Title: Airspace Modernisation – UK Airspace Design Service (UKADS)

IA No: DfT00477

RPC Reference No: N/A

Lead department or agency: Department for Transport

Other departments or agencies: Civil Aviation Authority **CAP 3029a**

Impact Assessment (IA)

Date: 16/08/2024

Stage: Consultation

Source of intervention: Domestic

Type of measure: Other

Contact for enquiries: airspace.modernisation@caa.co.uk

Summary: Intervention and Options

RPC Opinion: Not Applicable

Cost of Preferred (or more likely) Option (in 2019 prices, 2020 present value)			
Total Net Present Social Value	**Business Net Present Value**	**Net direct cost to business per year**	**Business Impact Target Status**
£61.5m	£28.6m	£0.04m	Non qualifying provision

What is the problem under consideration? Why is government action or intervention necessary?

Airspace modernisation is a critical part of the UK's Aviation strategy. The current model for airspace change is complex and inefficient. With individual change sponsors overseeing the development of their own airspace designs as part of the airspace modernisation process, each region of inter-connected airports can only proceed at the pace of its slowest member. There is a significant risk that the current model will lead to a co-ordination failure, that adjacent changes will not be compatible with each other, or that designs will be sub-optimal from a network perspective, particularly for airports in and around London which have the potential to deliver the greatest benefits. Government intervention is required to ensure that the airspace changes necessary for airspace modernisation are delivered.

What are the policy objectives of the action or intervention and the intended effects?

The policy objective is to ensure that Airspace Change Proposals (ACPs) are developed and implemented efficiently, resulting in the timely delivery of airspace modernisation. This is particularly the case for those ACPs that are part of the London Cluster within the airspace change masterplan, which offer the greatest benefits but where significant complexities have called into question the effectiveness and hence delivery confidence of the existing approach. The UK Airspace Design Service (UKADS) will help achieve the vision of airspace modernisation: To deliver quicker, quieter and cleaner journeys and more capacity for the benefit of those who use and are affected by UK airspace, as well as the wider strategic objectives of airspace modernisation – enhancing aviation safety, enabling the integration of diverse users of airspace, simplifying airspace designs and improving efficiency, and applying environmental sustainability as an overarching principle through all airspace modernisation activities.

What policy options have been considered, including any alternatives to regulation? Please justify preferred option (further details in Evidence Base)

Option 0 – Do nothing. Under the 'do nothing' option, individual change sponsors (usually airports) would remain responsible for progressing their own airspace changes. The Airspace Change Organising Group (ACOG) would continue to co-ordinate ACPs on a voluntary basis as required under the airspace masterplan, and the Civil Aviation Authority would continue to deliver the overarching Airspace Modernisation Strategy.

Option 1 (preferred option) – Establish an Initial UKADS to deliver airspace modernisation ACPs within the London Terminal Control Area (TMA) region, and any other ACPs deemed a short-term priority. The Initial UKADS would be established within an existing third-party organisation. Other ACPs would continue to be delivered under current arrangements. The initial UKADS would have a tightly defined scope and (subject to decisions) could have a fixed lifespan. This option would offer enhanced certainty on delivering the aspects of airspace modernisation most at risk of delay, while offering the potential for more permanent approaches to be considered in the longer term.

Option 2 – Establish an End State and permanent UKADS with an increasing scope over time. This option would see an Initial UKADS within a third-party organisation, until a standalone End State UKADS could be established.

Will the policy be reviewed? It will be reviewed. **If applicable, set review date:** TBC

Is this measure likely to impact on international trade and investment?		No		
Are any of these organisations in scope?	**Micro** Yes	**Small** Yes	**Medium** Yes	**Large** Yes
What is the CO_2 equivalent change in greenhouse gas emissions? (Million tonnes CO_2 equivalent)		**Traded:** -0.20	**Non-traded:** -0.01	

I have read the Impact Assessment and I am satisfied that, given the available evidence, it represents a reasonable view of the likely costs, benefits and impact of the leading options.

Signed by the responsible Minister: Mike Kane Date: 10 October 2024

Summary: Analysis & Evidence

Policy Option 1 (preferred option)

Description: Establish an Initial UKADS to deliver London TMA region ACPs, and other ACPs deemed a short-term priority

FULL ECONOMIC ASSESSMENT

Price Base Year 2024	PV Base Year 2025	Time Period Years 15	Net Benefit (Present Value (PV)) (£m)		
			Low: -	**High: -**	**Best Estimate:** 84.5

COSTS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Cost (Present Value)
Low	-	1	-	**-**
High	-		-	**-**
Best Estimate	0.09		-	**0.71**

Description and scale of key monetised costs by 'main affected groups'

Costs predominantly fall upon those organisations that will be captured by the funding mechanism for the UKADS – expected to largely be commercial airlines. Across the ACPs assessed in this case, this results in a PV cost of £33.5m. This is largely a transfer from airspace change sponsors (predominantly airports and Air Navigation Service Providers (ANSPs)), who would experience corresponding savings of £32.9m. Airspace change sponsors will face familiarisation costs of c. £85,600.

