, **amber** or **red status** and compared with progress indication made in the previous year:

- green status indicates that the initiative is on track to be completed in the timescales expected.
- amber status indicates that the initiative needs attention from key stakeholders to ensure completion in the timescales expected, or that there may be merit in reviewing deadlines.
- red status indicates there are major issues with the initiative and a significant risk that completion will not be achieved in the timescales expected.

1.3 A Trend Indicator has been provided with progress status as follows:

Progress is getting **worse**; severity is trending up

Progress is getting **better**; severity is trending down

Progress is **steady**.

1.4 Key dependencies and risks to the realisation of modernisation benefits are also summarised under each initiative. The risks are assessed on a 1 (low) to 5 (high) scale against likelihood (L), and severity (S).

[4] Following the publication of the refreshed Airspace Modernisation Strategy in January 2023, the 2018 strategy will be available on request by email to airspace.modernisation@caa.co.uk.

Initiative 1 – Direct Route Airspace

Table 1.1 – Initiative 1 plan and progress status - December 2022

UPPER AIRSPACE

Description: deployment of additional waypoints to the existing route network.		**Implemented**
1.1 New waypoints	1.2 Established procedures	1.3 Airline flight planning system
Timescale: 2018	**Driver:** UK Statutory Instrument / Airspace Modernisation Strategy	
Stage: Implemented	**Mechanism:** NATS (En Route) plc Service and Investment Plan	

Progress Update

The implementation of Direct Route Airspace was mandated by Implementing Regulation EU 716/2014, as retained (and amended in UK domestic law), under the European Union (EU) (Withdrawal) Act 2018.

Direct Route Airspace was a steppingstone towards Free Route Airspace (see initiative 2).

This initiative is now considered as implemented and closed, because NATS (En Route) plc is focusing efforts and resource to further optimise airspace design under the Free Route Airspace concept, as described below under initiative 2.

Risks to benefit realisation:	**Score:**
n/a	n/a

Initiative 2 – Free Route Airspace

Table 1.2 – Initiative 2 plan and progress status - December 2022

Free Route Airspace 2	NERL's SIP

Description: removal of all fixed routes so aircraft can fly fully optimised routes.		**2021** ➡	**2022**
2.1 Remove fixed route network	2.2 New procedures	2.3 Airline flight planning system	
Timescale: 2025+		**Driver:** UK Regulation (EU) 716/2014/ Airspace Modernisation Strategy	
Stage: Delivery		**Mechanism:** NATS (En Route) plc Service and Investment Plan	

UPPER AIRSPACE

Scope

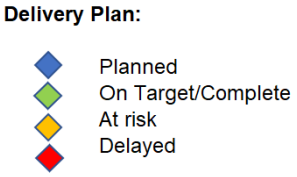
Free Route Airspace, as defined by EUROCONTROL, is a *'specified airspace within which users can freely plan a route between a defined entry point and a defined exit point, with the possibility of routeing via intermediate (published or unpublished) waypoints, without reference to the Air Traffic Services route network, subject of course to availability. Within such airspace, flights remain subject to air traffic control'*.

The implementation of Free Route Airspace is mandated by the UK Regulation (EU) 716/2014. NATS (En Route) plc is intending to cover these requirements and Borealis Alliance[5] ambitions for the UK, while managing the deployment in line with other simultaneous airspace modernisation projects.

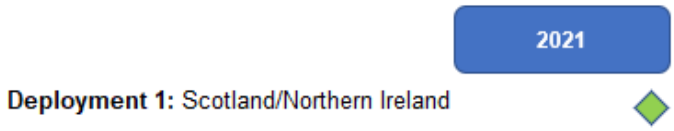
The programme was originally initiated in January 2015, to fulfil the key free route planning principles, where users could ultimately flight plan to preferred trajectories, irrespectively of the air traffic control responsibility boundaries across the Borealis-controlled airspace.

[5] The Borealis Alliance is a group of Air Navigation Service Providers collaborating on a major programme to deliver free route airspace across the whole of Northern European Union.

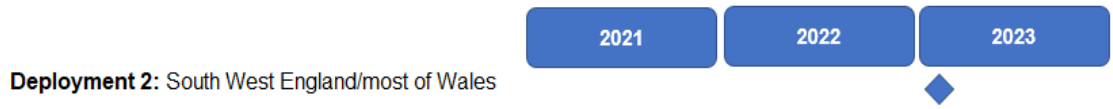
Key Milestones



Deployment 1 was delivered in December 2021 following CAA approval of the Airspace Change Proposal and Operational Conversion Training of controllers. An additional deployment of Free Route Airspace in delegated airspace in the southwest of the UK was included as an enabler to permit the deployment of Free Route Airspace across Brest Control West sectors.



Deployment 2 remains on track for delivery in Spring 2023 as part of the West Airspace Deployment having passed CAP 1616 Stage 6.



NERL is reviewing its capital expenditure plans for the period 2023 to 2027 (NR23[6]) in light of changes and delays to its DP En Route and Voice programmes. This may have consequential impacts on **Deployments 3 and 4**. NERL has been asked to set out its revised capital expenditure programmes, including impacts on costs, milestones and benefits in its response to the CAA consultation on Initial Proposals[7] for the NR23 price control period.

6 In light of changes to the regulatory framework brought about by the UK withdrawal from the European Union and the impact of COVID-19, we have curtailed the UK RP3 period to cover only 2020 to 2022 and are in the process of establishing a new UK performance plan for the period 2023 to 2027, known as "NR23".

7 In October the CAA published for consultation its Initial Proposals for new price controls for NATS (En Route) plc. All stakeholders had until 13 December 2022 to respond to the consultation. CAA expects to make a final decision on the NR23 performance plan in Q2 2023.

The timescale of this milestone is annotated as **'At Risk'** due to the consequence of planned delivery being beyond 2025.

Deployment 3: Northern England/North Wales

Deployment 4: South East England

Key Achievements

The Airspace Change Proposal for Deployment 1 was approved, the UK Aeronautical Information Publication changes were published, and operational staff training took place to support implementation in December 2021. A year of operations have occurred and have gone well. The CAA's Airspace Change Portal includes up to date information and documents for this change, which can be accessed here.

The Free Route Airspace D2.1 Airspace Change Proposal, for the deployment of Free Route Airspace in a small portion of the southwest approach in the London UIR, has been approved and was an important enabler for realising the benefit of delivery in the Brest West sectors. The Airspace Change Portal includes up to date information and documents for this change, which can be accessed here.

The Airspace Change Proposal Phase 2 (FRA D2: ACP-2019-12), which deploys Free Route Airspace across the Swanwick West Sector Group, is currently at Stage 6 (Implement) of the airspace change process. The Free Route Airspace D2 Airspace Change Proposal covering southwest England and Wales was approved for implementation and is on track for deployment in Q1 2023. The Airspace Change Portal includes up to date information and documents for this change, which can be accessed here.

There were continued effective operations throughout the summer of Free Route Operations across Scotland.

NATS (En Route) plc is looking for ways to deploy further Free Route Airspace given the re-planning of the technology transformation programme deployment into Prestwick and Swanwick centres.

NATS (En Route) plc has also engaged with Jeppesen and airlines to ensure flight planning systems can support the change.

Dependencies

Deployments 3 & 4 are dependent on the interoperability Through European Collaboration (iTEC) platform installation, which is part of initiative 15, with timescales yet to be confirmed.

There is a need for DP En Route technology platform to realise cross border free route operations across London and UK airspace.

Overall, Free Route Airspace deployment progress has been made in 2022 and the phased introduction of Free Route Airspace will lead to a further two deployments targeting November 2025 and November 2026 to complete the roll out across the UK.

Risks

Inability to complete the rollout of free route operations in the planned timescales due to late deployment of required technology. To mitigate this, NATS (En Route) plc will seek ways to expand Free Route Airspace operations and continue close liaison with the DP En Route technology Programme.

Benefits

The key benefit of Free Route Airspace delivery is an improvement of Upper Airspace efficiency. In line with requirements set out within the Airspace Modernisation Strategy and UK Regulation (EU) 716/2014, it will deliver airspace harmonisation at a European level, enabling operational and fuel consumption cost savings, while reducing CO2 emissions, in line with environmental objectives, set out within the Air Navigation Guidance 2017.

During the Stage 2 (Options Appraisal) of the CAP 1616 airspace change process, NATS (En Route) plc submitted information regarding anticipated deployment benefits (see links provided under the **'Key Achievements'** section above). NATS (En Route) plc estimates that D1 deployment could deliver up to 3,314 tons of fuel benefit per annum, equating to c 10,500T per annum of CO2 benefit.

D2 benefit analysis undertaken by NATS (En Route) plc as part of its Step 3B submission, estimates a range of potential fuel benefit between 152 and 481T of fuel per annum, equating to between 483 and 1153T of CO2 per annum, dependent on the scale of structural limitations implemented. As this deployment will be concurrent with the West Airspace Deployment and enhanced Systemised Airspace arrangements in the lower airspace, the actual value is likely to change this estimate, depending on the option chosen.

Both D1 and D2 fuel and CO2 figures are enabled benefits, and therefore realised benefits are contingent on airline flight planning behaviour.

While benefit scoping of D3 and D4 is yet to be undertaken by NATS (En Route) plc, a specific project, named '*Borders and Central',* has now been initiated and is currently in the 'Feasibility and Options' stage to determine the scope of the change.

Risks to benefit realisation That aircraft operators do not invest in the flight planning system upgrades required to use Free Route options effectively and maximise the benefits of implementation. Full deployment of Free Route Airspace is dependent on the delivery of DP-En Route technology, which has suffered a number of delays in deployment and therefore may not deliver in the required timescale to support Free Route Airspace.	**Score:** 12 (Likelihood:3) * (Severity:4)

Initiative 3 – Advanced Flexible Use of Airspace

Table 1.3 – Initiative 3 plan and progress status - December 2022

Advanced Flexible Use of Airspace	3	FUA State Programme

UPPER AIRSPACE

Description: to increase airspace configuration options supporting more efficient use.	**2021** ➡	**2022**
3.1 New airspace structures	3.2 New procedures	3.3 Airspace management tools
Timescale: 2022-24	**Driver:** UK Regulation (EU) 716/2014/ Airspace Modernisation Strategy	
Stage: Delivery	**Mechanism:** Flexible Use of Airspace State Programme Working Group	

Scope

Advanced Flexible Use of Airspace concept and a co-ordinated plan was developed through Flexible Use of Airspace State Programme, established in 2016. It is based on design principles, to accommodate both civil and military user requirements. The concept focuses on improved management of Special Use Airspace and flexible airspace structures for commercial and military use. The current scope of this initiative relates particularly to deployment of the Advanced Flexible Use of Airspace concepts in the upper airspace. The implementation of Advanced Flexible Use of Airspace is mandated by UK Regulation (EU) 716/2014. **General Aviation Users** interested in low level flexibility of using airspace volumes should refer to **Chapter 3** of this report.

The main activities that will deliver this initiative include:

- airspace changes and redesign of airspace structures to offer more flexible locations, in line with military requirements and civil traffic flows, extending Airspace Management tools, processes, and data sharing, through access and use of the Local and Regional Airspace Management tool,
- implementing a new performance framework, to provide statistics and trend analysis.

Key Milestones

The NATS (En Route) plc Airspace Management Enhancements project and Ministry of Defence (MoD) continue to deliver the Advanced Flexible Use of Airspace initiative. The

programme of works to support airspace management tools development has progressed throughout 2022. Joint civil and military and specific defence Airspace Change Proposals, including updates to Special Use Airspace, together with associated enhancements to airspace management processes have successfully delivered benefit to the UK network and enhanced access to airspace in conformance with UK ASM Policy.

Key milestones remain broadly aligned to the Flexible Use of Airspace State Programme Reference Period 3 Performance Improvement and Delivery Plan. This has been supplemented by the MoD/NATS Joint Future ATM Development Team Airspace plan, which captures the Military airspace changes and enhancements to airspace management over the control period.

The transition of key volumes of airspace into managed environments is complete, with full adoption of the Local and Regional Airspace Management (LARA) tool at Key Military Units now planned for Q2 2023.

Key Achievements

Key achievements and areas of progress are listed below:

- Implementation of NATS/MoD Joint Future Air Traffic Management Development Team sponsored airspace change proposals, including modernisation, enhancement and simplification of airspace management procedures across several Special Use Airspace.

Ministry of Defence

- Ongoing review of future military requirements to develop planned airspace changes in NR23 for increasing military demand.
- Launch of Fast Jet Areas Airspace Change Proposal to formalise existing Special Use Areas and management processes for combined joint military exercises within Free Route Airspace Deployment 1 area.
- Implementation of Future Combat Airspace Temporary Danger Area (TDA) Airspace Change Proposal. Refinement of 2021 trial procedures to introduce fully manageable Special Use Airspace for large scale military exercises until October 2023.

NATS (En Route) plc

- Updates to the UK ASM system (LARA) improving airspace management capability successfully delivered, further enhancements planned.
- Projects continues to progress network connectivity to EUROCONTROL Business-to-Business and access to LARA for MoD progressing with testing of software and

network connectivity with MoD; revised implementation (Q2 2023) due to cybersecurity requirements.

- Continued development of technical solutions for extended access to Local and Regional Airspace Management tool developed (revised implementation Q2 2023).
- Progression of Business-to-Business connectivity with the Network Manager (planned implementation Q2 2023).
- New ASM procedures implemented in support of AMS Airspace Change Proposals as well as new procedures and technical solutions for tactical ASM.
- Airspace Change Proposals are sponsored by the NATS/MoD Joint Future ATM Development Team within the North Wales Mil Training Area (NWMTA) and Salisbury Plain Training Areas. The transition from non-managed to Airspace Management Cell managed Airspace Change Proposal was in May 2022 for NWMTA and in November 2022 for Salisbury Plain Training Areas.
- Development of additional tactical airspace management capability, processes and integration between 78Sqn Military airspace managers and the UK Airspace Management Cell, through provision and use of LARA ASM Tool (planned implementation in November 2022).

Risks

- The AFUA concept cannot be realised without improved utilisation performance, which relies on true interoperability, integration and commonality of tools, support systems and processes between the civil and military users.
- To mitigate against safety risks and enhance Collaborative Decision Making, integration of airspace management data to provide a level of automation is required.
- MoD Airspace changes may not be approved however MoD will continue to work alongside the CAA through the CAP 1616 process.
- Due to the complexity of the programme and dependencies, any larger Ministry of Defence Airspace Change Proposal will not be delivered until after Free Route Airspace implementation under initiative 2.
- Lack of resource and funding availability may hinder implementation of the programme in the planned timescales. Mitigation activity is dependent on the NR23 plan agreement, for which NATS (En Route) plc is in the process of undertaking consultation engagement activity.
- Increasing requirements may constrain airspace and technology solutions and their delivery however this can be mitigated by Working with NATS Engineering, MoD

and EUROCONTROL to ensure requirements are appropriate/understood and funding can be met.

Benefits

The key benefit brought about by the deployment of Advanced Flexible Use of Airspace is efficient airspace management. It will make planning and sharing of airspace between agencies more collaborative and predictable. Reservation of any volumes of airspace needed for a particular military exercise or mission will be more efficiently tailored, thereby delivering operational efficiencies to the MoD, while minimising as far as possible any disruptive impact on other airspace users.

With that, additional airspace capacity will reduce the risk factors associated with traffic congestion and peaks in controller workload. Increasing the number of route options available to airspace users will allow air traffic controllers to manage more flights through the same sectors and aircraft operators will have the flexibility to plan and re-plan flightpaths in response to poor weather, segregated areas, and airspace restrictions.

The programme will further support delivery of environmental benefits, with aircraft having the flexibility to flight plan and fly more direct routes at more efficient altitudes and speeds, than with limited fixed waypoints, reducing emissions per flight and saving fuel.

Finally, with the military having efficient and effective access to suitably sized and sited volumes of airspace to complete its missions, information on actual planned utilisation of reserved airspace will be shared in real time, enabling airspace to be handed between users with minimal unutilised time.