Other key non-monetised costs by 'main affected groups'

There will be further costs associated with the initial establishment of the Initial UKADS. The ultimately affected groups will again depend on funding mechanisms, which will be guided by the user pays principle.

BENEFITS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Benefit (Present Value)
Low	-		-	**-**
High	-		-	**-**
Best Estimate	-		7.5	**85.2**

Description and scale of key monetised benefits by 'main affected groups'

The primary indicative monetised benefits are fuel savings to airlines operating at the London airports that are able to modernise their airspace earlier – this amounts to a PV of £40.0m. There are further substantial social benefits delivered through the associated reduction in carbon emissions, valued at £45.1m.

Other key non-monetised benefits by 'main affected groups'

Timely and effective (i.e. optimised) delivery of airspace modernisation is expected to lead to a greater ability to manage overall noise impacts for communities around airports. Modernised airspace will additionally help to reduce delays for passengers. Further benefits may be delivered by enabling the implementation of upper airspace changes. Further benefits may be delivered as a result of the UKADS providing a holistic design for London terminal airspace, making trade-offs and securing an optimal overall design in a way that would be more difficult under an airport-led approach.

Key assumptions/sensitivities/risks	Discount rate (%)
The benefits modelling has used indicative scenarios to display potential benefits. These have been tested with sensitivity analysis, but will be refined in line with views received during the consultation. There remains uncertainty as to the delivery timelines for modernised airspace, both under the status quo and under this option. Key risks include that existing airspace change sponsors may seek to delay their ACPs in order to pass costs to the UKADS, but it is believed sufficient mitigations are in place to prevent this.	3.5

BUSINESS ASSESSMENT (Option 1)

Direct impact on business (Equivalent Annual) £m:			Score for Business Impact Target (qualifying provisions only) £m:
Costs: 0.1	**Benefits:** 0.0	**Net:** 0.1	

Summary: Analysis & Evidence

Policy Option 2

Description: Establish an End State UKADS with an increasing scope over time (Incorporates Option 1)

FULL ECONOMIC ASSESSMENT

Price Base Year 2024	PV Base Year 2025	Time Period Years 15	Net Benefit (Present Value (PV)) (£m)		
			Low: -	**High:** -	**Best Estimate:** 91.4

COSTS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Cost (Present Value)
Low	-	1	-	**-**
High	-		-	**-**
Best Estimate	0.10		-	**0.99**

Description and scale of key monetised costs by 'main affected groups'

Costs predominantly fall upon those organisations that will be captured by the funding mechanism for the UKADS – expected to largely be commercial airlines. Across the ACPs assumed in this case, this results in a PV cost of £46.6m. This is largely a transfer from airspace change sponsors, who would experience corresponding savings of £45.7m. Airspace change sponsors will face familiarisation costs of c. £104,000.

Other key non-monetised costs by 'main affected groups'

There will be further costs associated with both the initial establishment of an Initial UKADS, and subsequent establishment of an End State UKADS. The ultimately affected groups will again depend on funding mechanisms, which will be guided by the user pays principle. There will be further cost transfers from those who would have acted as airspace change sponsors for wider ACPs under the baseline.

BENEFITS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Benefit (Present Value)
Low	-		-	**-**
High	-		-	**-**
Best Estimate	-		8.0	**92.4**

Description and scale of key monetised benefits by 'main affected groups'

The primary indicative monetised benefits are fuel savings to airlines operating at airports who are able to modernise their airspace earlier – this amounts to a PV of £43.5m. There are further substantial social benefits delivered through the associated reduction in carbon emissions, valued at £48.9m.

Other key non-monetised benefits by 'main affected groups'

Timely or effective delivery of airspace modernisation is expected to lead to a greater ability to manage overall noise impacts for communities around airports. Modernised airspace will additionally help to reduce delays for passengers. An expansive UKADS will offer further benefits to emerging sectors, particularly those utilising unmanned aircraft systems, by facilitating the airspace change process. Further benefits may be delivered by enabling the implementation of upper airspace changes.

Key assumptions/sensitivities/risks	Discount rate (%)	3.5

The benefits modelling has used indicative scenarios to display potential benefits. These have been tested with sensitivity analysis, but will be refined in line with views received during the consultation. There remains uncertainty as to the delivery timelines for modernised airspace, both under the status quo and under this option. Key risks include that existing airspace change sponsors may seek to delay their ACPs in order to pass costs to the UKADS, but it is believed sufficient mitigations are in place to prevent this.

BUSINESS ASSESSMENT (Option 2)

Direct impact on business (Equivalent Annual) £m:			Score for Business Impact Target (qualifying provisions only) £m:
Costs: 0.1	**Benefits:** 0.0	**Net:** 0.1	

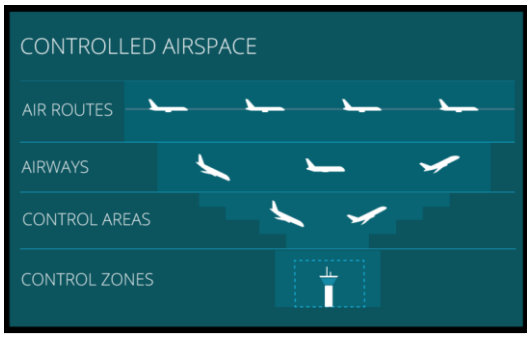
Evidence Base

1) Background

1.1) The structure of UK airspace[1]

1. All airspace around the world is divided into Flight Information Regions (FIRs). Each FIR is managed by a controlling authority that has responsibility for ensuring that air traffic services are provided to the aircraft flying within it. UK Airspace is divided into three FIRs: London, Scottish and Shanwick Oceanic. The Civil Aviation Authority (CAA) is the controlling authority for the UK, with NATS[2] providing air traffic services for them.
2. Airspace within an FIR is usually divided into pieces that vary in function, size and classification. Classifications determine the rules for flying within a piece of airspace and whether it is controlled or uncontrolled. Aircraft in controlled airspace must follow instructions from Air Traffic Controllers, while aircraft flying in uncontrolled airspace are responsible for their own separation and terrain clearance. Aircraft in uncontrolled airspace are not mandated to be in receipt of an air traffic service.
3. In the UK there are five classes of airspace: A, C, D, E and G. The classification of airspace within an FIR determines the flight rules that apply and the minimum air traffic services which are to be provided. Classes A, C, D and E are areas of controlled airspace, and G is uncontrolled airspace.
4. Controlled airspace is provided primarily to protect its users, mostly commercial airliners, and as such, aircraft which fly in controlled airspace must be equipped to a certain standard and their pilots must hold certain flying qualifications. Pilots must obtain clearance from Air Traffic Control (ATC) to operate within such airspace and they must follow ATC instructions.
5. In addition to being given a class, controlled airspace may further be defined by its 'type' depending on where it is and the function it provides:
    i. Aerodrome **Control Zones** afford protection to aircraft in the immediate vicinity of aerodromes;
    ii. **Control Areas** are situated above Aerodrome Traffic Zones and afford protection over a larger area to a specified upper altitude;
    iii. **Terminal Control Areas** are normally established at the junction of airways in the vicinity of one or more major aerodromes. The London Terminal Control Area is an example of this;
    iv. **Airways** are corridors of airspace connecting Control Areas and link up with airways in other countries too. Airways usually have bases between 5,000 and 7,000 feet and extend upward to an altitude of 24,500 feet;
    v. **Upper Air Routes** sit above airways, usually from 25,000 to 46,000 feet. All airspace above 24,500 feet is Class C controlled airspace;
    vi. **Restricted** areas prevent aircraft from entering dangerous places. To ensure efficient use of airspace, most Restricted areas can be deactivated when they are not in use.

Figure 1: Diagram of controlled airspace



[1] This section summarises NATS' introduction to airspace, which provides further detail and is available at Introduction to Airspace - NATS

[2] Formerly 'National Air Traffic Services'

6. Within controlled airspace, flight procedures, restrictions, routes, rules and policies may be established. For airports, these are most commonly Standard Instrument Departure (SID) and Standard Arrival (STAR) routes, which dictate how aircraft must depart from and arrive at airports, such as their precise routing, altitude and speed restrictions. Each airport may have a number of different SID and STAR routes, the use of which will depend on the destination of an individual flight, weather conditions, or in some cases the need to provide noise respite to communities. These routes have historically been dependent on ground based navigational aids, which help to direct aircraft.