Risks to benefit realisation	**Score:** 9
That the implementation of new airspace structures restricts the access of civil and/or military traffic to key routes or volumes of airspace, generating inefficiencies and capacity constraints in certain areas of the UK; and that Advanced Flexible Use of Airspace will not deliver sufficient airspace to facilitate military activity.	(Likelihood:3) * (Severity:3)

Initiatives 4 & 5 – FAS Implementation South & North

Table 1.4 – Initiatives 4 & 5 plan and progress status - December 2022

FAS Implementation South & North	**4 and 5**	**ACOG**	
TERMINAL AIRSPACE	**Description:** redesign of the terminal network in Southern England (#4), Northern England and Scotland (#5).	**2021** ⬆ **2022**	
	4.1 Terminal airspace redesign	4.2 New procedures	4.3 Not Applicable
	Timescale: 2026+	**Driver:** CAA (Air Navigation) Directions / Airspace Modernisation Strategy / UK Regulation (EU) 716/2014/ Government Policy	
	Stage: Delivery	**Mechanism:** Airspace Change Organising Group	

Scope

Future Airspace Strategy Implementation (FASI) – South & North (known as FASI-S and FASI-N, respectively) are complex airspace design programmes that require coordination between the different sponsors of airspace changes.

The CAA and the DfT commissioned NATS (En Route) plc to lead the FASI-S and FASI-N programme by creating a coordinated implementation plan for strategically important airspace changes in the UK (the 'masterplan'). NATS (En Route) plc have established a separate and impartial unit, known as the Airspace Change Organising Group (ACOG), to carry out this task.

The sponsors involved in the FASI-S programme are NATS (En Route) plc (which manages upper airspace and its design) and the airports, which for FASI-S are: Biggin Hill, Bournemouth, Bristol, Cardiff, Exeter, Farnborough, Gatwick, Heathrow, London City, Luton, Manston, RAF Northolt, Southampton, Southend and Stansted.

The FASI-S airspace change programme is particularly complicated due to the number of changes necessary to achieve modernisation over the south of the UK.

The FASI-N redesign of the airspace involves participation from NATS (En Route) plc and seven airports: Aberdeen, East Midlands, Edinburgh, Glasgow, Manchester, Leeds-Bradford, and Liverpool.

Key Achievements

Progress under this initiative has been enabled by the financial support provided by the Government. Funding has been allocated to airspace change sponsors participating in the programme, who were able to fund their activities, in line with the requirements of the airspace change process (CAP 1616). More detail on the progress achieved through the FASI Grant is set out below.

Masterplan Iteration 2 Acceptance

The CAA completed their assessment of Iteration 2 of the Masterplan in Q1 2022 and concluded that ACOG had provided the content required to meet the Masterplan Commission, NATS (En Route) plc Licence Condition 10a and the Government's policy objectives. The CAA was also satisfied that NATS (En Route) plc (the licensee) through ACOG, has provided sufficient evidence against the relevant requirements of the Masterplan Acceptance Criteria. We published our acceptance decision as CAP 2312A.

The Masterplan Iteration 2 represents an important step towards the wholesale redesign of UK airspace in accordance with the initiatives of the Airspace Modernisation Strategy. Following its acceptance, Iteration 2 became part of the CAA's statutory framework for making airspace change decisions and enabled the first six masterplan Airspace Change Proposals to complete Stage 2 of CAP 1616 between Q1 and Q3 of 2022.

In Iteration 2, ACOG proposed organising the Masterplan Programme into four regional clusters:

- The West of the UK
- Scotland
- Northern England, and
- London and the Southeast.

In Q3 2022, ACOG demonstrated how the potential interdependencies between the regional clusters would be identified and managed appropriately. The co-sponsors accepted the 'cluster' approach in October 2022 (CAP 2312A Addendum).

Iteration 2 described how safety is paramount while making trade-off decisions to optimise the airspace system. ACOG have produced a Safety Assurance Strategy that has been regularly assessed by the CAA. The safety strategy describes the requirement for an integrated approach to safety assurance, to systematically reduce – and where possible remove – safety risk factors as part of airspace modernisation.

Masterplan Iteration 3 Scope, Structure and Engagement Plan

ACOG has defined and agreed the scope of the Masterplan Iteration 3 with the CAA. Iteration 3 will provide a description of the proposed airspace structure and route network envisaged by the masterplan Airspace Change Proposals when viewed as a collective, but without the detailed design information of all the routes that will be subject to public

consultation, as part of Stage 3 of CAP 1616. The cumulative impacts of the Airspace Change Proposals will be described in greater detail in Iteration 3, along with proposed trade-offs between different design choices. Masterplan Public Engagement Exercise (PEX) on Iteration 3 will provide stakeholders with an opportunity to feedback on the development of the Masterplan. This activity is planned for Q1 2023.

Optimising Airspace Design Decisions

Throughout the year, ACOG conducted programme management and technical coordination groups with the Airspace Change Proposal sponsors in each regional cluster. The programme management groups have tackled key areas of misalignment in the timelines of the interdependent Airspace Change Proposals, to reach agreements on indicative regional Deployment Plans.

The technical coordination groups have identified where airspace design conflicts may arise as the interdependent Airspace Change Proposals begin to shortlist design options.

ACOG has developed a framework for tracking the identification and management of each major design interdependency to ensure that assessment, trade-off and optimisation activities are transparent to stakeholders. With that, ACOG developed the first part of the Cumulative Analysis Framework (CAF). The CAF Part 1 provides guidance to Airspace Change Proposal sponsors on the appraisal of cumulative impacts that may be identified when the shortlisted options of their interdependent proposals are compared, following the completion of Stage 2 of CAP 1616. Part 2 of CAF was developed in Q3, to guide the development of cumulative impact assessments and trade-off analysis as the proposals move to Step 3A of the CAP 1616 process. The CAF Part 2 also provides guidance on the development of Full Options Appraisals to ensure a consistent and comparable approach is followed across the sponsors.

In addition, ACOG published its Environment Strategy on how to address the environmental challenges and opportunities created by airspace modernisation, including how it can contribute to early progress towards a Net Zero future.

ACOG is also working, in collaboration with EUROCONTROL, Manchester Airport and EasyJet, to compile baseline data on aircraft noise and emissions that can be used to model the expected outcomes of different airspace design choices. ACOG is leading the trial based at Manchester Airport to generate data on new routes using EasyJet simulators. The trial outputs will be used to test the predictive modelling tools for environmental analysis and provide an approach to quantifying the environmental improvements associated with future changes. An airline operator working group was also established by ACOG, to fully define the technology, procedures and concepts needed to achieve the optimised use of Performance-based Navigation capabilities as part of the Airspace Change Programme.

Stakeholder Engagement and Communications

Following acceptance of the Iteration 2, ACOG has continued engagement on the Masterplan with stakeholders through a variety of established forums. This includes presentations by ACOG at the Government Airspace Strategy Board[8].

In Q2, ACOG engaged with elected representatives to inform them about the Masterplan and next steps regarding public engagement. A new quarterly newsletter was launched at the same time, which is issued to stakeholders to help build awareness of the Airspace Change Programme and how it is progressing.

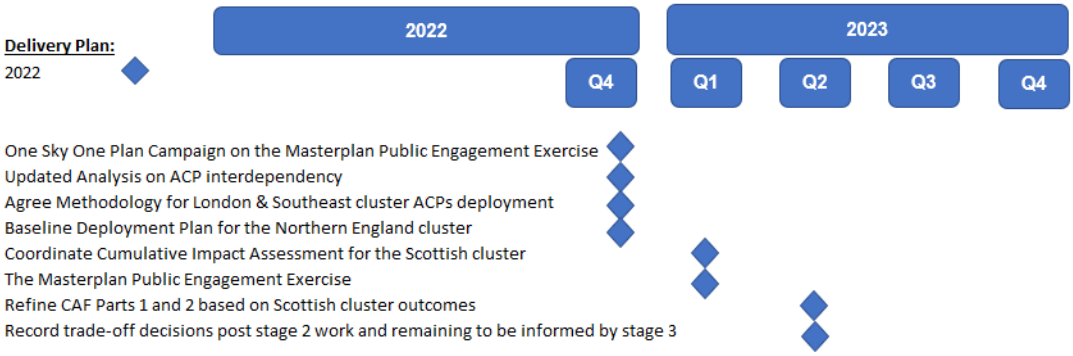
ACOG also produced a Masterplan '*easy-read*' summary and publicised the high-level content of Iteration 2 to stakeholders via digital and social channels.

In Q2, ACOG recruited a GA coordinator to support the Group's engagement regarding integration and impacts of the impacts of the Airspace Change Programme with other existing and future airspace users (for example, General Aviation, Unmanned Aerial Systems and Electric Vertical Take-off and Landing operators).

ACOG also set up a Community Advisory Panel to help shape public engagement on the Airspace Masterplan. The panel meets every two months to improve how the key information for communities included in the Masterplan is presented and to promote accessible and meaningful engagement. More information can be found on ACOG's Masterplan Resource Centre.

Next Steps

Future milestones of work coordinated by ACOG are detailed below:



Deployment schedules are currently being developed between ACOG and the Airspace Change Sponsors, with early indicative work suggesting delivery timescales between early 2024 and early 2029, for the various clusters of airspace change. Once the key

[8] Airspace Strategy Board is chaired by the Department for Transport Aviation Minister. It supports the Department for Transport and Civil Aviation Authority in their role as co-sponsors of airspace modernisation. The board brings together a wide range of interested aviation stakeholders to discuss national airspace policy and the strategic objectives of modernisation.

milestones are agreed upon and baselined, those will be included in future reporting iterations of this document will form part of the refreshed Airspace Modernisation Strategy Part 3 content.

Progress made by the FASI Airspace Change Sponsors

The FASI Airspace Change Sponsors have remobilised their efforts on airspace change with support from **The Future Airspace Strategy Implementation Programme Funding Support Package (FASI Grant)**. The DfT made funds available to support the progression of this programme, while the CAA is required to aid and advise in connection with the administration of the fund.

The grant is for the FASI Airspace sponsors to fund the activities required to progress their Airspace Change Proposals through Stage 2 of the airspace change process (CAP 1616). That work has also supported the development of Iteration 2 of the Masterplan by ACOG.

To date, £9.2m[9] has been made available for investment since the commencement of the fund in 2020/21 financial year, with 18 out of 22 UK airports in the FASI programme taking advantage of the funding.

As of December 2022, 86% of the total 22/23 budget has been invested with the status of the airspace change sponsors' progress against the various stages of assessment under CAP 1616 summarised in the table below.

[9] £9.2m is the sum of: FY 21/22 £5.5m; FY 22/23 £3.5m, plus £200k for the provision of advice in relation to the direction making powers under the ATMUA Act.

Table 1.5 FASI Airspace Change Sponsors – Summary of Progress as of December 2022

Key: Complete; Not Started; On Track; Needs Attention; Major Issue

	Stage 1	Stage 2a Develop & Assess	Stage 2b Options Appraisal	Stage 2 Develop & Assess Gateway	Stage 2 Gateway date	Progress Areas
Farnborough					Mar-23	**Stage 1:** Step 1b: Design Principles
Biggin Hill					Feb-23	**Stage 2:** Developing and accessing airspace design options
East Midlands					Mar-23	
Edinburgh					Feb-23	
Gatwick					Mar-23	
Bournemouth					Oct-22	
Leeds Bradford					Mar-23	
Southampton					Jan-23	
Heathrow					Aug-23	
Southend					Jan-23	
Manchester					Dec-22	
Exeter					Feb-23	
Aberdeen					Dec-22	**Stage 3:** Consultation Preparation
Glasgow					Aug-22	
Bristol					Jul-22	
Cardiff					Jul-22	
Stansted					Mar-22	
Luton					Mar-22	
London City					Jun-22	
Liverpool					TBC	**Liverpool will resume at Stage 2**

Edinburgh

Following the sponsor's decision to withdraw their Stage 2 submission from the September 2022 gateway, a new Stage 2 gateway has been set for 24 February 2023.

Biggin Hill

Biggin Hill are scheduled to submit their documentation for assessment at Stage 2 'Develop & Assess' gateway on 24 February 2023. Further gateway dates cannot be confirmed until iteration 3 of the airspace change masterplan is accepted by the CAA.

Bristol / Cardiff / Exeter

Feedback session between the CAA and Exeter was held in October where the CAA provided clarity on the outputs of the unsuccessful September Stage 2 gateway. New gateway date is yet to be confirmed.

Bristol and Cardiff successfully passed the Stage 2 gateway, and the CAA is waiting for indicative timelines for Stage 3 submissions. However, conversations between the three airspace change sponsors, ACOG and the co-sponsors are ongoing with regards to the next steps of delivery within the Western Cluster.

Liverpool / East Midlands

Following recent discussions the co-sponsors have accepted ACOG's advice received in October 2022 regarding Liverpool's reintegration into the Masterplan programme. Liverpool is now remobilising its teams, in order to unpause their ACP at an earlier stage (Stage 2 of the CAP1616 process) in order to allow necessary design collaboration with relevant sponsors to take place, as is envisaged by the Masterplan process. On this basis, the co-sponsors can now confirm that FASI grant funding has been made available in order for Liverpool to revisit and undertake relevant work in Stage 2 of the CAP1616 process.

Manchester

The CAA's assessment determined that Manchester did not meet the requirements of the process to progress through the Stage 2 'Develop & Assess' Gateway in December 2022. The CAA has informed the change sponsor of this decision. In accordance with CAP 1616, the Sponsor is now able to reconsider its submission before resubmitting it for further review by the CAA.

Farnborough

Following advice from ACOG, the Co-sponsors have accepted the request for the inclusion of Farnborough within the FASI Master Planning Process. The sponsor has started at Stage 1, Step 1B 'Design Principles'.

NATS (En Route) PLC

NATS (En Route) plc has worked with ACOG and the airport Airspace Change Proposal sponsors to agree a Deployment Plan for the Scottish cluster. Work has also been carried out within the London and Southeast cluster, to establish an initial Deployment Plan. That is to provide baseline planning assumptions for further testing and refinement by the programme participants and the co-sponsors.

A series of workshops have been held to continue the development of the deployment strategy and an initial implementation plan for LTMA.

London Airspace Modernisation Programme (LAMP) 2

Deployment 1.1 (ACP-2017-70) successfully completed stages 3 and 4 of the airspace change process and the CAA have approved the implementation of this airspace change proposal, subject to a number of approval conditions, following the assessment gateway held in October.

Deployment 1.2 (ACP-2021-050) is currently at Step 3A while the CAA awaits further contact from the change sponsor, in light of a received query from ACOG, as to the steps required to formally pause this deployment.

Deployment 2 (Gatwick & South - ACP-2020-043), **Deployment 3** (London City & Luton - ACP-2020-044) and **Deployment 4** (Central - ACP-2020-045) were aligned by NATS (En Route) plc with an agreement from the CAA in November for a single Stage 2 submission for all three deployments, with a single set of documentation and identical geographic areas. This is scheduled for May 2023.

FASI-N MTMA, Manchester and East Midlands (ACP-2019-77) and **FASI-N, MTMA - Liverpool** (ACP-2019-76) are both currently at Step 2A. The co-sponsors have accepted ACOG's advice on NATS' proposal to amalgamate both into a single airspace change proposal. Engagement between NATS and Liverpool is to be concluded prior to amalgamation being finalised. Timescales for this Airspace Change Proposal cannot be confirmed until Iteration 3 of the Masterplan, including the updated programme plan has been assessed and accepted by the co-sponsors.

Manston

Following a successful gateway, the Sponsor is now at Step 3A with the Airspace Change Proposal ACP-2018-75. Documentation is available here. The Sponsor has been instructed to work with the ACOG on its coordination requirements with other FASI Sponsors and any decisions will likely be reflected in the next iteration of the Masterplan.

RAF Northolt

The Airspace Change Proposal ACP-2018-66 is currently in progress and at Stage 2, with documentation available here. There was a dependency with Iteration 2 of the masterplan, so the Stage 2 Gateway was moved from June to November. A follow up meeting between CAA and MoD was held on 26 October. This meeting aimed to clarify and confirm the overarching aspects of regulatory oversight, roles and responsibilities and the approval process. The November gateway was passed, and the Stage 3 gateway date is yet to be confirmed.