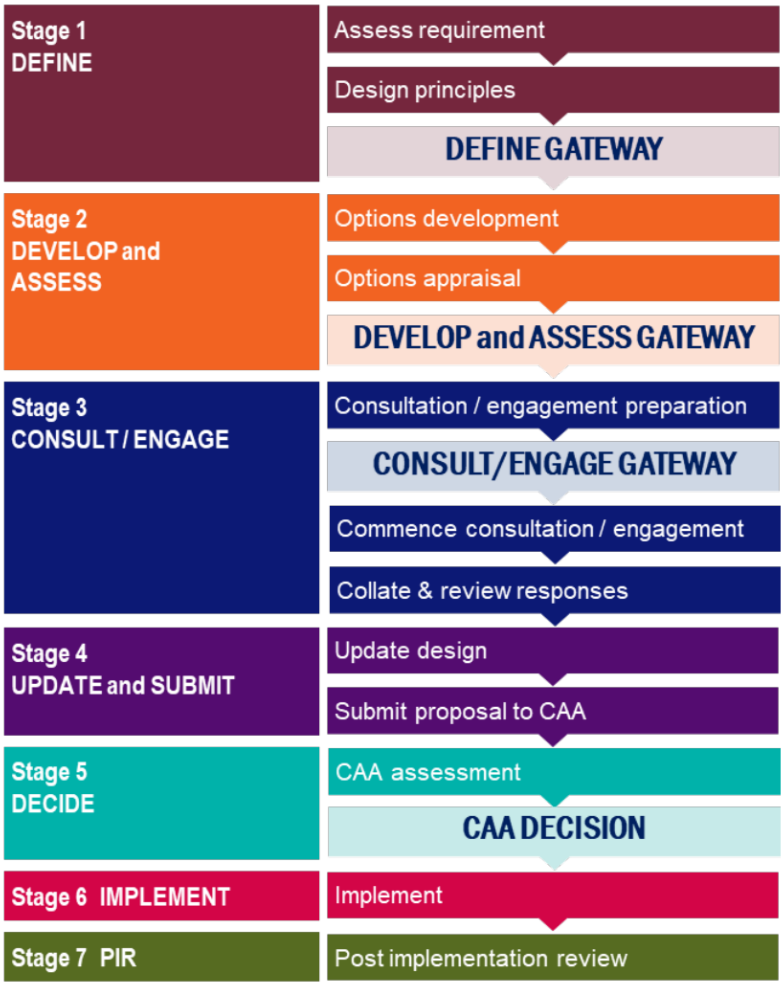
1.2) The Airspace Change Process

7. The needs of airspace users are constantly changing, and as such procedures are needed to allow for changes to structured airspace. The CAA is responsible for managing this process and deciding whether or not to approve individual Airspace Change Proposals (ACPs). In some cases, individuals or organisations may request to 'call-in' the decision on an ACP which, if approved, results in the decision being made by the Secretary of State for Transport (hereon referred to as the Secretary of State). Maintaining a high standard of safety is the CAA's primary duty when it makes airspace change decisions, in accordance with section 70(1) of the Transport Act 2000. Beyond this, section 70(2) requires the CAA to consider a number of factors, including safety, security and operational and environmental impacts, some of which may conflict with others.

8. Changes to airspace are proposed by an airspace change sponsor. An airspace change sponsor owns the ACP and is responsible for developing it, including taking into account feedback from relevant stakeholders. Anyone can sponsor an airspace change proposal – although it is usually an airport or an air navigation service provider (ANSP). An airport will typically sponsor a change to the airspace design in its immediate vicinity, while NERL (the air navigation service provider for en-route airspace) will typically sponsor changes to airspace above 7000ft.

9. The airspace change process was reformed in 2018 in order to provide a clearer, more robust approach. Following a public consultation, the CAA published a further revised process in October 2023. This is set out in Civil Aviation Publication (CAP) 1616, and summarised below.

Figure 2: The CAP 1616 Airspace Change Process



10. The process comprises seven stages, during which a change sponsor must demonstrate:
    - A need or opportunity for a change to airspace design
    - That relevant design principles have been established through effective engagement with those affected, and that design options have been informed by these design principles
    - That the impacts of those design options have been properly assessed
    - That, where relevant, they have facilitated meaningful consultation or engagement on proposed options and that feedback has been taken into account
    - That the final ACP submission to the CAA of the change to airspace design contains all relevant and necessary information.
11. The precise requirements are dependent on the impact of the change, and special arrangements govern temporary changes or airspace trials.
12. The process contains a series of 'Gateways', at which the CAA decides whether or not an ACP has followed the correct process up to that point and can progress to the next stage. If rejected, a change sponsor will be required to rectify the shortcomings identified in the CAA's decision before resubmitting to that gateway.