Risks

Although the programme successfully remobilised in 2021 and continued to progress throughout 2022 with the support of the FASI Grant, a number of high priority risks continue to pose a significant threat and impact on the scope and timeframes of the Programme. These risks have been outlined below:

- **Slower than anticipated recovery from COVID-19** continues to affect the aviation industry. This may result in airport sponsors being unable to continue with their Airspace Change Proposals beyond FY22/23. Despite the remobilisation of the programme using the FASI Grant, the airport airspace change sponsors continue to operate under financial constraints which may limit their ability to invest in airspace developments in the near term. Airport sponsors that cannot access investment could fall behind and the timeline for delivery of the programme may become delayed. Due to the interdependencies between the Airspace Change Proposals', and the coordination required through the airspace change masterplan, this could lead to significant non-linear delays to benefits realisation.
- **Risks associated with the size and complexity of the changes** required in the London Terminal Control Area (TMA) and the availability of resource across all parties involved in the process. This risk may be compounded by delays to the clusters of work planned for earlier deployment, specifically any delays to delivery of change within the Manchester TMA.
- **Risk associated with uncertainty about future runway developments** and the scope and timeframes of plans to introduce additional runway infrastructure in the southeast of England. This risk may make it difficult for the airports and NATS (En Route) plc to determine the required scope of their Airspace Change Proposal and the nature of the dependencies between them. Heathrow Airport started a new Airspace Change Proposal in 2021 based on a two-runway configuration, however, this may change in the future in line with evolving business plans.
- **Risks associated with changes to the policy and regulatory framework** that underpins airspace change. Possible changes to existing airspace related policies and regulations have the potential to impact on progress in developing airspace changes and the policy objectives they should meet although on-going projects will be taken into account when any policy or regulatory updates are considered.

Risks to benefit realisation that the large number of co-dependent airspace changes required to modernise terminal airspace in the south of England are not co-ordinated effectively, leading to sub-optimal airspace designs, poor engagement with affected stakeholders, inefficient network	**Score:** 16 (Likelihood:4) * (Severity:4)

	integration and implementation delays. Inability of sponsors to undertake the work, due to financial and resource pressure, brought about by continued COVID-19 impact to sponsors' revenue.	

Initiative 6 – Queue management

Table 1.6 – Initiative 6 plan and progress status - December 2022

Queue management	6	NERL's SIP

TERMINAL AIRSPACE

Description: new capabilities to stream the flow of traffic.	**2021** ⬆	**2022**
6.1 Linear Holding Structure	6.2 New procedures	6.3 Queue management tools
Timescale: by 2024	**Driver:** UK Regulation (EU) 716/2014/ ICAO GANP	
Stage: Delivery	**Mechanism:** NATS (En Route) plc Service and Investment Plan	

Scope

Queue Management tools and procedures are relatively well developed and understood, with NATS (En Route) plc an active member of the Single European Sky Air Traffic Management Research Deployment Alliance. As part of the Service and Investment Plan re-planning, NATS (En Route) plc expect greater clarity on the scope, ambition, and timetable for further deployments of queue management, while focusing on a benefit-driven approach to consultation with their customers.

Under this initiative's, NATS (En Route) plc envisages deployment of the Arrival Manager at Manchester and Stansted, upgrading Heathrow's Time-Based Separation to Pairwise and deploying Optimised Mixed Mode Time Based Separation at Gatwick, subject to spending limits, airport funding and customer SIP approval.

The NATS (En Route) plc price control review (NR23) blended plan contains a proposal to upgrade Arrivals Manager with an Arrivals Streaming capability at suitably equipped airports (Heathrow, Gatwick and Stansted). NR23 also contains a proposal to deploy a suitable means of supporting overseas airports' extended arrivals management procedures. It also contains provision for making use of Manchester Airport's Arrivals Manager data as part of an extended arrivals management process, assuming that Manchester deploys an Arrivals Manager.

Time Based Separation Pairwise

Time Based Separation is already in place at Heathrow. This is planned to be enhanced to Static Pairwise separation, which is individually tailored to each aircraft type. The project has over €1 million of Single European Sky Air Traffic Management Research 2020 funding.

Time Based Separation Optimised Mixed Mode Gatwick

Optimised Mixed Mode Time Based Separation optimises the spacing between arriving aircraft, while allowing for interleaved departures. The Optimised Mixed Mode+ variant adjusts arrival spacing, while additionally taking account of the type of departing aircraft. This requires additional system and operations inter-operability. NR23 reflects the agreement with Gatwick, which is to deliver Optimised Mixed Mode Time Based Separation first, followed by Optimised Mixed Mode+ one year later.

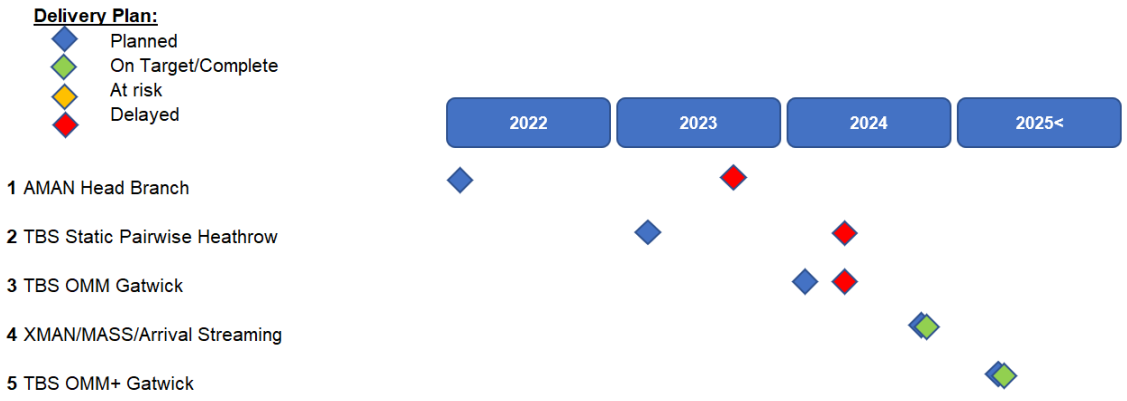
Extended Arrivals Manager, Multi-airport Arrivals Streaming Service & Arrivals Streaming

The concept is based on deployment of arrivals streaming capability, so that pilots can manage their flights, to meet a time-separated target time at the start of systemised airspace. The benefit anticipates increase of the numbers of aircraft that can fly a continuous descent from the en route phase to the Terminal Control Area and reducing stack-holding time. Initially, the work is funded primarily by the Single European Sky Air Traffic Management Research and, depending on suitable positive results, will then be deployed by NATS (En Route) plc as individual projects, as described in the NR23 plan.

Key Milestones

NATS (En Route) plc is currently engaging with the industry as part of the NR23 process, which includes the exact scope and planned timescales of deployment for these initiatives.

Below information is indicative and subject to change:



The Arrival Manager Head Branch upgrade is delayed for technical integration and resource availability reasons, with deployment now anticipated in the second half of 2023.

The Heathrow Time Based Separation Pairwise requirements have been finalised and passed on to the manufacturer in the early months of 2022. The project continues to make progress. However, delivery has shifted from the initially planned early 2023 to Q2 2024.

The Gatwick Advanced Mixed Mode TBS project is underway, also targeting deployment before Q2 2024.

Risks

The key risk highlighted by NATS (En Route) plc is the availability of resource, especially engineering, while major Single European Sky Air Traffic Management Research activity is underway in parallel to the planned queue management projects. However, the prioritisation of this initiative has been raised.

Benefits

Deployment of the queue management initiative is expected by NATS (En Route) plc to deliver environmental benefits, associated with cost efficiencies for airspace users. It will maintain and where possible, enhance safety performance and deliver workload efficiencies through a combination of Air Traffic Management System and Airspace Change. Below is a summary of the currently deployed queue management benefits, observed by NATS (En Route) PLC:

Gatwick Extended Arrivals Management

Extended arrivals management and reduced descent speed procedures save airlines 1200 tonnes of fuel annually by transferring 27,000 minutes of delay out of the Terminal Control Area.

Heathrow Demand Capacity Balancer

Using Demand Capacity Balancer (instead of normal air traffic control flow regulations), generated 26-41% less pre-departure delay during trials held between April and June 2019. Analytical modelling indicated that stack holding could be reduced by five minutes, as a result of asking long haul aircraft to slightly slow during the entire cruise phase.

Heathrow Extended Arrivals Management

Extended arrivals management and reduced descent speed procedures save airlines 8000 tonnes of fuel annually, by transferring 132,000 minutes of delay out of the Terminal Manoeuvring Area. Higher proportion of heavy, faster aircraft, with routine stack-holding provides a big opportunity to gain benefits of slowdown.

Heathrow Time-Based Separation using NATS (En Route) plc's and Leidos' *Intelligent Approach* the following benefits were noted by NATS (En Route) plc:

- 62% reduction in Arrival delays due headwinds & more stability in landing & flow rates

- 230,000 minutes annual reduction in Heathrow average airborne holding, saving 15,000 tonnes of fuel per annum
- Average landing rate increased by +2 /+4.2 landings/hour & improved consistency of air traffic control spacing
- Arrival spacing savings equivalent to over 30 minutes of extra landings per day
- No tactical flight cancellations due headwinds
- Overall savings (including holding & delay) > €30m p.a.

Expected benefits for the proposed future queue management solutions have been captured by NATS (En Route) plc and communicated as part of their Service and Investment Plan consultation. A summary has been provided by NATS (En Route) plc below:

Time Based Separation Pairwise

Solution will include safety case to reduce Minimum Radar Separation on final approach to realise benefits for all wake pairs. It will also optimise Runway Occupancy Time spacing indications. The benefit is expected to translate into an increased landing capacity, reduced delays and airborne holding and is expected to deliver >30kT CO2 per annum at 2019 traffic levels. Building on the Single European Sky Air Traffic Management Research work, the project will industrialise Pairwise Wake Vortex Separation into Heathrow Time Based Separation, providing increased landing capacity of 1-2 landings per hour, enabling significant fuel/CO2 savings and enhancing airport service resilience.

Time Based Separation Optimised Mixed Mode

The solution is expected to deliver increased landing capacity, reduction in delays and airborne holding. Environmental benefit will be dependent on the degree to which additional capacity is scheduled. Early studies and simulations showed potential for substantial benefits in landing capacity. Optimised Mixed Mode is expected to deliver circa 3 additional landings per hour, with Optimised Mixed Mode+ adding a further one landing per hour.

Extended Arrivals Manager, Multi-airport Arrivals Streaming Service & Arrivals Streaming

Benefits of these solutions are expected to deliver significant fuel/CO2 savings and reduce airborne holding, complexity, and controller workload. It will also enhance capacity and safety and contribute to the wider benefits of the systemised airspace concept.

Risks to benefit realisation	**Score:** 9
That the implementation of multiple arrivals and departures management systems focused on different airports are not integrated effectively at a network level, leading to pinch points & inefficiencies. Resource availability and project re-prioritisation as a result of finalised NR23 planning may mean some of the timescales of delivery and benefit realisation may be shifted.	(Likelihood:3) * (Severity:3)

Initiative 7 – Satellite navigation route replication

Table 1.7 – Initiative 7 plan and progress status - December 2022

Satellite navigation route replication	7	ACOG and airports

LOWER ALTITUDE

Description: replication of existing arrival and departure routes using Performance-based Navigation concepts	2021 ➡	2022
7.1 Route Upgrades	7.2 New procedures	7.3 Aircraft avionics upgrades
Timescale: by 2030	**Driver:** UK Regulation (EU) 716/2014/ UK Regulation (EU) 2018/1048 Airspace Modernisation Strategy	
Stage: Delivery	**Mechanism:** Airspace Change Organising Group / Airports	

Scope

Satellite Navigation Route Replication is based on the requirements defined within the International Civil Aviation Organisation (ICAO) Global Air Navigation Plan (GANP) thread on Improved Arrival and Departure Operations.

Performance Based Navigation is a concept[10], providing specifications for area navigation and Required Navigation Performance, which can be applied to an airspace volume, air traffic route or instrument procedure. UK Regulation (EU) 716/2014 mandates the deployment of Performance Based Navigation capability to London Heathrow, London Gatwick, London Stansted and Manchester airports.

UK Regulation (EU) 2018/1048 sets out airspace usage requirements and operating procedures concerning Performance Based Navigation that affects UK Aerodromes and providers of ATM/ANS, over and above the aerodromes within scope of UK Regulation (EU) 716/2014. However, it was only partially adopted, with no mandated ongoing deployment of PBN adopted beyond December 2020. That does not diminish the commitment to deploy Performance Based Navigation as a core element of airspace modernisation.

The Navigation Specification is one of the components of the Performance Based Navigation concept where integrity, continuity and accuracy of operational performance is defined in a particular airspace. Description for achievement of set performance is also included, such as requirements for specific navigation functionalities.

10 ICAO Pages - Performance Based Navigation

Pilot training and knowledge requirements are also set, along with required operational approvals, dependent on the type of specification. Required Navigation Performance specification requires on-board self-contained performance monitoring and alerting, whereas specification for area navigation does not.

The Navigation Specification will indicate requirements for space- or ground-based navigational aids (Navaid Infrastructure), the availability of which must be considered, to support the navigation application on air traffic services routes, in line with instrument flight procedures.

Key Achievements

NATS (En Route) plc delivered to ACOG a Performance Based Navigation Deployment Strategy, to help determine potential delivery within the scope of initiatives 4 and 5 (FASI). It is expected that deployment plans will be reflected in the next iteration of the Masterplan for the relevant airport sponsors under the FASI programme.

PBN deployment requirements for smaller airfields will be considered in line with the requirements of ICAO GANP Block 2 and will be reflected in the refreshed Airspace Modernisation Strategy due for publication in early 2023.

NATS (En Route) plc has met its commitment to remove all en route dependencies from the specified en route DVOR (Doppler VHF Omni Directional Range) navigation beacons by December 2022. Area Navigation (RNAV) Standard Arrival Routes (STARs) have been implemented at all airports with these procedures by NATS (En Route) plc. Airports continue to work towards the removal of procedures reliant on these en route facilities, including Standard Instrument Departures (SIDs), but many are unable to meet the deadline set. NATS (En Route) plc will therefore retain some DVORs beyond January to continue to support airport procedures

Cardiff and Bristol Airports have received CAA approval for the RNAV substitution of SIDs that are dependent on DVORs, in accordance with CAP 1926, meeting the deadline. London City removed all their conventional (non-RNAV) airport procedures in December 2022 and Birmingham also has no DVOR dependencies.

NATS (En Route) plc is initiating a similar programme of work to rationalise en route Distance Measuring Equipment (DME) provision with engagement and consultation planned throughout 2023.

Risks

The DfT and the CAA are working on a way forward with regards to Performance Based Navigation deployment. The Performance Based Navigation deployment requirements in the UK are based on retained EU law, but this is under review. The roll out of Performance Based Navigation is affected by scale of change, airport commitment, complexity of

consultation and change process, as well as a lack of industry expertise and the necessary resources.

Not all airports have been able to remove their dependencies by December 2022, however NATS (En route) plc continue to ensure safe operations at airports.

Dependencies

Most airports required to upgrade their arrival and departure routes to Performance Based Navigation will do so as part of the FASI-N and FASI-S programmes.

There is therefore a significant dependency with initiatives 4 and 5, including the successful co-ordination of the Airspace Change Proposals by ACOG. There is also a dependency on the quality of the Airspace Change Proposals submitted to the CAA's Airspace Regulation team as part of the CAP 1616 airspace change process. Initiative 7 is also interdependent with the Satellite Navigation Implementation Plan, delivered under initiative 14.

Benefits

Performance Based Navigation delivers operational benefits of improved safety, access, flight efficiency and capacity, through optimising aircraft routing. With that, it may translate into reduced CO2 emissions and fuel burn efficiencies. Applying the appropriate navigation performance specification can also avoid noise-sensitive areas, adding to environmental benefits of the concept.

Risks to benefit realisation	**Score:** 16
It is expected that route replication can be achieved successfully however, this will not deliver environmental benefits. The need for further legislation is under consideration with the DfT and industry, which will impact previously anticipated delivery timescales. Furthermore, dependency with initiatives 4 and 5 may delay full Performance Based Navigation implementation, the impact of which cannot be assessed at this stage without an accepted Iteration 3 of the Masterplan.	(Likelihood:4) * (Severity:4)

Initiative 8 – Satellite navigation route redesign

Table 1.8 – Initiative 8 plan and progress status - December 2022

Satellite navigation route redesign	**8**		**ACOG and airports**	
Description: deployment of new arrival and departure routes using Performance-based Navigation concepts.			**2021** ⬆	**2022**
8.1 Route Design	8.2 New procedures	8.3 Aircraft avionics upgrades		
Timescale: 2030		**Driver:** UK Regulation (EU) 716/2014/ UK Regulation (EU) 2018/1048 Airspace Modernisation Strategy		
Stage: Delivery		**Mechanism:** Airspace Change Organising Group / Airports		

Satellite Navigation Route Redesign relies on airports requiring new arrival and departure routes to be designed to Performance Based Navigation standards. Most will be doing so as part of the FASI-N and FASI-S programmes.