1.3) Airspace Modernisation

13. Many of the ACPs currently being progressed are as a result of the UK's programme of airspace modernisation. The need for airspace modernisation has arisen as the growing demand for aviation has been constrained by the capacity of the UK's airspace. The basic design of airspace has remained the same for decades, despite technological advances. This has resulted in increasingly inefficient flightpaths, delays and reduced resilience, which will only worsen as future demand grows.[3]
14. The UK's airspace modernisation plan exists within the context of a wider global programme. The International Civil Aviation Organization (ICAO) established the Global Air Navigation Plan (GANP) to provide strategic guidance and timescales for regional and national airspace modernisation programmes.
15. In 2017, the Secretary of State tasked the CAA with preparing and maintaining a coordinated strategy and plan for the use of UK airspace up to 2040. Under the direction of the Secretary of State, the CAA published a revised Airspace Modernisation Strategy in early 2023 that sets out strategic vision and objectives[4] and required delivery elements[5]. Of the nine interlinked delivery elements, categorised under two headings of aircraft-based navigation and airspace management, one key element is the redesign of terminal airspace.
16. To facilitate the redesign of terminal airspace, ACOG was formed in 2019. As part of its role to coordinate the national programme of airspace redesign, ACOG have been developing a 'masterplan' of all ACPs that are deemed strategically important. The latest iteration of the masterplan[6] identifies 20 airports[7] in scope, in four geographic groupings (clusters):

    Scottish Cluster

    Edinburgh, Glasgow.

    Western Cluster

    Bristol, Exeter.

[3] Upgrading UK Airspace: Strategic Rationale. Department for Transport, 2017

[4] CAP 1711 Part 1 Airspace Modernisation Strategy 2023-2040 (caa.co.uk) The vision of the AMS is to deliver quicker, quieter and cleaner journeys and more capacity for the benefit of those who use and are affected by UK airspace. Benefits to consumers include greater connectivity, faster journeys and greater resilience to disruption.

[5] CAP 1711a Part 2 Airspace Modernisation Strategy 2023-2040 (caa.co.uk)

[6] UK Airspace Change Masterplan Iteration 2 (caa.co.uk)

[7] At the time of publication, Iteration 2 of the masterplan identified 21 airports. Since then, Farnborough has been added and Aberdeen and Cardiff have been removed, making 20. For more information see https://www.caa.co.uk/commercial-industry/airspace/airspace-modernisation/airspace-change-masterplan/evolution-of-the-masterplan/

Manchester Cluster

East Midlands, Leeds Bradford, Liverpool, Manchester.

London Cluster

Biggin Hill, Bournemouth, Farnborough, Gatwick, Heathrow, London City, Luton, Manston, RAF Northolt, Southampton, Southend, Stansted.

17. In addition to these airport-level changes, the masterplan also incorporates the redesign of areas of airspace above 7,000 feet, including the particularly congested London TMA region.

2) Problem under consideration

18. The ACPs making up the masterplan, particularly in London and the South-East, are highly interdependent and complex. Each element of airspace redesign is also fundamentally and inextricably interlinked – airport SIDs and STARs[8] must integrate with any terminal area control design, which must in turn align with upper airspace design. A delay to any individual ACP may therefore have implications stretching across wide portions of the network.

19. As of February 2024, all 20 airport-led ACPs identified above were at either Stage 2, the 'Develop and Assess' Gateway, or at the first step of Stage 3. Therefore, there remains a considerable amount of further development required in order to deliver the airspace changes.

20. Many of these ACPs have been subject to considerable delay. While there may be a range of reasons for these delays, that so many ACPs suffer delays suggests a potential systemic issue that may need to be rectified. It must be recognised that much of the planned airspace modernisation activity was due to occur during the height of the COVID-19 pandemic, which disrupted activity. £9.2m of government funding was provided during this period to ensure that progress on airspace modernisation was maintained and this enabled sponsors to continue with their programmes, which otherwise would have paused or ceased. An assessment of delays to pass the 'Develop and Assess' gateway is shown in Table 1 below.

Table 1: State of ACPs making up the masterplan as of September 2024[9]

Airport	Initial develop & assess gateway estimate (Stage 2)	Date develop & assess gateway passed (Stage 2)
Edinburgh	28th February 2020	8th March 2023
Glasgow	24th June 2022	1st September 2022
Bristol	25th February 2022	3rd August 2022
Exeter	29th November 2019	Not yet completed
Manchester	29th May 2020	31st March 2023
Liverpool	30th November 2018	6th October 2023
East Midlands	29th May 2020	23rd November 2023
Leeds Bradford	28th October 2022	Not yet completed
Heathrow	30th June 2023	11th July 2024
Gatwick	29th July 2022	17th October 2023
Stansted	31st January 2020	13th April 2022
Luton	25th March 2022	1st April 2022
London City	20th December 2019	24th June 2022
Southend	31st July 2020	Not yet completed

[8] Standard Instrument Departure and Standard Arrival Route – the published flight procedures followed by aircraft on an Instrument Flight Rules (IFR) flightplan immediately after take-off (SID) and just before reaching a destination airport (STAR); in other words designated routes linking the runway and the 'en route' phase of flight.

[9] Based on earliest available Indicative Timeline Forms on the CAA Airspace Change Portal. This may not comprehensively capture the true 'initial' estimate, so delays may be underestimated.

Southampton	24th April 2020	3rd February 2023
Bournemouth	31st July 2020	Not yet completed
Biggin Hill	31st January 2020	8th March 2023
RAF Northolt	24th June 2022	29th November 2022
Manston	27th March 2020	3rd October 2022
Farnborough	23rd February 2024	Not yet completed

21. While the immediate problem under consideration is the need to deliver the airspace changes necessary for airspace modernisation, there exists a wider potential problem with the development of ACPs by individual sponsors. Of the 20 ACPs above, 50% failed to pass at least one of the gateways on their first attempt, with failures to progress through gateways also noted in ACPs that are unrelated to the masterplan.[10] Airspace change is by its nature highly complex, and the relatively small number of ACPs that each individual airport undertakes limits their ability to have airspace design skills in-house and to gain practical experience of the CAP 1616 process. This is partially mitigated by sponsors' extensive use of external airspace design consultants who have a high degree of familiarity with the CAP 1616 process. However, these consultants are relatively few in number and in high demand. As a result, despite the use of these specialist consultants, the quality of the ACP submissions to the CAA in recent years has been variable. Airspace design skills are in short supply and the decentralised approach means these skills are both thinly spread across industry and lacking common standards.

22. This issue is also likely to be particularly relevant to other organisations such as windfarms, or new drone or spaceport operators, some of whom may be going through the process for the first time.

23. Furthermore, the CAA's refreshed Airspace Modernisation Strategy published in January 2023 broadens its scope to include future airspace concepts such as an integrated airspace accommodating new types of airspace user (drones, electric vertical take-off and landing aircraft (e-VTOL), spacecraft) while improving access for General Aviation and military users, but there is no single entity to deliver those new concepts nor any agreed way to fund them.

3) Rationale for intervention

24. The current delivery model requires individual 'sponsors' (mainly airports and air navigation service providers) to design and propose airspace changes. Each sponsor attempts to optimise their usage of airspace within the constraints already set by existing airspace design, as and when their own needs change. Unlike other countries, including most of Western Europe, the US and Australia, in the UK no single organisation is responsible for creating a modern and coherent airspace design.

25. In contrast, the airspace modernisation programme involves airspace serving multiple airports being redesigned simultaneously. This offers the opportunity to develop airspace in such a way that network efficiency is maximised. However, to do so requires a high degree of co-ordination between all change sponsors – designs must take into consideration those of other change sponsors in order to ensure they are non-conflicting. This interdependence means that change sponsors within a cluster have to proceed through the CAP 1616 airspace change process in lock-step, and at the pace of the slowest sponsor. To generate coherent airspace design across the whole network, it could require multiple iterative designs from individual sponsors to resolve confliction issues.

26. There are multiple airport sponsors for these airspace redesigns, with each airport incentivised to optimise their own airspace design. Airspace is an excludable resource, and if airports consider only costs and benefits that accrue to themself, airspace designs will not be socially optimal. The CAP 1616 process is designed to mitigate this – requiring the calculation of negative externalities such as noise impacts to ensure that designs are robust, but there remains an incentive to prioritise benefits to the airport sponsor rather than the overall network. It is the airport change sponsor that faces the direct costs of undertaking a change, but the whole sector – airports, airspace users[11], passengers and potentially overflown communities – who will benefit. When facing all of the costs, but only some

[10] DfT analysis of CAA Airspace Change Portal.

[11] Including airlines, General Aviation, military and new entrants like drones, aerial taxis and spacecraft.

of the benefits, airports may not be incentivised to progress these changes as quickly as socially optimal.