There is therefore a significant dependency with initiatives 4 and 5, including the successful co-ordination of Airspace Change Proposals by the ACOG and the quality of the Airspace Change Proposals submitted to the CAA's Airspace Regulation team as part of the CAP 1616 airspace change process. In some circumstances, new routes may be more difficult to achieve, and this will be monitored as Airspace Change Proposals progress.

The Global Navigation Satellite System (GNSS) Programme supports this initiative with further expansion of the UK's General Aviation sector. The GNSS Programme helps airfields to implement new approach procedures that use satellites. This technology can improve flight safety when landing in poorer weather, as well as creating new commercial opportunities for GA airfields. It also provides increased resilience for helicopter emergency services, where previous operations have been limited to visual flight conditions.

In September, the CAA and the DfT announced the start of the third phase of the programme, with eligible airfields able to register their interest in programme participation. To incentivise development of GNSS Instrument Flight Procedure, the DfT has increased its maximum funding from 50% to 75% for successful applicants within this tranche of support.

LOWER ALTITUDE

Applications have been received from 13 helicopter and 8 fixed wing sites. Assessments of applicants are being made with a decision to fund the top 10 eligible project sponsors in the new year.

Key Achievements

The redesign of new arrival and departure routes using satellite-based navigation standards will be delivered through the FASI programme. NATS (En Route) plc is working closely with airports to further the initial design activities and the development of options in support of consultation activities and in support of the Masterplan.

NATS (En Route) plc have made progress and removed all dependencies from specified ground based radio navigational aids (Very High Frequency Omni Range - VORs) that are planned to be withdrawn.

NATS (En Route) plc have to retain some DVORs beyond January 2023 to continue to support airport procedures but as part of this initiative NATS (En Route) plc has implemented Area Navigation (RNAV) Standard Arrival Routes procedures for all airports supporting Standard Arrival Routes within the UK.

Airports have made some progress, with Cardiff and Bristol obtaining approval for their mitigations and London City and Birmingham Airports withdrawing their conventional procedures from use.

Risks and benefits have been captured under initiative 7, above.

Risks to benefit realisation	**Score:** 16
Design of new routes changes the environmental impact and can provide respite through alternation, however the cost and resource requirement for consultation may lead to delayed delivery by impacted sponsors. Furthermore, dependency with initiatives 4 and 5 may delay full Performance Based Navigation implementation, the impact of which cannot be assessed at this stage without an accepted Iteration 3 of the Masterplan.	(Likelihood:4) * (Severity:4)

Initiative 9 – Review of air traffic service provisions in the UK

Table 1.9 – Initiative 9 plan and progress status - December 2022

Review of air traffic service provisions in the UK	9	CAA developing policy

UNCONTROLLED AIRSPACE

Description: review of air traffic service provision in the UK to ensure alignment with international standards and interoperability across airspace boundaries.		**2021**	⬆	**2022**
9.1 Define ATS requirements	9.2 ATS framework	9.3 Not applicable		
Timescale: 2027	**Driver:** ICAO Standards and Recommended Practices / ICAO Procedures for Air Navigation Services / CAA (Air Navigation) Directions/ Airspace Modernisation Strategy			
Stage: CAA Policy	**Mechanism:** TBC			

Scope

Review of Air Traffic Service Provision in the UK requires the CAA to:

(a) achieve compliance and increased alignment with ICAO's provisions on Flight Information Service (FIS), specifically the *Information Thread – Meteorological Information (MET), Digital Aeronautical Information Management (DAIM), Flight & Flow in Collaborative Environment (FICE), System-Wide Information Management (SWIM)*

(b) consider mechanisms and arrangements by which air traffic services are provided to aircraft in an en route phase of the flight (currently delivered through the Lower Airspace Radar Service - LARS concept).

Key Milestones

Timescales for this work will now be aligned with the refreshed Airspace Modernisation Strategy due for publication in early 2023 and will form part of the Integration Implementation Plan.

Key Achievements

Flight Information Display (FID), *Supplementary Instruction CAP 797 SI 2021/03 FISO Manual: Use of ATS Surveillance Systems in Aerodrome Flight Information Service* was published in December 2021. It amended CAP 797, to enable the use of FIDs at those aerodromes where a Flight Information Service Officer (FISO) provides the service. CAP 797 was updated in March 2022 to incorporate the Supplementary Instruction. More recently, the use of FID has been extended to air traffic controllers to support the provision of flight information service provided by aerodrome control.

The work on initiative 9 has now been paused, awaiting the refresh of the Airspace Modernisation Strategy and work on the lower airspace service replacement.

Next Steps

Concept development work is planned to start in Q2 2023, subject to the CAA successfully onboarding key subject matter resource in the new year. The concept development work will then be followed by a consultation and joint industry-CAA procedure definition phase. This phase will aim to finalise the operational procedures, test them within a simulated environment, and develop the State safety argument and education materials by Q1 2026.

Promulgation of change will take then take place, with at least 12-months' notice, to give industry the time to brief and train their personnel, as well as undertake their own change management activities with the implementation stage planned for Q2 2027.

Risks

Decisions on the electronic conspicuity solution may impact timescales for deployment of proposed flight information service procedures and lower airspace service replacement, where flexibility in airspace use is assumed to be required.

Delivery timescales for stakeholder engagement and subsequent deployment will be established through implementation planning activity in Q2 2023.

Risks to benefit realisation	**Score:** 12
Funding model required to deliver a service that serves the needs of users may not be possible. Available technology may not fully support developed concepts and procedures. Reliance on subject matter expertise is critical to successful progression of this initiative.	(Likelihood:3) * (Severity:4)

Initiative 10 – Airspace classification review

Table 1.10 – Initiative 10 plan and progress status - December 2022

Airspace classification review	10	CAA Airspace Classification Team

Description: review of airspace classification to optimise the integration of all classes of aircraft.		**2021** ⬇	**2022**
10.1 Optimised classification	10.2 New procedures	10.3 Electronic Conspicuity	
Timescale: 2025	**Driver:** ICAO Standards and Recommended Practices / ICAO Procedures for Air Navigation Services / CAA (Air Navigation) Directions		
Stage: Delivery	**Mechanism:** Airspace Classification Team		

UNCONTROLLED AIRSPACE

Scope

Airspace Classification Review must be undertaken regularly by the CAA, in line with the requirements of The Air Navigation Directions 2017. The CAA must consider whether airspace classifications should be reviewed; to carry out a review (which includes consultation with airspace users), where we consider a change to classification might be made; and as we consider appropriate, to amend any classification in accordance with the CAP 1991 procedure developed and published by the CAA for making such amendments. More information on this work can be found on a dedicated webpage.

Key Achievements

The Cotswold Region

In January, the CAA launched a feedback exercise on its Cotswold Region report (CAP 2315), setting out its draft findings, as part of the regional approach to the airspace classification review. The report set out our findings on the airspace usage, including an overview of the different airspace authorities operating within the region, as well as the type and scale of aviation activity in the region. The report presented an overview of our evidence and recommendations, together with an initial plan of volumes that could be taken to the Amend stage of the procedure. We invited feedback on our methodology used in deciding on the volumes proposed as part of our initial plan, as we wanted to make sure we did not misinterpret any of the feedback received. The information has been used to inform the airspace volumes we have taken forward to the Amend stage of the procedure, as well as our approach to our other recommendations.

Throughout Spring and early Summer 2022, we worked closely with a wide range of stakeholders. As well as improving our relationship with the General Aviation community, airfields, the military users of airspace, and air traffic service providers, the review also looked to new, innovative solutions to assist in the scrutiny of airspace use. Our new Airspace Analyser Tool has been particularly helpful in forming an evidence-based picture of how specific volumes are being used.

The final report on our findings was published in July (CAP 2359), accompanied by a podcast, outlining which volumes of airspace the process will seek to amend, as well as what other changes can be made to improve UK airspace.

Our Recommendations

As a result of the Cotswold Region report findings, Daventry CTA 6 has been taken forward to the Amend phase of the CAP 1991 process. The review has also enabled further positive changes to UK airspace beyond a change to airspace classification, such as:

- Disestablishing the RAF Lyneham ATZ and removing it from the AIP.
- Enabling the disestablishment of three separate restricted areas via the Civil Aviation Authority's airspace change proposal process.
- Passing the findings on Areas of Intense Air Activity (AIAAs) to the relevant teams within the CAA, who will instigate a UK review.
- Implementing a new procedure for handling FCS 1522 Refusal of Service forms, resulting in positive feedback from those who have submitted them.
- Building on tangible improvements in relationships with stakeholders created during the review work and using this to reinforce the CAA's ongoing safety and education work.
- Developing and enhancing an Airspace Analyser Tool which uses current and historic airspace use data to help form an evidence-based picture of how specific volumes are being used.

All reports and associated information can be found on the Airspace Classification web pages here.

Next Steps

Extensive collaborative work is currently taking place between the CAA and NERL on progressing Daventry CTA 6 through the Amend stage. A consultation on the proposed amendment is scheduled for early 2023.

The CAA announced its second region for review, the Barnsley region, in November and has launched a Call for Evidence into the region seeking the views of all stakeholders to help identify volumes that may need changes to their classification and other issues that may require alternative solutions. The feedback from our Call for Evidence will inform our

review of the Barnsley Region and, combined with our own data gathering will help to determine which volumes should form part of our Initial Plan.

The CAA is also undertaking a detailed review of the Manchester Low Level Route (MLLR) to better understand the issues raised with this portion of airspace and identify any opportunities as to how they may be addressed. Feedback has been sought on this region through the Call for Evidence and our findings will be published early in the new year, which will set out whether the airspace has the potential to be taken to the Amend Phase or whether another solution will be required.

Risks and mitigations

Key risks to the delivery of the initiative have been noted by the CAA and outlined below, alongside proposed mitigating actions:

- The designated controlling authority responsible for the airspace volume for which the CAA proposes for classification review, may not have the resources to cooperate, particularly as a result of the ongoing recovery from the COVID-19 pandemic. To mitigate this risk, the CAA will produce evidence as to why the change is necessary and will undertake the majority of the analysis required to support the change. The CAA will monitor the implementation of the new procedure, in order to identify anything that is blocking progress, and may decide to engage with Government about how to resolve any issues.
- The environmental impacts of a classification change could be uncertain. Removing controlled airspace, for example, effectively opens up that volume of airspace to all flights. If the airspace were previously relatively unused (hence the reclassification), there could potentially be an increase in noise from new low-level traffic. The CAA does not envisage any significant environmental impacts from a classification change, because these would have been filtered out at an earlier stage in the procedure. However, the CAA cannot model the impacts outside controlled airspace and in respect of this procedure, the CAA does not have specific guidance from the DfT on assessing environmental impacts. If the CAA notes a correlation between increased noise complaints and classification amendments, we will advise the DfT, and reflect any policy changes they make in updates to the procedure. As with any change, the designated controlling authority will monitor its implementation and after one year the CAA will report on the effectiveness of the change and whether any further action is needed.

Risks to benefit realisation: Limited local knowledge resource availability to support work progress. Unexpected environmental impacts of removing controlled airspace may lead to a new requirement for updating government policy on noise and CAA's process regarding classification review.	**Score:** 6 (Likelihood:2) * (Severity:3)

Initiative 11 – Deployment of electronic surveillance solutions

Table 1.11 – Initiative 11 plan and progress status - December 2022

Deployment of electronic surveillance solutions	11	CAA developing policy

UNCONTROLLED AIRSPACE

Description: deployment of electronic surveillance solutions to aircraft and at airports to aid integration of traffic.		**2021**	⬇	**2022**
11.1 New airspace structures	11.2 New procedures	11.3 Electronic Conspicuity		
Timescale: 2024	**Driver:** Airspace Modernisation Strategy / Safe and Efficient Airspace / Integration of new airspace users			
Stage: CAA policy	**Mechanism:** TBC			

Scope

Deployment of Electronic Surveillance Solutions initiative relies on the CAA to develop a strategy, determining how electronic conspicuity can play as an enabler in addressing integration of existing and new users of UK airspace. This work is a key enabler for initiatives 9 and 10 and builds on the work undertaken by the CAA and the inputs from a cross-section of stakeholders via a Call for Evidence[11], focusing on the technical solution required to progress.

Electronic conspicuity is an umbrella term for the technology that can help pilots, remotely piloted aircraft users and air traffic services to be more aware of what is operating in surrounding airspace. The transmission of electronic conspicuity data will be used by ground-based services, to enable delivery of Flight Information Services and the implementation of more flexible controlled airspace structures. The information generated and depending on the integrity and accuracy of the data, can be presented to pilots and air traffic services visually, audibly, or both, to provide them with information on other traffic nearby. This strengthens the principle of '*See and Avoid'* by adding the ability to '*Detect and Be Detected'*. To be most effective, it needs 100% of users operating in a designated block of airspace to be using compatible electronic conspicuity devices, for detection purposes.

[11] CAP 1837 Response to Electronic Conspicuity Call for Evidence

Many airspace users (with aircraft weighing more than 5700kg), are legally required to transmit electronic conspicuity information using Automatic Dependent Surveillance–Broadcast Out transponders, under UK Regulation (EU) 1207/2011.

Key Achievements

Last year, the CAA and DfT established the Surveillance Standards Task Force to work with industry on developing surveillance specifications, including a national, voluntary specification for electronic conspicuity.

The broad scope of the Task Force was to:

- Identify the operational need for an electronic conspicuity specification from future airspace scenarios.
- Identify the minimum standards which would satisfy the operational needs.
- Identify the minimum standards that could fill the recognised gaps in the UK regulatory framework; and,
- Create a Roadmap for updates to the regulatory framework that support implementation.

The aim of a new electronic conspicuity specification is to enable the delivery of the Airspace Modernisation Strategy, integrate new airspace users and reduce the risk of mid-air collision in UK airspace – enhancing safety. To facilitate this work, a Task Force was commissioned by the DfT, working with the CAA, to explore the options going forward. This work was conducted in three phases by Egis, an independent aviation consultancy firm:

Phase 1 recommended an approach utilising existing global standards, focussing on voluntary uptake where possible, and mandatory carriage only where necessary.

Phase 2 developed scenarios to identify the operational requirements and assumptions needed to deliver the recommended approach and assessed the potential costs of transition to possible new standards. It also conducted a gap analysis of the existing UK regulatory framework.

Phase 3 created a suggested regulatory roadmap required to support the preferred recommendation.

The report recommends that the adoption of electronic conspicuity specifications should not be immediately mandated UK-wide. Instead, users of other systems should continue to benefit from the functionality that those products offer. However, compliance with the established electronic conspicuity specifications is likely to be mandated in other blocks of airspace to enable an ever-increasing variety of users. This will be required to ensure safety and interoperability between airspace users.

The DfT-sponsored electronic conspicuity rebate scheme has provided ~£1.5 million assistance to airspace users to assist in the purchase of EC devices; 7000 applications

have been received against this fund to date and is expected to provide safety benefits across the aviation community.

In December 2022 the CAA and DfT published a joint statement on the development of a national standard for electronic conspicuity. The DfT and CAA both strongly support the recommendations made by Egis in their report for aircraft to be equipped with regulated EC devices that meet the proposed specifications.

Next Steps

The DfT and CAA will agree a programme of work to deliver a new electronic conspicuity specification in the UK, aligned to the aims of the refreshed Airspace Modernisation Strategy. Identification of the future requirements for electronic conspicuity policy, needed to enable the Airspace Modernisation Strategy, will need to explore all aspects of airspace usage, along with, where required, any necessary changes to legislation and associated guidance material.

To support the rapidly evolving needs of new airspace users, and to provide additional safety benefits to airspace users in Class G airspace in the UK will require significant engagement both internally within the CAA and DfT, and externally with the airspace user and equipment provider communities. That is to ensure transparency and understanding, and to allow individuals to make the right choices. There will be a detailed consultation on how existing and new supporting policies may be amended or created. This will include specific issues packaged together to provide a fuller picture of change, ensure coherent development, and an effective approach for consultees to feed into.

The DfT and CAA both support the recommendations made by Egis in their report for aircraft to be equipped with regulated electronic conspicuity devices that meet the proposed standards, operating on 1090 MHz for piloted aircraft and 978 MHz for unpiloted aircraft (UAS) respectively.

We strongly encourage voluntary use of electronic conspicuity devices in all airspace to enhance their visibility to other traffic.

The three Egis reports published in December 2022 can be found here:

- Phase 1 report - www.caa.co.uk/CAP2498A
- Phase 2 report - www.caa.co.uk/CAP2498B
- Phase 3 report - www.caa.co.uk/CAP2498C

Benefits

Electronic conspicuity will continue to play a vital enabling role in the Airspace Modernisation Strategy. The solution is seen as an enabler to the on-going modernisation of the UK's airspace structure and route network. It is expected to enable safe and efficient integration of remotely piloted aircraft while providing accurate data to ground systems enabling greater flexibility in airspace use.

Risks

Because the availability and capacity of the protected portion of radio frequency spectrum, used by aviation stakeholders to transmit Automatic Dependent Surveillance–Broadcast (1090Mhz) is limited, there is a risk that the general electronic conspicuity equipage use creates a surge in demand for spectrum, that cannot be accommodated. This may lead to gaps in the ability to create a full known environment, as the spectrum becomes saturated.

The Remotely Piloted Aircraft Systems integration risk is closely related to the spectrum supply risk. Given the potential high demand from the Remotely Piloted Aircraft Systems sector and the finite amount of spectrum resource, the CAA is observing international developments in this area and is working closely with Ofcom, under initiative 12, to mitigate the risk and find an optimum general equipage mandate solution.

Risks to benefit realisation	**Score:** 12
That the adoption of electronic surveillance solutions on board aircraft and on the ground at airports is not considered commercially viable and competitive. While good progress was made on this workstream in 2022, the risk of any potential further delays may impact wider modernisation objectives, particularly around integration of all airspace users.	(Likelihood: 3) * (Severity:4)

Initiative 12 – Efficient use of radio frequency spectrum

Table 1.12 – Initiative 12 plan and progress status - December 2022

Efficient use of radio frequency spectrum 12	CAA and Ofcom

COMMS AND ATM INFRASTRUCTURE

Description: cross-industry plan for the efficient use of radio-frequency spectrum to support growing demand from aviation.		**2021**	➡	**2022**
12.1 Airspace structures	12.2 New procedures	12.3 Develop standards		
Timescale: ongoing	**Driver:** UK Statutory Instrument / Airspace Modernisation Strategy			
Stage: Delivery	**Mechanism:** CAA / Ofcom			

Scope

Efficient Use of Radio Frequency Spectrum is relevant to the areas of Communications (including datalinks), Navigation (terrestrial and space-based) and Surveillance (primary, secondary and ADS-B), as they all require appropriate radio spectrum for safe and efficient operation.

At a global level, the United Nation's International Telecommunications Union manages the Radio Regulations, which are the international treaty, governing the global and regional use of radio-spectrum and satellite orbits.

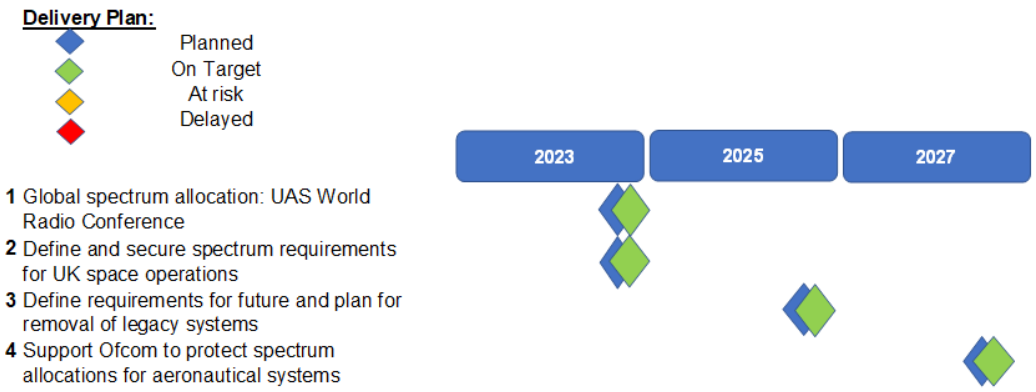
The treaty can only be amended through a World Radiocommunication Conference (WRC), which will next occur in 2023. Within the International Telecommunications Union aeronautical issues including the preparation of aeronautical related WRC agenda items is the responsibility of working party 5B for which the CAA currently holds the chair. There are six items on the agenda where aviation is seeking action to enhance its use of spectrum, with a further ten, that aviation needs to watch, as they could potentially adversely impact aviation's access to spectrum. Within the UK spectrum, assignments are licensed by Ofcom, the telecommunications regulator.

More information can be found within the dedicated Spectrum and Frequency Management pages within the CAA website.

Key Milestones

The key milestones for initiative 12 are mainly driven outside the aviation sector, by the work of radio regulators, tabled at the Spectrum Implementation Group. The following key dates are therefore observed:

Key Achievements



Led by uAvoinx and Trax International at Goodwood, an ongoing trial of using the 978MHz, as an additional Automatic Dependent Surveillance – Broadcast frequency is taking place. The purpose of the trial is to avoid overloading the 1030/1090 frequency. That is aimed at covering Beyond Visual Line of Sight operations and provision of Traffic Information Service from ground to air. The outcomes of the trial are yet to be ratified by the DfT; however, work is ongoing in parallel with OFCOM to ensure that should the go ahead is given, then OFCOM approvals and licencing are in place.

Next Steps

The use of space-based technology to extend VHF coverage is being considered. Global collaboration on this matter is complicated and will require a number of VHF frequencies, which are yet to be defined. The frequencies will be needed to generate global coverage and allow for multiple commercial service providers. Work to identify the specific number of frequencies and planning rules required, to ensure the protection of terrestrial systems, is ongoing. The work has been made more complicated by some Nations having moved over to 8.33KHz spacing, while others have not.

Risks

Risk of interference[12] from 5G base stations to radio altimeters, highlighted by the Radio Technical Commission for Aeronautics (RTCA) has led to ongoing collaboration between the CAA, the MoD and Ofcom to understand the implications for the UK and UK-

[12] Assessment of C-Band Mobile Telecommunications Interference Impact on Low Range Radar Altimeter Operations

registered aircraft flying abroad. This is now considered as CAA's business-as-usual activity and the issue is being captured and tracked.

Additionally, the CAA are involved with work at the global and regional level within aviation and the radio regulatory community. Indications are that a minority of radio altimeter designs may not have considered the potential for the introduction of high-powered systems in the frequency band below that is used by radio altimeters when they were designed.

The CAA has identified a risk that if manufactures are unwilling to release the data on performance of individual radio altimeter models, then the retrofit programme may need to be more extensive and further testing may be required at a CAA or DfT cost. Recently progression of this matter in the US has indicated a requirement to replace or modify poor performing radio altimeters in a short timescale (2-3 years). It is thought that many radio altimeters can be upgraded through the use of a retrofit filter. Requirements in the US (where the 5G deployment presents a high risk of potential interference) may drive global adoption of improved radio altimeter performance.

The CAA recognises potential issues with timely and precise definition of remotely piloted aircraft and UK space requirements, ahead of the World Radio Conference 2023. Operational and safety risks will also need to be identified, together with appropriate mitigation with any conflicting systems.

Finally, for a truly integrated environment, ground infrastructure would be required to interpret and relay 1090/978 data. However, the infrastructure cost responsibilities are yet to be agreed.

Benefits

The main objective is to provide airspace users with safe, reliable, and interoperable operational environment, the benefits therefore translate into greater capacity of a globally finite radio spectrum resource. Initiative 12 is therefore expected to deliver benefits, by:

- enabling single, unified airspace management,
- enabling Communications, Navigation and Surveillance functions in an integrated system, while ensuring adequate redundancy,
- addressing radio frequency capacity issue, protection, resilience, efficiency, and compatibility,
- ensuring spectrum utilization meets radio regulations,
- maintaining sufficient and suitable spectrum for aviation needs,
- ADS-B (including additional spectral capacity to support electronic conspicuity) is a step to a fully integrated environment.

Risks to benefit realisation Lack of sufficient, suitably assigned, and protected spectrum will constrain the widespread adoption of new technologies and procedures, designed to improve airspace safety, efficiency, and capacity. The situation is exacerbated by aviation's current in-efficient use of the spectrum resources it already has access to, which could potentially be available to support all future requirements and minimize the risk.	**Score:** 12 (Likelihood:3) * (Severity:4)

Initiative 13 – Full adoption of datalink communications

Table 1.13 – Initiative 13 plan and progress status - December 2022

Full adoption of datalink communications	13	Virtual datalink groups of CAA, NATS and airlines

COMMS AND ATM INFRASTRUCTURE

Description: cross-industry plan for the full adoption of datalink communications.		**2021** ➡ **2022**
13.1 Not applicable	13.2 New procedures	13.3 Develop standards
Timescale: by 2035		**Driver:** UK Regulation (EU) 716/2014/ Airspace Modernisation Strategy
Stage: Delivery		**Mechanism:** CAA, NATS (En Route) plc and UK Airlines

Scope

Full Adoption of Datalink Communications refers to a system of text message transmission between the aircraft and ground. Controller–pilot datalink communications allow certain non-urgent air traffic control messages to be communicated via text message, rather than voice.

The deployment and use of datalink forms part of the EUROCONTROL Operational Excellence Programme aimed at fully re-invigorating the use of datalink and to realise the benefits of an operational datalink service. UK Regulation (EU) 29/2009 on datalink services, applies to all flights operating as general air traffic, in accordance with instrument flight rules in all airspace above FL285, with some exceptions.

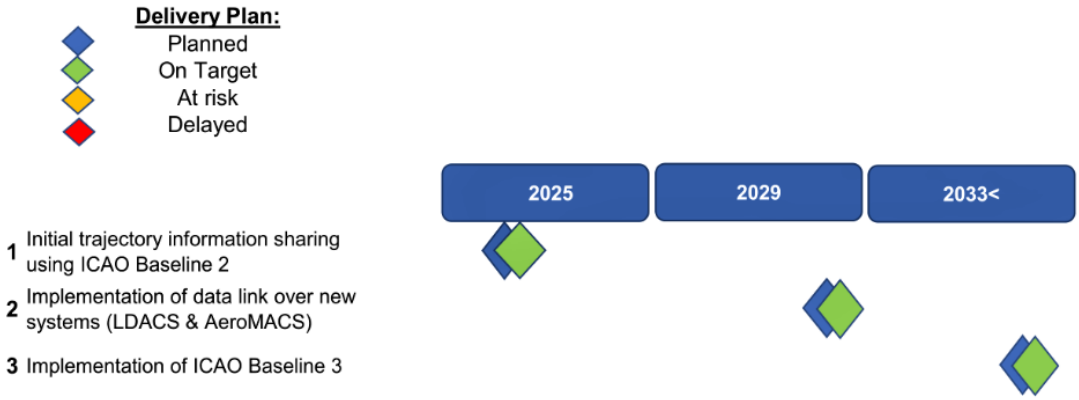
In 1983 ICAO began an effort to establish a datalink architecture under its Future Air Navigation System structure. This advance became the architecture and protocol standard of an oceanic communications network. ICAO have developed Future Air Navigation System structure to different baseline standards. ‘Baseline 2’ includes advanced services such as:

- 4D Trajectory Negotiation & Synchronization
- Flight deck-Based Interval Management (aircraft spacing)
- Taxi Clearance
- Hazardous Weather Reporting
- Runway Visual Range
- Operational Terminal Information.

'Baseline 3' will drive performance improvements to enable a global airborne network for air traffic control and related services, that uses multiple down-links to the ground network.

Key Milestones

Activities under the Operational Excellence Programme Work Stream 12.1 are progressing as planned, with a view to increasing the datalink message set to enhance operations. Future delivery plans linked to Baseline 2, and 3 deployments remain unchanged and on track, as shown below:



NATS is contributing to EUROCAE Working Group 78 to update the ATS Baseline 2 datalink standard Controller-Pilot Data Link Communications (CPDLC) and Automatic Dependent Surveillance-Contract (ADS-C). Good progress has been made with proposals for changes, to support future trajectory-based operations.

Work continues within EUROCONTROL on the planning and provision of additional VHF Datalink (VDL) Mode 2 datalink channels to allow greater capacity for air traffic control and air operation centre communications traffic. EUROCONTROL has almost finalised a set of optional, additional CPDLC messages and plans to seek harmonised support across European air navigation service providers for their implementation.

L-band Digital Aeronautical Communications System (LDACS)[13] is the proposed high-capacity terrestrial datalink replacement in Europe. Standards and Recommended Practices have been developed and are planned to be submitted for ICAO approval, for applicability in 2024. However, LDACS is not seen as the long-term datalink solution within certain quarters of ICAO.

Risks

ICAO Surveillance panel has objections to the acceptance of the proposed Standards and Recommended Practices. Concerns have been raised that insufficient testing of

13 L-band Digital Aeronautical Communications System

impact on other airborne systems has been conducted. LDACS interference with other systems is also not clearly understood.

This doubt will likely require a test window which will push the ratification and therefore implementation of the LDACS Standards and Recommended Practices to most likely beyond 2026.

Another risk identified, despite 75% of the equipage datalink capability being met, is that only 50% of flights are using Controller–Pilot datalink communications. Despite lower-than expected data and aircraft traffic levels as a continued effect of COVID-19, performance issues related to particular aircraft datalink equipment and frequency management (congestion) have been noted by the CAA a. Actions to address these issues are currently being investigated, although negotiations on the exact allocations and use to ease the congestion have slowed. Work on international agreements will be proposed for agreement regarding frequency use.

Promotion of UK engagement within the European Union datalink improvement activities is ongoing, with a view of increasing the datalink message set to enhance operations.

Dependencies

There is a strong link between datalink services and trajectory information sharing and dependency exists with deployment of System Wide Information Management under initiative 15. The ability to move to full Trajectory Based Operation in a collaborative environment, strongly depends on simultaneous sharing of the full range of aeronautical and meteorological information between airspace users, to provide a similar picture of the operational environment to all.

Benefits

Datalink use is not universal, but the benefits are being seen where it is deployed, and greater utilisation is being encouraged. More controllers are seeing the benefits of using both datalink and voice messaging to reduce workload and ambiguity in communication, thereby reducing safety risk.

The use of Controller–Pilot datalink communications messages provide several advantages over traditional voice communications. Datalink also plays a central role in the implementation of trajectory-based operations. Text-based messages reduce the margin for error due to a poor voice radio connection and they liberate space on the congested Very High Frequency channels for more urgent voice communications.

Datalink therefore delivers operational benefits, reducing controller workload and frequency congestion, and increase efficiency and awareness in the cockpit.

Risks to benefit realisation That a lack of co-ordination in the adoption of datalink solutions across airports, aircraft operators and air traffic control will reduce the benefits of the technology.	**Score:** 6 (Likelihood:2) * (Severity:3)

Initiative 14 – Satellite navigation implementation plan

Table 1.14 – Initiative 14 plan and progress status - December 2022

COMMS AND ATM INFRASTRUCTURE	**Satellite navigation implementation plan** 14		**ACOG and ANSPs**	
	Description: a national infrastructure plan for communications, navigation and surveillance, that includes the retention of sufficient capability, to ensure the continued provision of air services in contingency.		**2021** ➡	**2022**
	14.1 National standards Airspace Structures and Routes	14.2 National standards Air Traffic Management Procedures	14.3 Rationalise ground infrastructure	
	Timescale: 2030	**Driver:** UK Regulation (EU) 2018/1048/ Airspace Modernisation Strategy		
	Stage: Delivery	**Mechanism:** Airspace Change Organising Group / Air Navigation Service Providers		

Scope

Satellite Navigation Implementation Plan stems from the need for further legislation regarding Performance Based Navigation. That is currently under consideration with the DfT and the industry, but it does not diminish the commitment to deployment as a core element of airspace modernisation, the introduction of three-dimensional Performance Based Navigation instrument approach procedures, Standard Instrument Departure routes (SIDs), Standard Arrival Routes (STARs), and the application of Performance Based Navigation on air traffic service routes.

It also envisages placing airspace usage requirements on rotorcraft operations and all providers of Air Traffic Management/Air Navigation Services, including aerodromes, to present Performance Based Navigation Transition Plans to the CAA[14]. The necessity for contingency measures drives the scope of this initiative, to ensure continuity through other means where, for unexpected reasons beyond their control, Global Navigation Satellite System or other methods used for performance-based navigation are no longer available. This may require retention of a network of conventional navigation aids and related surveillance and communication infrastructure.

[14] Obligation in UK Regulation (EU) 2018/1048 to have PBN transition plans applies to providers of Air Traffic Management (ATM) / Air Navigation Services (ANS) at aerodromes with instrument runway ends not served by precision-approach procedures (2D).

NATS is continuing work on the rationalisation of its en route DME infrastructure and is anticipating consultation on the proposals in 2023.