27. This current model is complex and inefficient, with designs of varying quality. With individual change sponsors developing their own airspace designs as part of the modernisation process there is a significant risk that the current model would lead to a co-ordination failure, and/or that adjacent changes will not be compatible with each other, particularly for the London TMA region which is some of the most congested and complex airspace in the world. While ACOG has provided a benefit through trying to coordinate some activities, it does not have the power or remit to produce a single and coherent design from the ground up to cruising altitude.

28. This could result in significant further delays to the programme, additional costs to develop ACPs, and / or sub-optimally designed airspace. Stakeholder engagement, in particular the CAA's 2022 consultation on its Airspace Modernisation Strategy and two rounds of formal discussions with a range of stakeholders in September and December 2023 on scoping an alternative approach to airspace design, has only reinforced those concerns. In Scottish airspace, where airspace redesign focuses on adjacent changes between only two airports and NATS, a lack of coordinated design has created a year-long delay in the programme of work.

29. The risk is that the benefits of airspace modernisation – including to the UK economy, consumers (such as greater connectivity, faster journeys, greater resilience to disruption), integration of new airspace users and the environment – will not be realised. The airspace change masterplan risks being delayed. Delivery of government's Future of Flight strategy may be at risk because innovation may be stifled if new types of airspace user (such as drones, e-VTOL, spacecraft) cannot get access to modernised and integrated airspace. General Aviation and military activities may also be constrained. The Government's and CAA's credibility may suffer in having a modernisation strategy containing expectations that cannot be delivered.

4) Policy Objective

30. The policy objective is to ensure that ACPs are developed and implemented efficiently, resulting in the timely delivery of airspace modernisation. This is particularly the case for those ACPs that are part of the London Cluster within the airspace change masterplan, where significant complexities have called into question the effectiveness and hence delivery confidence of the existing approach.

31. The proposal will help achieve the vision of airspace modernisation: *To deliver quicker, quieter and cleaner journeys and more capacity for the benefit of those who use and are affected by UK airspace,* as well as the wider strategic objectives of airspace modernisation – enhancing aviation safety, enabling the integration of diverse users of airspace, simplifying airspace designs and improving efficiency, and applying environmental sustainability as an overarching principle through all airspace modernisation activities.

5) Options Considered

5.1) Option 0 – Do nothing

32. Under the 'do nothing' option, individual change sponsors would remain responsible for progressing their own airspace changes, as detailed in section 1.2. ACOG would continue to co-ordinate ACPs as required under the airspace masterplan, and the CAA would continue to oversee delivery of the Airspace Modernisation Strategy. But while ACOG can develop the masterplan through coordinating activities, it does not have powers to dictate to airports how and when to produce their designs, or to make trade-offs when airports create conflicting designs. If airports were to generate conflicting designs, there would be no formal mechanism for resolving this, other than relying on airports to voluntary alter their designs.

33. The potential implications of this are discussed fully in section 7.1, but this is predominantly expected to result in delays to the modernisation programme, increased costs for ACP sponsors, a redesign of lower airspace that gives a less efficient network, a risk to the Government's Future of Flight programme, or all of the above. Delays to the redesign of lower airspace would be expected to have knock-on impacts for the redesign of upper airspace.

5.2) Establishing a UKADS

34. This section considers the varying forms that a UKADS could take and outlines the two options identified for the purposes of this Impact Assessment. In broad terms, the UKADS would be an organisation tasked with taking a centralised role in developing and progressing ACPs, ultimately replacing the current approach involving multiple airspace change sponsors. The UKADS would work closely with existing change sponsors, who would retain responsibility for some aspects of ACPs.

35. While changing which organisations are responsible for progressing ACPs, the creation of the UKADS would not fundamentally change the CAP1616 process that determines how ACPs must be progressed, nor would it change how airspace is managed on a day-to-day basis.

36. For a given ACP, it is proposed that the UKADS is responsible under CAP1616 as the change sponsor. Airports and ANSPs at the outset of the ACP would agree what level of input is required from them. The partnership agreement would be key in establishing the relationship between the UKADS and an airport or ANSP. Mandatory input will include safety cases, where the airport can use their detailed operational knowledge to underpin assessments.

37. Airports and ANSPs may choose to deliver the engagement and consultation activities, retaining control over those areas that would most benefit from their local knowledge. This requirement would be optional, as the UKADS could complete this step without the airport or ANSP being involved.