ICAO Integrated Communication, Navigation, Surveillance and Spectrum Task Force is responsible for recommending how the Standards and Recommended Practices' development process can be made more efficient. The task force also considers the long-term evolution of the communications, navigation and surveillance system and how it can be rationalised and modernised to meet future demands. Emerging technology is also taken account for, with the aim of global harmonisation using the minimum number of systems. CAA are aligned with ICAO/EUROCONTROL panels on Surveillance issues. A global concern is safeguarding the surveillance environment against multiple, repeated interrogations from multiple sources.

The National Information Security Conference[15] support this work for the UK and the CAA also make use of a EUROCONTROL tool (EMIT), which is a radar sensor that analyses the surveillance environment assess interrogation thresholds. Potential saturations/spikes can be picked up by EMIT allowing remedial action to be taken. The use of primary radar for both air traffic control and airborne weather radar is seen to be required for the foreseeable future and will provide a vital element of Remotely Piloted Aircraft Systems detect and avoid capabilities.

Further risks and dependencies to this work has been captured under initiatives 7, 8 and 12 above.

Risks to benefit realisation	**Score:** 16
Rationalisation of conventional navigation aids will be complex, as there needs to be appropriate contingency, particularly due to potential interference threats such as space, weather or jamming trials.	(Likelihood:4) * (Severity:4)

15 National Information Security Conference

Initiative 15 – Air traffic management

Table 1.15 – Initiative 15 plan and progress status - December 2022

Air traffic management	15	NERL SIP for ATM, AIS part. Met Office part with CAA.

COMMS AND ATM INFRASTRUCTURE

Description: air traffic management to modernise systems, tools, and procedures.	**2021** ➡	**2022**
15.1 Not applicable	15.2 New procedures	15.3 New systems and tools
Timescale: by 2035		**Driver:** UK Regulation (EU) 716/2014/ Airspace Modernisation Strategy
Stage: Delivery		**Mechanism:** NATS (En Route) plc Service and Investment Plan/ Met Office via CAA

Scope

Air Traffic Management initiative 15 sets out the requirement for the modernisation of air traffic management systems, tools, and procedures. Part of this work is to implement modern data exchange and sharing services, that will allow the efficient communication of flight, meteorological and aeronautical information to operational stakeholders, using new air traffic management systems and tools on the ground and in the air.

Much of this work has been set out in ICAO GANP *Information Thread – MET, DAIM, FICE, SWIM* and UK Regulation (EU) 716/2014.

ICAO Information Management (IMP) and Meteorology (METP) Panels are responsible for timely delivery of the provisions, supporting implementation of the GANP, which provides Aviation System Block Upgrades (ASBU), Modules and Roadmaps. The ASBU framework defines six-year timeframes and deadlines for each block for implementation.

Progress

The AIM Digital datasets project, a prerequisite for development of products and services in the future, commenced in Q3 2022, to deliver ICAO Digital Datasets. This includes an AIP dataset, IFP dataset and Obstacle and Terrain dataset (6-7), for delivery by the end of 2024. Initial deployment is expected by the end of 2023 with the remaining scope delivered in 2024. The datasets will enable parties to access aeronautical information in industry standard format, so that they can develop products and services using this information.

Key Milestones

AIM- and MET- related activities are planned in three main ASBUs, with key target dates provided below:

- DAIM – Digital Aeronautical Information Management – Block 2
- SWIM – System Wide Information Management – Blocks 2 & 3
- AMET – Meteorological information – Blocks 2 – 4

The Air Traffic Management activities envisage for deployment are:

- iTEC – Flight and Radar Data Processing tool
- Foursight – an aircraft trajectory prediction (conflict detection) system
- Main and Second Voice – (Communication) systems

NATS (En Route) plc's planning for the deployment of Voice and En Route systems have been revised in the light of COVID-19. The aim is deployment of a common platform, providing mutual system contingency and resolution of legacy issues from National Airspace System/National Air Traffic Operational Display Equipment. Originally envisaged work for 2022 has not been achieved, iTEC and the deployment of tools in lower airspace has been postponed for now with further activities on iTEC being a core activity in the NR23 planning.

Deployment of the next version of iTEC V3, is currently entering the requirements definition phase which will last through to Spring 2023. This is the period where the functional (ATC capabilities) and non-functional requirements needed in the early iTEC V3 builds will be defined. They will include requirements to support deployment into the NATS (En Route) plc's lower operations (Prestwick Lower and Terminal Control operations) later this decade which will enable the roll out of a common Flight Data Processor and Common Workstation across all NATS (En Route) plc centres.

The CAA and the Met Office will jointly lead on policy and report on progress, once the scope and requirements have been established. NATS (En Route) plc and Met Office will lead on deliverables once requirements are known.

Significant work is underway and planned that will support initiative 15 (and other initiatives) but there are currently no specific deliverables or requirements that have been identified and can be reported on. Scoping and planning activity are expected to commence in the Q1 2023.

Risks

The following risks have been identified by the CAA and NATS (En Route) plc, with regards to deployment of scope under the initiative:

- Financial pressure due to the ongoing pressures, following industry recovery post COVID-19 may lead to re-prioritisation of projects, where some elements

of the initiative may not be delivered or delivered at timescales significantly different to estimated deployment.

- Resource availability within the CAA's Aeronautical Information Management & Meteorological Information team, and NATS (En Route) plc project teams may increase reliance on third party contractors for delivery, impacting planned timescales.
- Lack of clarity and consistency between users and industry requirements, along with NR23 planning and re-prioritization may cause a disconnect between what the industry expects and what is delivered in the short-term.
- Concern that work is progressed either to initiative 15 or other initiatives that is dependent on AIM or MET deliverables, which is not identified sufficiently early in the workflow of the project. Mitigation is expected to be delivered through the refreshed Airspace Modernisation Strategy.

Dependencies

Successful deployment of initiative 15 impacts delivery of the performance-based navigation concept, under initiatives 7 and 8, and supports delivery of initiative 9 - Review of Air Traffic Service Provision in the UK, which relies on timely deployment of System Wide Information Management. Deployment of electronic conspicuity under initiative 11 on the other hand, enables technical integration of solutions, delivered under initiative 15 workstreams.

Initiative 15 is also an enabler, and partially addressed requirements under initiative 12, while benefit realisation of System Wide Information Management is inter-dependent on deployment of datalink solution, under initiative 13.

Dependencies have been noted on successful development of new user requirements, in line with innovation, and establishing an alignment point, especially in the areas of Remotely Piloted Aerial Systems and Space flights. This dependency is expected to be partially mitigated by the refreshed Airspace Modernisation Strategy.

Global dependency is also of importance, which is based on industry's readiness to implement change and requirement for harmonisation across all international stakeholders.

Benefits

The air traffic management system is increasingly reliant on accurate and timely information. Such information must be organised and provided by solutions that support system wide interoperability and secured seamless information access and exchange.

Global improvements in information management are needed and the implementation of the System Wide Information Management should ensure delivery of the right information, to the right people at the right time, in an interoperable manner that meets the appropriate quality standards.

There are a number of benefits achieved through the modernisation of air traffic management systems, tools, and procedures, especially through the application of System Wide Information Management, such as:

- improved safety by providing the capability to receive relevant information in timely and effective manner,
- improved efficiency by enabling performance-based operations and by transitioning to a service orientated environment,
- improved collaborative-decision making by all stakeholders through the access to quality data including dynamic data, and improved exchange of information,
- improved air traffic management performance and increased capacity.

This initiative will also provide improved access to increasing amounts of high quality, high detail, and globally available MET data, in line with the System Wide Information Management. This is required by a variety of aviation stakeholders and by concepts and activities, such as performance-based navigation, flight planning, continuous descent operations and continuous climb operations. This will help to improve the efficiency, performance, and safety of operations, while minimising environmental impacts.

Risks to benefit realisation	**Score:** 16
That the requirements to change the airspace and upgrade air traffic management systems, tools and procedures in the same timeframe creates complex interdependencies that require significant resources, funding, and additional development time to resolve.	(Likelihood:4) * (Severity:4)

Chapter 2

Co-sponsors' update

The role of the co-sponsors: policy and regulation

Airspace Modernisation co-sponsors

2.1 The DfT and the CAA are the co-sponsors for airspace modernisation. The DfT is accountable for national policy on airspace, and the CAA for the strategy. While these accountabilities are distinct, they act as co-sponsors together to ensure alignment. Together, the DfT and the CAA commission specific projects, necessary for airspace modernisation, including the delivery of the initiatives set out in the Airspace Modernisation Strategy. Such commissions will require delivery groups or an organisation leading a delivery group to develop a realistic, evidenced and financed plan with any contingencies made explicit. It must be noted however, that while in some cases delivery of initiatives is a matter of law, for others delivery depends on the voluntary participation of delivery groups. In such cases, the confidence of delivery is dependent on the benefits and delivery bandwidth that organisations can commit to.

2.2 The co-sponsors agree deliverables and outcomes and set parameters for delivery groups tasked with planning and delivering modernisation projects and Airspace Modernisation Strategy initiatives.

2.3 The expectation of the co-sponsors is that progress of the commissioned projects is monitored and reported on by the CAA's Airspace Modernisation Oversight Team, further described in the section below. The co-sponsors will be the point of escalation on delivery issues, communicated by the Oversight Team, and will jointly consider when and how to intervene. Further detail on the co-sponsors role is set out in the annex on governance, that was initially published alongside the Airspace Modernisation Strategy in December 2018 and updated in the December 2019 Airspace Modernisation Progress Report (CAP 1862). The governance annex will be updated as part of the Airspace Modernisation Strategy refresh activity, described later in this chapter.

Airspace Modernisation Oversight

2.4 Reporting into the co-sponsors, the CAA's delivery, monitoring and oversight role is carried out by the Oversight team in the Strategy and Policy Department. The key function of the team is to oversee, track and regularly report on the Airspace Modernisation Strategy initiatives' delivery to the co-sponsors and annually to the Secretary of State.

2.5 The team consists of the Head of Airspace Modernisation Oversight and an Airspace Modernisation Oversight Associate. In 2022 the team has expanded by making new appointments, one for the role of another Associate and one for a newly created role of an Airspace Modernisation Oversight Principal.

2.6 The Oversight team is also responsible for administering and managing the FASI Grant on behalf of the DfT and provides an Advisory Board function within the governance structure of the Airspace Modernisation Strategy Support Fund, described in more detail later on in this chapter.

2.7 The Oversight Team holds a key role in problem solving modernisation delivery. Some examples are:

- identifying opportunities for effective management of financial support grants
- identifying and escalating risks and resource requirements which may be stalling delivery
- advising the Secretary of State on the potential use of powers.

2.8 The powers could be used to direct sponsors to prepare and submit airspace changes that are required as part of the CAA's strategy and plan, under the Air Traffic Management and Unmanned Aircraft Act 2021, further described in this chapter.

Airspace Modernisation Assurance Group

2.9 In order to manage the overall efficiencies of resource allocation and effort prioritisation within the CAA, in support of delivery within the areas relevant to the Airspace Modernisation Strategy and modernisation of airspace as a whole, a senior management group has been established internally, in a form of the Airspace Modernisation Assurance Group.

2.10 Different departments within the CAA may have different roles within the Airspace Modernisation Strategy. From a Co-Sponsor perspective, the CAA may have strategy or policy responsibilities. From a regulatory perspective, the CAA may be a decision-maker, or may have a technical role in introducing certain requirements.

2.11 Several airspace workstreams require cross-CAA development of technical policies, to support industry implementation. Staff across the CAA will be involved in developing these initiative areas and will be required to update the Oversight Team, linking in with the Airspace Modernisation Strategy Governance Structure for reporting on progress and risks to the Airspace Modernisation Strategy co-sponsors, and complementing the CAA's internal governance process through reporting into its Airspace Programme Board.

2.12 The group, which comprises of different teams and areas of expertise, will be focussed on airspace and infrastructure developments in support of airspace modernisation deployments, where the CAA has a prime task to enable them. The broad scope of the initiatives offers the group a unique insight into the potential cross technical policy dependencies and therefore make informed decisions on the required CAA input. Its work will also cover areas of drone integration, space launch operations, Unified Traffic Management development and Airspace Management and Air Traffic Services.

2.13 In addition to that, the group will make decisions on the need for an airspace classification review, as per the CAP1991 process and will periodically engage with representatives of the airline community, as part of its governance function for the Airspace Modernisation Strategy Support Fund, when considering applications for funding, in line with the benefits of the proposals received from the wider industry.

Airspace Modernisation Strategy Refresh

Introduction

2.14 The Airspace Modernisation Strategy sets out what airspace modernisation must achieve and how it will happen. When we first published the Airspace Modernisation Strategy in December 2018, we intended to review it in 2020 to make sure it responded to any policy changes brought about in the DfT's Aviation Strategy, the subject of a 2018 Green Paper (in particular policy changes on managing aviation noise), and to build upon the existing strategy. We also recognised that the Airspace Modernisation Strategy would need to be updated in order to meet the Government's specified timescale of a strategy, covering the period out to 2040. The refresh activity commenced towards the end of 2020 and at the time of writing, is planned for publication in early 2023.

2.15 A key part of the 2018 Airspace Modernisation Strategy was the need to enable sustainable growth in capacity in the system. In December 2018, the Government published Aviation 2050, a Green Paper consulting on how it saw sustainable growth being delivered. In light of the unprecedented impacts that the COVID-19 pandemic had on the aviation sector, in May 2022 the Department for Transport published Flightpath to the Future[16], a medium-term strategic framework for the sector in support of its vision for a modern, innovative and efficient sector over the following 10 years.

2.16 Building on the responses received to the Aviation 2050 consultation, this 10-point plan focuses on how government and industry can work together to deliver a successful aviation sector of the future. It focuses on four key themes:

[16] Flightpath to the future: a strategic framework for the aviation sector - GOV.UK (www.gov.uk)

- enhancing global impact for a sustainable recovery;
- embracing innovation for a sustainable future;
- realising benefits for the UK; and
- delivering for users.

2.17 In view of the impacts of the pandemic, and having responded to one specific aspect, the Government decided not to publish a further formal response to the remaining parts of Aviation 2050.

Communication and engagement

2.18 The Air Navigation Directions 2017 require the CAA to consult the Secretary of State in relation to preparing and maintaining the Airspace Modernisation Strategy. With that in mind, the CAA published CAP 2175 *Airspace Modernisation Strategy Review 2021 Stakeholder Engagement Plan and Process* to outline our approach on how we intend to better reflect the priorities of all stakeholder and interest groups in the production of a refreshed draft of the Airspace Modernisation Strategy, ahead of the public consultation period. The pre-public consultation engagement activities of 2021 helped establish the strategic objectives described in 2.20.

2.19 Between January and April 2022, we ran a 12-week public consultation on a draft of the refreshed Airspace Modernisation Strategy covering the period up to 2040. The consultation also sought views on improving the current governance structure.

2.20 The draft Airspace Modernisation Strategy kept as its vision to "*Deliver quicker, quieter and cleaner journeys and more capacity for the benefit of those who use and are affected by UK airspace*" and it was structured around four strategic objectives:

(1) Maintain and enhance high aviation safety standards.

(2) Integration of diverse users and meet defence/security needs.

(3) Simplification – reduce complexity and improve efficiency.

(4) Sustainability – delivering the Government's key environmental objectives with respect to air navigation.

2.21 The strategic objectives and delivery plan were split into separate documents because the delivery plan will need more frequent updates.

2.22 We introduced environmental sustainability as an overarching principle to be applied through all modernisation activities, taking account of the latest government policy and environmental guidance. That includes better managing noise and helping achieve government commitments to net zero emissions.

2.23 The draft Airspace Modernisation Strategy aligns with the ICAO Global Air Navigation Plan (GANP) which is driving evolution of the global air navigation system.

2.24 The delivery 'elements' enable GANP and UK-specific modernisation requirements, while replacing the terminology and structure of the 15 'initiatives' set out within the 2018 version of the Airspace Modernisation Strategy.

2.25 The Airspace Modernisation Strategy will also be used to assist in the development and prioritisation of UK airspace rulemaking activity (policy and legislation) to help ensure the timely and coordinated implementation of modernisation initiatives.

2.26 We received 114 responses[17] to the public consultation and we continued to update and involve our stakeholders when it closed, in line with the ongoing communications commitment made in our 2021 Engagement Plan.

2.27 Representatives of the Requirements Gathering, Co-Creation and Review Groups created in 2021 were invited to briefing sessions (see Table 2.1). While the first session was conducted with all stakeholder groups participating in the refresh process, we held an additional meeting with the members of the AMS Review Panel, to critique how we have interpreted the information we collected.

Table 2.1 – AMS Refresh 2022 Post-Consultation Engagement Schedule

Airspace User Groups (alphabetical order)	**AMS Review Panel**	**All Groups Engagement Date**	**AMS Review Panel Date**
Airlines	Airlines UK International Air Transport Association	10th August	17th August
Airports	Airport Operators Association		
Air Traffic Control and Meteorological Information	Guild of Air Traffic Control Officers NATS En Route plc		

[17] One third of responses were from the General Aviation community, and one fifth were from commercial industry. Just under two thirds of respondents were based in the southeast of England.

Communities, Environment & Noise	Aviation Environment Federation		
General Aviation	GA Partnership		
Innovation	Association of Remotely Piloted Aircraft Systems		
Ministry of Defence	Ministry of Defence		
Space	UK Space Agency		

2.28 During the sessions we explained that the four strategic objectives in the proposed refreshed Airspace Modernisation Strategy were based on the legal and policy framework, including our duties under section 70 of the Transport Act 2000. We also explained that the CAA is likely to require a new legislative framework for some elements of the rule-making tasks related to delivery of the Airspace Modernisation Strategy – conversations with the DfT are ongoing in respect of this.

2.29 In November, we published CAP 2404 *Outcome of the consultation on Airspace Modernisation Strategy 2022-2040*, explaining in detail how we plan to respond to the feedback received during the public consultation. As a result of the consultation and related engagement, five key areas of future work have been defined and are summarised below:

- **Sustainability as an overarching principle** - while most consultation respondents were supportive of this objective, a number also questioned how we would achieve it and against what policy criteria. However, most of the feedback received about environmental elements related to government policy and guidance, which the CAA must work within, and not to the Airspace Modernisation Strategy itself. We will align – where overarching law and government policy allows, the refreshed Airspace Modernisation Strategy with the CAA's new Environmental Sustainability Strategy and its principles. Further detail on how this work will evolve has been captured in chapter 3 of this report.
- **Delivery model for airspace change** – concerns were raised in the responses around the delivery of airspace change, particularly around transparency, complexity and the number of organisations involved. The CAA will commence a distinct internal project to explore this area further, separately to the Airspace Modernisation Strategy refresh workstream.

- **Governance and leadership of the modernisation programme** – we will consider the responses in more detail regarding feedback and intend to publish an updated governance structure within the refreshed Airspace Modernisation Strategy, although it will continue to evolve.
- **Funding and resourcing the broader modernisation envisioned by the AMS** - funding sources for some delivery elements will not be resolved by the time we publish the Airspace Modernisation Strategy. Working groups, to develop the various delivery elements, will need to be established and where a new funding stream is clearly needed, this will be part of their remit.
- **Improving the General Aviation community's perception of modernisation concepts** – planned re-engagement targeted mainly at the General Aviation community, gave a better visualisation of the future lower airspace concepts and has been included as an appendix to the consultation response document (CAP 2404).

Next steps

2.30 Having published the consultation response document, we are now in the final stages of incorporating feedback into the refreshed Airspace Modernisation Strategy and have commenced formal consultation with the Secretary of State.

2.31 We will then continue development of the required delivery plans**,** in conjunction with relevant stakeholders, while continuing to oversee and report on progress with delivery.

Criteria for accepting the airspace change Masterplan into the Airspace Modernisation Strategy

2.32 Last year the CAA published a suite of documents comprising:

- the criteria for accepting each of the future iterations of the Masterplan into the Airspace Modernisation Strategy (CAP 2156a)
- the supporting assessment framework (CAP 2156b)
- a short summary of opportunities for stakeholders to engage in development of the Masterplan and constituent airspace change proposals (CAP 2156c – now retired)
- how we considered responses to the public engagement exercise that we ran in early 2020 (CAP 2157).

2.33 The CAA accepted Iteration 2 of the masterplan into the Airspace Modernisation Strategy in January 2022 (CAP 2312A).

2.34 We then published an Addendum to the CAP2312A acceptance document in October 2022, accepting ACOG's advice on the *'clustered'* approach to masterplan development and the integration of Farnborough into the masterplan.

2.35 Throughout 2022, the CAA has continued working with ACOG and the DfT on agreeing an approach to Iteration 3 of the masterplan which has been reflected in the updated acceptance criteria (CAP 2156a) and assessment framework (CAP 2156b), published in December 2022.

Strategic Environmental Assessment and Habitats Regulations Assessment

2.36 The Masterplan is required to be subject to a Strategic Environmental Assessment and a Habitats Regulations Assessment. These assessments are a legal requirement, and the CAA is responsible for carrying them out.

2.37 The Strategic Environmental Assessment is a systematic decision-support process, aiming to ensure that environmental and sustainability impacts are integrated into high-level government policy, planning and programme making. The Strategic Environmental Assessment for the Masterplan would be an 'upstream' assessment which complements the more specific 'downstream' assessment of environmental impacts carried out for each individual airspace change proposal under the CAP 1616 process. The aim is to influence strategic decisions taken early on, to take account of alternatives and assess the cumulative effects of multiple proposals.

2.38 The Habitats Regulations Assessment refers to the several distinct stages of assessment which must be undertaken in accordance with law on conservation of habitats and species. The Habitats Regulations Assessment for the Masterplan would determine the potential effects of the masterplan on ecologically protected sites, known as European sites, in view of the sites' conservation objectives. The CAA, as the competent authority, could only agree to the Masterplan after having ascertained that it will not adversely affect the integrity of a European site, unless there are no alternative solutions and there are imperative reasons of overriding public interest.

2.39 Following the appointment of environmental, technical and legal consultants to produce the Habitats Regulations Assessment and Strategic Environmental Assessments, the CAA commenced the workstream in April, starting with the screening of impacted sites and scoping of the environmental assessment exercises.

2.40 The CAA and their consultants will require information from ACOG, and the airspace change sponsors participating within the Masterplan Programme, to feed into the required assessments.

2.41 Screening and scoping reports are planned for early next year, followed by a public engagement exercise, most likely coordinated with ACOG's Public Engagement Exercise planned for Q2 2023.

Air Traffic Management and Unmanned Aircraft (ATMUA) Act 2021

2.42 Historically, neither the Government nor the CAA had the powers to compel that airspace change, as part of a wider modernisation programme is taken forward. To address this issue and following consultation[18], the Government introduced the Air Traffic Management and Unmanned Aircraft Bill into Parliament. The Bill received Royal Assent on 29 April 2021 and is cited as the Air Traffic Management and Unmanned Aircraft Act 2021[19].

2.43 Part 1 of the ATMUA Act 2021[20] relates to Airspace Change Proposals and contains powers for the Secretary of State[21] to direct "*a person involved in airspace change*" to progress or cooperate in an Airspace Change Proposal. Such persons are air navigation service providers, airports and other persons with functions relating to air navigation. When determining whether to use the power, the Secretary of State would consider advice from the CAA. This advice would need to take account of the extent to which the Airspace Change Proposal would assist in the delivery of the Airspace Modernisation Strategy.

2.44 Should the Secretary of State issue a Direction to a person involved in airspace change, the Act provides the CAA with enforcement powers and the ability to determine and impose a penalty based on a person's turnover.

2.45 In 2021, we published our enforcement guidance and draft statement of policy on penalties (CAP 2280) for consultation.

2.46 In addition, the Government introduced The Air Traffic Management and Unmanned Aircraft Act 2021 (Airspace Change Directions) (Determination of Turnover for Penalties) Regulations 2022 into Parliament. These regulations define "turnover" for the purpose of determining any penalties.

2.47 The CAA has an advisory role regarding the use of the Direction powers. Last year, a letter from DfT set out where the Secretary of State may require CAA advice, which includes:

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18 Department for Transport: Consultation Response on Legislation for Enforcing the Development of Airspace Change Proposals, October 2019

19 Air Traffic Management and Unmanned Aircraft Act 2021 (legislation.gov.uk)

20 Part 2 of the Act amends the ATS regulatory framework and gives temporary powers to the Secretary of State to make regulations about airport slot allocation.

21 The Secretary of State may also delegate certain functions to the CAA by giving a notice to the CAA.

- how the Airspace Change Proposal will assist in the delivery of the CAA's strategy
- the complexity of the Airspace Change Proposal and the cost of progressing it
- whether there is a case for another sponsor to progress the Airspace Change Proposal.

2.48 The Act also gives the CAA information powers, enforcement powers and the ability to issue a penalty if a sponsor does not comply with a Direction.

2.49 The CAA produced Enforcement guidance (consistent with the existing CAA wide umbrella enforcement policy) and the ATMUA Act required the CAA to consult on a penalties statement. Following the consultation, we published CAP 2431 *Air Traffic Management and Unmanned Aircraft Act 2021 Part 1: Enforcement Guidance and Statement of Policy on Penalties* in April 2022 which:

- explains the scope of type of information that may be required by the Secretary of State from the CAA
- sets out the CAA's enforcement guidance in relation to ATMUA Act Part 1
- provides a Statement of Policy on Penalties in relation to ATMUA Act Part 1 (how the CAA will judge the type and amount of penalty).

2.50 Work on setting up the regulatory regime under the ATMUA Act 2021 is now concluded.

Air Navigation Directions – Review

2.51 The DfT initiated a review of the Air Navigation Directions, with the current scope including:

- The ability to prioritise Airspace Change Proposals in order to deliver the AMS and other Govt objectives
- Updates that were planned in 2020 but were not signed off
- ICAO MET designation (UK-EU Transition related)
- Loss of Comms requirements on the CAA
- Amendments to text to better cater for drone operations under 'temporary airspace change' Direction.

2.52 Good progress has been made on all of the above areas. The DfT however, were not able to obtain sign-off before the end of 2022 and will seek to take the Directions through a sign off process in 2023.

Airspace Modernisation Strategy Support Fund

2.53 The CAA has set up the Airspace Modernisation Strategy Support Fund which is intended to aid projects in support of the delivery of airspace modernisation, where delivery benefits multiple stakeholders or research will enable wider industry deployment. It follows on from the 2015-2019 Future Airspace Strategy Deployment Facilitation Fund[22] (specifically the Small Gaps element) but is broader in scope and has a new advisory function within its governance. It provides the opportunity for recognised legal entities[23] in the UK, other than NATS (En Route) plc and the CAA, to seek financial support to deliver against the Airspace Modernisation Strategy, where the required work cannot be funded by other means.

2.54 The dedicated fund of about £2 million per annum is funded through the UK State overflight charging mechanism (en route unit rate) for commercial air transport. It was established as part of the UK regulatory cycle reference period (RP3) performance plan, and a similar provision has been maintained in the NR23 Initial Proposals for consultation. The fund is collected through the CAA element of the en route unit rate and administered by the CAA. Any unused funds will be returned to airlines through an adjustment to the UK unit rate in the future regulatory period.

2.55 The fund has been created to support the delivery of airspace modernisation, in line with the Airspace Modernisation Strategy. The proposals must therefore align with the overall objectives of the Strategy. The current set of initiatives in the Airspace Modernisation Strategy are broad in their description and will evolve with the refreshed Airspace Modernisation Strategy and any future iterations, but we expect a proposal's ambition to support the ends (the outcomes) of modernisation.

2.56 Money is allocated on the basis of annual calls for applications. We welcome any relevant proposals to be submitted, thereby providing an opportunity for a wide range of organisations to come forward, as long as their proposals align with and support the Airspace Modernisation Strategy initiatives.

2.57 The CAA's Oversight Team functions as the Airspace Modernisation Strategy Support Fund Advisory Board, together with CAA technical specialists. They will consider the proposer's business case in accordance with assessment criteria set out in the Terms of Reference before they give advice and make recommendations to the Decision Board.

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22 The Terms of Reference for the Future Airspace Strategy (FAS) Deployment Facilitation Fund were set out in CAP 1249.

23 Legal entities must be UK aviation industry, engaged in modernising the UK airspace.

2.58 The role of the Airspace Modernisation Strategy Support Fund Decision Board is to act as an objective and independent decision-maker, providing advice to the Chair of the group on the approval or rejection of funding proposals to the Airspace Modernisation Support Fund. The Airspace Modernisation Assurance Group takes on the role of the Airspace Modernisation Strategy Support Fund Decision Board. Airline representatives are invited to participate in the advice and decision-making on Airspace Modernisation Support Fund funding allocations.

2.59 Once a positive decision to fund a project has been made, there is an ongoing requirement on the CAA to provide oversight of its delivery. This work is managed and administered by the CAA's Oversight Team through a newly established Airspace Modernisation Support Fund Programme Board.

2.60 Following temporary suspension of the fund during the COVID-19 pandemic, the CAA issued its first call for applications to the fund in September last year. Two projects were successful in securing the funding, with the second call launched in March. To date an investment of just over £2.1m has been committed towards seven projects in total. Their scope and benefits have been provided below:

- **Electronic Conspicuity Interoperability Test Programme (ECIPT)** - led by The Aviation Innovation Centre. Electronic conspicuity is a range of technologies that allows airspace users to be aware of other users via radios or transponders. This is a very important project in the journey to modernising the UK airspace. It carries a lot of benefits such as ensuring safety of the airspace as it mitigates collisions and ensures awareness of airspace users.
- **Light GA Digitalisation of Flight Data** – led by Skyverse, focuses on a concept to deliver end-to-end digital transfer Visual Flight Rules data via the internet. This project is an enabler to future implementations that will help modernise UK airspace by providing a more robust demand view of traffic to air traffic control, reducing workload and ensuring radio transmissions are minimised whilst also planning transits of controlled airspace. Future implementations are expected to enhance safety in the airspace, along with the potential to reduce emissions through less refusals or delays to crossing controlled airspace.
- **FID Document Template** – led by Custom Chess Company, the project will allow Flight Information Display to reduce the burden on Aerodrome Flight Information Services. It will also provide some common standards to the documentation, improve the efficiency of CAA's approval process and encourage common standards across the aviation industry.

- **Trial of ADS-B Obstruction Beacons on 978Mhz UAT** – led by uAvionix, the trial aims at evaluating the effectiveness of the Automatic Dependent Surveillance Broadcast obstruction beacons, from the operator and the other airspace user's point of view. This will in turn ensure a safer and greener airspace.
- **Reduced Departure Divergence** – led by Heathrow & Gatwick airports aim to reduce the existing minimum standard angle of divergence for conventional departures below 45˚. The research aims at validating the use of flight data from the existing Standard Instrument Departure (SID) routes and a robust analytical approach to loss of separation risk modelling.
- **Fair and Equitable Distribution of Aircraft Noise** – is a community research project led by Gatwick Airport. This project aims to mitigate the social unacceptability of airspace design generated by airspace change proposals. The project aims to define what does '*fair and equitable distribution'* means in the context of environmental noise impacts and how this might be captured and measured as part of the airspace change process.
- **Scottish TMA Airspace Modernisation** – aims at a practical application of the ACOG developed Cumulative Impact Assessment Methodology and is led by Glasgow & Edinburgh airports. The project will use the ACOG-developed framework in practice for the first time. A robust cumulative impact assessment is essential to effectively integrate the Glasgow and Edinburgh airspace change proposals' design options. In addition, Glasgow and Edinburgh expect the outputs of the project to challenge the ACOG-developed framework, by testing the methods in a real-world scenario and provide tangible examples, templates and guidance for the other sponsors participating in the FASI Programme.

2.61 All information, including guidance on how to apply can be found on a dedicated Airspace Modernisation Strategy Support Fund webpage.

2.62 The CAA anticipates launching a 2023 call in March, with an aim of aligning objectives to specific themes of scope, falling within the short-term horizon delivery window under the refreshed Airspace Modernisation Strategy. Details regarding the call will be published in the new year.

Airspace Modernisation – Strategic risks in 2022

2.63 Chapter 1 assessed each initiative and how delivery has progressed in 2022. At a strategic level, the CAA uses this progress report to raise with the Secretary of State any concerns or risks to delivery and advise on potential solutions or mitigations. These have been captured in the sections below.

Airspace Modernisation Strategy – Scope and delivery model

2.64 The scope of the UK airspace modernisation programme has been set out through the publication of the Airspace Modernisation Strategy in 2018. Since then, the context of aviation has changed, and a risk has been identified where the balance of initiatives was no longer aligning with the requirements of stakeholders and interest groups.

2.65 The CAA mitigated that risk this year, through its Airspace Modernisation Strategy refresh activity, as described in the early sections of this chapter, ensuring that any work currently undertaken by the industry and the CAA, in line with the 2018 Airspace Modernisation Strategy and relating to controlled airspace and commercial air transport, has not been jeopardised.

2.66 Based on the public consultation feedback however, we have identified further areas of work (highlighted in previous sections), and expanded the strategy to 2040, which will require a substantial and coordinated effort from across the industry, including the CAA, to ensure a safe and effective deployment.

2.67 In the new, broader scope, consideration must be given to the appropriate delivery entity and funding stream, especially in the areas outside of NATS (En Route) plc/ACOG's current scope and competencies, as their primarily focus is on controlled airspace and commercial air transport.

2.68 We are in the process of addressing this risk, working with the DfT and relevant stakeholders and will confirm the outcome through an update to the Airspace Modernisation Strategy Governance Structure and delivery plan under the refreshed Airspace Modernisation Strategy.

Airspace Modernisation Strategy – Rulemaking

2.69 The global ambition for airspace modernisation is set out by ICAO in the form of the Global Air Navigation Plan (GANP). The GANP drives the evolution of the global air navigation system to equitably accommodate all airspace users' operations in a safe, secure and cost-effective manner, while reducing aviation's environmental impact. To this end, the GANP provides a series of operational improvements to increase capacity, efficiency, predictability and flexibility while ensuring interoperability of systems and harmonisation of procedures.

2.70 Before the UK left the EU, the UK's international obligation to align with the GANP was met through the EU Single European Sky legislation, through which Single European Sky ATM Research (SESAR) – the European air traffic control infrastructure modernisation programme – developed the European ATM Masterplan.

2.71 EU regulations enabling the European ATM Masterplan are developed for the European Commission by the European Union Aviation Safety Agency (EASA).

The SESAR Pilot Common Project (PCP), with the first set of ATM functionalities, was implemented in the UK and is retained as UK Regulation (EU) 716/2014.

2.72 Post EU exit, this process has not yet been replicated. The refreshed AMS is designed to be the UK's roadmap to meet its obligations in relation to the GANP and drive the internal rulemaking process for airspace modernisation.

2.73 The CAA is currently in the process of evaluating the different legislative and regulatory vehicles that could be used to deliver the projects and improvements that are designed to achieve airspace modernisation.

2.74 As part of this exercise, the CAA is also identifying what additional legislation and guidance that may be needed to underpin the delivery of the refreshed AMS. This is not a small task and the timescales for this work will depend on a number of factors including agreed policy for the delivery elements in the refreshed AMS (many policy areas of which are still under development, for example the integration of new airspace users), legislative and parliamentary timetabling and the development of the AMS Part 3 deployment plans.

Delivery of the FASI airspace change programme

2.75 The greatest risk in the Airspace Modernisation Strategy concerns the delivery of the FASI programme under initiatives 4 and 5. Two of the most important and complex initiatives in the Airspace Modernisation Strategy concern the coordinated redesign of terminal and upper airspace across the UK. Funding has been made available through the FASI Grant, outlined in chapter 1 of this report, however, the CAA still considers the delivery of this initiative to be at risk.

2.76 Airports will have other, potentially competing priorities as they still recover economically from the impact of the COVID-19 pandemic, while we continue to engage with airports to reinforce the importance and benefits of the airspace change programme.

2.77 A pause or delay on the part of one sponsor may have impacts on other sponsors who have interdependent airspace change proposals. There is also a possibility that some sponsors may not fully utilise the available funding to complete their Stage 2 activities within the 2022/23 financial year, as they await resolution of interactions with other sponsors' Airspace Change Proposals. As a consequence, that may lead to a breakdown of collaboration needed and defined within the Masterplan.

2.78 Sponsors need to remain coordinated with ACOG and other interdependent sponsors, to ensure that both timing and designs align. We will continue to closely monitor this issue and continue to work closely with the DfT to assist their policy development, providing support and advice, for example should it be

necessary to use the Air Traffic Management and Unmanned Aircraft Act 2021, to compel airspace change.

2.79 The FASI Programme sponsors are unable to progress through the Stage 3 gateway of the CAP 1616 process until potential conflicts and interdependencies between airspace changes are represented in an accepted Iteration 3 of the Masterplan. Delays to this will impact dates by which sponsors undergo their planned Gateway 3 assessments under the CAP 1616 process. It is expected by the CAA that the sponsors have been working closely with the ACOG and other interdependent sponsors, to develop the appropriate Masterplan content, to the quality required.

2.80 Finally, some sponsors have been unsuccessful in passing their Stage 2 gateways under the CAP 1616 process and have needed to resubmit their proposal to the CAA. In some instances, this has led to further delay in delivery timescales. accepted by the regulator during the attempted stage gateway, leading to re-work and further delay in delivery timescales.

CAA resource

2.81 With the Airspace Modernisation Strategy Refresh activity undertaken in 2022, the Airspace Modernisation Team has expanded in line with existing budget, to undertake stakeholder engagement activity, produce the content for the Airspace Modernisation Strategy refresh and backfill technical lead positions, to further strengthen the expertise within the team. Further hires may be considered to further support the team, as programme momentum builds.

2.82 The CAA must provide oversight of the delivery of the Masterplan and, from a regulatory perspective, decide whether to approve the twenty-one lower-altitude Airspace Change Proposals that comprise of the Masterplan programme. This has led to the CAA increasing its staff resource within its oversight function, in testing and monitoring the delivery of the Masterplan, in addition to administering and managing the FASI Grant on behalf of the Department for Transport. A new function has also been created within the CAA Airspace Regulation team to collaborate with ACOG and the co-sponsors on matters relevant to the masterplan work and CAP 1616 process.

2.83 The CAA will also need to consider its resource with the airspace regulation function for making decisions about individual changes. The CAA Airspace Regulation resource constraints could cause delay to the review of Airspace Change Proposal submission documents impacting sponsor timelines. Sponsors are working with the CAA and the ACOG to ensure all Airspace Change Proposals and submissions are deployed with CAA resource available.

2.84 The CAA has recruited a new specialist to address the shortage of Instrument Flight Procedure expertise in the Airspace Regulation team. The CAA has also

brought the Swiss Air Navigation Service Provider's (SkyGuide) Instrument Flight Procedure team onboard, to process the routine five- yearly reviews, to reduce the load on its own resource.

2.85 On initiative 10, the CAA is directed to, among other things, regularly consider whether airspace classifications should be reviewed, carry out a review where the CAA considers a change to classification might be made and amend airspace classifications as the CAA considers appropriate. The CAA has therefore been undertaking policy development work to design and consult on a new process, introduced in December 2020. In addition to that, the CAA holds a delivery function role, with the creation of the Airspace Classification Review Team, to design and propose an amendment to the airspace classification. The CAA has now recruited four specialist roles in airspace design, environment, cartography and safety management, along with an Engagement Lead and a Team Principal function. Progress of the work has been described in chapter 1.

2.86 On initiatives 9 and 11, the CAA has a regulatory role in that we must set out the technical solutions required to enable delivery of the Airspace Modernisation Strategy initiatives. The work the CAA has done to make progress on these, has now been superseded by the work on the Airspace Modernisation Strategy Refresh, described earlier in this chapter.

2.87 On initiative 15, the CAA is providing regulatory (policy and technical) expertise within the Aeronautical Information Management and Meteorological Information disciplines. Limited resource within this team may increase reliance on third party contractors for delivery, which may impact on planned delivery timescales.

Chapter 3

Areas of interest to communities, general aviation and innovators

3.1 The following sections relate to areas that our engagement revealed were of particular interest to communities, general aviation and innovators. This reflects the CAA's ambitions at the time of writing and may be subject to change in the final version of the refreshed Airspace Modernisation Strategy.

CAA Environmental Sustainability Strategy

3.2 The CAA's Environmental Sustainability Strategy, published earlier this year, sets out our key environmental priorities, focusing across every area of regulatory, facilitating and enabling work.

3.3 The strategy provides clarity on our roles, remit and ambition as we work together to improve environmental performance in the aviation and aerospace systems for the benefit of consumers, users and the wider community. It also highlights our aim to improve environmental performance across the aviation and aerospace system.

3.4 We already undertake a number of activities where sustainability is central or where environmental objectives are taken into account as a material factor in the exercise of our functions. With this in mind, the strategy breaks down our generic regulatory role into the different ways in which we apply it: leading, regulating, influencing, observing and communicating.

3.5 The strategy features a specific section on our role co-sponsoring the modernisation of the airspace, which sets out the context and broader ambitions within which our work to review the Airspace Modernisation Strategy sits.

3.6 Achieving successful and sustainable aviation is a significant challenge for the industry, which is one of the hardest sectors to decarbonise. All parts of the aviation system need to work together on this goal, from those investing in and developing new technologies, the Government that sets targets and key policy levers, and the regulator.

3.7 Implementation and oversight of Environmental Sustainability Strategy will be undertaken by the newly created CAA Environmental Sustainability Team, which has two distinct areas within: '*Strategy & Engagement'* and '*Research, Advice & Reporting'*.

3.8 Other tasks the group aims to focus on:

- Environmental reporting functions, including on noise and carbon.
- CAA advice to government on a proposed set of options to help in prioritising trade-offs between different policy interests more clearly, including between additional capacity, CO2 emissions and noise.
- Finalising the design of the Aviation Noise Attitudes Survey for launch in 2023
- Provision of environmental information to consumers, to highlight options with lower climate impacts, encouraging more sustainable consumer choices and further investment from industry.
- Establishment and embedding of the new CAA Environmental Sustainability Panel to support and challenge the CAA on the delivery of the Environmental Sustainability Strategy.
- Delivery of the CAA's corporate sustainability strategy, ensuring that as an organisation we are leading by example, reducing and mitigating the impact of our own operations.

3.9 The team is also engaged across industry and government, working with the government to deliver net zero aviation by 2050 through the Jet Zero Strategy, while providing advice and support on domestic and international policy.

3.10 The CAA welcomed the historic agreement at the recent ICAO Assembly on the Long Term Aspiration Goal of Net Zero by 2050 for air transport, which will provide international context and drive for our work.

3.11 More information on this subject can be found on the CAA website.

Integration – The 2040 Vision

3.12 The aim of the Airspace Modernisation Strategy refresh (see Chapter 2) was to ensure airspace modernisation responds to requirements of all stakeholders and interest groups, in a balanced manner. For that reason, the strategy will not be broken down into silos of work but will be a single airspace strategy, clearly showing benefits to all the individual airspace users.

3.13 Ideally, the air navigation system should avoid to the greatest extent possible imposing any restrictions on individual flight operations. In practice, this is rarely feasible because of external constraints (beyond the control of air navigation services) or at times conflicting needs of airspace users, amongst other reasons.

3.14 Integration and flexibility of operations in the UK airspace is a key priority of the airspace modernisation refresh. That is to help deliver an air navigation system

flexible enough to integrate changes in business and operational trajectories, at the frequency required by airspace users.

3.15 This requires use of onboard and ground-based information exchange technologies to provide timely operational information that allows for as much freedom to operate as possible for the end users while ensuring safe separation from other users.

3.16 We will deliver this through our work on electronic conspicuity and the initial developments for ground use of this information source through the Flight Information Display capability.

3.17 It is recognised in the refreshed Airspace Modernisation Strategy that some form of electronic conspicuity is one of the key enablers to facilitating the better integration of drones and other new entrants in the Class G environment.

3.18 We will look to aid deployment of new user requirements through the use of existing regulatory frameworks to help manage the burden on existing and new users, while developing operational integration further through the Lower Airspace Service concept.

3.19 The Airspace Modernisation Strategy refresh is driven by the intent of improving the overall access to airspace for all users in the spirit of '*integration over segregation'*. It will focus on better use of airspace, especially with the principle of *'only using what is required and when'*. Access to controlled airspace is already available to those that ask, but there will be more emphasis on the type of airspace classification used, along with the types of service provided, for better flexibility for the Visual Flight Rules pilot.

3.20 Our integration vision is to enable an airspace which delivers a safe, interoperable environment for all users, today and in the future. A single airspace in which all airspace users may operate.

3.21 Within our vision, traffic management services are based upon digital data exchange between ground service providers and aircraft, while separation services are provided by a variety of means, for example by evolving the current human-based tactical air traffic control service, to become more automated.

3.22 In our modernised lower airspace, aircraft and other airspace users will choose to be electronically conspicuous, to safely integrate with other users and benefit from new digital services

3.23 Our vision is built around retaining the '*freedom to roam'* principle, by encouraging users to be electronically conspicuous, to enable safe interoperability. It also focuses on improving airspace access, while providing enhanced flight information services and a joined-up, simplified air traffic service.

3.24 Our vision intentionally moves towards ICAO flight information service (FIS), however, while ICAO FIS does not allow the provision of air traffic control in Class G airspace, the Airspace Modernisation Strategy does not intend to facilitate the creation of controlled airspace everywhere that a Control Service is currently provided. We do not, therefore, mean to suggest a proliferation of control zones.

3.25 Service providers needing to deliver separation services to Instrument Flight Rule (IFR) operations will need to apply for an appropriate airspace classification via an Airspace Change Proposal, as today.

3.26 Enhanced use of Flight Intention Data will rely on voluntary submission of flight plan data, for flights in the lower airspace and in particular Visual Flight Rules (VFR) flights, will be processed and shared to and by appropriate service providers.

3.27 Radio Mandatory Zones (RMZ) are envisioned, in lieu of the current Aerodrome Traffic Zone to be implemented, regardless of the licensed status of that airfield. Operators of unlicensed airfields supporting intense and/or complex operations will be able to choose to deploy a Radio Mandatory Zone around their airfield to generate a collaborative environment as a safety mitigation.

3.28 The refreshed vision moves away from the use of Temporary Danger Areas (TDAs), towards the Transponder Mandatory Zones (TMZ), in order to facilitate Beyond Visual Line of Sight (BVLOS) drones in Class G airspace. The policy would also allow for other forms of electronic conspicuity to be used within the zone, and not only relying on transponders. That is to prevent airspace capacity shortage brought about by segregation.

3.29 Flexible access airspace (in addition to the Advanced Flexible Use of Airspace concept described in chapter 1 under initiative 3), will be an aim such that it becomes controlled when an Air Traffic Control Service is required for Instrument Flight Rules flights. The in-use airspace will be structured around the specific procedures applicable at that time.

3.30 There are already examples in the UK of flexible airspace, for example at Southampton, while the CAA's Airspace Classification Team will continue to review the classification of airspace and to amend volumes where appropriate. An example of such work already instigated is a review of defence airspace suitability, as a consequence of the findings of the Cotswold Review Report. The findings of the report suggested some military areas could also be revised. We recognise that this process adds additional requirements, but it is seen as part of airspace management responsibility, including needed justification for the current amount of controlled airspace.

3.31 Furthermore, while segregation will remain for specific activities, where safety is of concern, for example due to military firings or space launched, more flexibility

will be sought for Danger Areas only being active for the minimum safety and time required.

3.32 The long-term objective is that this airspace will better facilitate autonomous, self-managed use, by suitably equipped aircraft.

3.33 It is also intended to progress a Lower Airspace Service that will provide the services and airspace management necessary to better enable these changes.

Simplifying and digitising UK Flight Information Services

3.34 As mentioned above, a surveillance-based ICAO Flight Information Services is planned to replace the current Lower Airspace Radar Service and other flight information service providers. This will be a dedicated service for the lower airspace user. The concept is being developed and planned for it to take advantage of cooperative surveillance and be available 24/7 but with a focus on the daylight hours.

3.35 In addition, this service would also provide the airspace management function for flexible access airspace, enable Remotely Piloted Aircraft Traffic Management conduit and be the steppingstone to autonomous airspace.

3.36 As part of digitised Flight Information Service provision, there is an intention for a wide area broadcast service of a suite of data products, transmitted for the use of any air system within range of the broadcast. The data will include near real time and forecast meteorological products, as well as textual and graphical data supporting airspace notification and tactical changes. This concept is known as FIS-B, which stands for Flight Information Service – Broadcast.

3.37 The broadcast will utilise internationally recognised formats and operate within the aviation spectrum, ensuring the widest possible range of reception equipment possibilities and will be free at the point of use.

3.38 The concept also makes provision for ground-based obstruction beacons will electronically mark temporary obstructions in the airspace.

3.39 Similarly for the digital traffic information, that will normally be derived by direct reception of cooperative air systems however, it will be deployed as a localised service where the airspace will benefit from a rebroadcast of a unified surveillance picture of multiple emission types. That concept is known as Traffic Information Service – Broadcast (TIS-B).

3.40 To help visualise the future of lower airspace, please see our infographic on Modernised Lower Airspace in the UK in Appendix A of CAP 2404.