Table 2: ACP workstreams and responsibilities under a UKADS led process

Workstream	Responsible organisation
Project management	UKADS
Airspace / IFP design	UKADS
Environmental assessment	UKADS
Engagement and consultation	The airport (or other ‘partner’ for the ACP) may be responsible for certain aspects if they choose, with UKADS retaining overall accountability
Economic assessment	UKADS
Safety Case assessment	The airport (or other ‘partner’ for the ACP)
Aeronautical information	UKADS
Implementation	The airport (or other ‘partner’ for the ACP) through the designated airspace controlling authority responsible for the airspace in question.
Post Implementation Review	UKADS

38. The sections below consider options relating to specific characteristics of the UKADS. Given the wide range of potential combinations, these are not all assessed – representative options encompassing each of these areas of choice are set out in section 5.2.4.

5.2.1) Organisational Structure

39. The UKADS will either need to be established as a new organisation or set-up within an existing organisation. Potential options are considered below.

A new UKADS supported by primary legislation

40. This option would create a wholly new entity, such as a statutory corporation, with functions and services, accountability and charging structures specific to a UKADS. It could include a bespoke charging mechanism, enforcement and any other powers needed specific to the UKADS through primary legislation.

41. This option requires a long lead-in time so would not be in place to deliver the London Cluster redesign within the required timeframe to meet the need for airspace modernisation.

A new CAA directorate (discounted)

42. This model would require the Secretary of State for Transport to direct the CAA, through the Air Navigation Directions, to create the UKADS function within a new CAA directorate. The CAA would have the function of both airspace designer and airspace decision-maker.

43. This option is discounted as it is thought unlikely the CAA would be able to attract and retain appropriately skilled airspace designers to deliver the required UKADS function and in the required timeframe. In addition, earlier stakeholder engagement has identified a lack of support from both industry and community groups for this option. The principal concern was that this would place the CAA in the position of both designing airspace (as the UKADS) and then approving that design as regulator, thereby creating a perceived conflict of interest.

A third-party entity (e.g. NERL)

44. This option would establish the UKADS within a third-party entity. For the purposes of this Impact Assessment, this is assumed to be NERL, the air navigation service provider for en-route airspace[12], and the typical sponsor of changes to upper airspace, through a licence condition.

5.2.2) ACPs in scope

45. In the short term, it would not be practical for the UKADS to take immediate responsibility for all ACPs, and the range of ACPs in scope would evolve over time. Potential options are considered below.

London TMA region ACPs only

46. ACPs within the London TMA region have been identified as being most at risk from suffering a co-ordination failure and being delayed as a result. Under this option, the UKADS would be established to progress these ACPs as a priority, with non-London change sponsors within the scope of the masterplan continuing to progress their own ACPs, coordinated by ACOG.

London TMA region ACPs + ACPs identified as a priority

47. In addition to the London TMA region ACPs, under this option the UKADS would be responsible for progressing ACPs deemed as a priority, which could include those with urgent safety / security implications, or others considered a priority by DfT and the CAA.

Rollout to all ACPs

48. Under this option, the UKADS would be expected to eventually take over progression of all UK ACPs. As it would take several years for capacity within the UKADS to be sufficiently grown, the UKADS would be required to focus on selective ACPs in the short term.

5.2.3) Funding

49. Any approach to funding will be guided by the ‘user pays’ principle, wherein those who benefit from airspace modernisation will be expected to fund it. Potential options are considered below.

UKADS costs recouped through the UK en-route rate and London Approach rate

50. Under this option, costs for the UKADS would be paid for using the existing UK en-route rate and London Approach rate. This is already used to fund NERL’s airspace change, as well as the CAA’s regulatory costs. As this is levied on users of controlled airspace, this would cause costs to fall on airlines, rather than airports as currently.

UKADS costs recouped through a new charge

51. Under this option, a new charge would be established to fund the costs of the UKADS, which could be levied on the wider aviation sector, including airports. The precise design of the charge would be subject to further assessment and consultation.

52. This charge could also be used to finance a UK Airspace Design Support Fund that would part-finance eligible UK ACPs not being undertaken by the UKADS.

[12] NERL operate as a monopoly provider under a license issued under the Transport Act 2000 and are regulated by the CAA. NERL sit within NATS, a public private partnership between the Airline Group, which holds 42%, NATS staff who hold 5%, UK airport operator LHR Airports Limited with 4%, and the Government which holds 49% (the golden share).

5.2.4) Final Options

53. Two options have been selected, varying the scope of the UKADS:

Option 1 – Establishment of an Initial UKADS within a third-party entity to progress airspace modernisation ACPs within the London Terminal Control Area (TMA) region, and other ACPs identified as a short-term priority **(preferred option)**. This is the preferred option as it offers enhanced certainty on delivering the aspects of airspace modernisation most at risk of delay, while offering the potential for more permanent approaches to be considered in the longer term.

Option 2 – Establish an End State UKADS, which could initially focus on London TMA region ACPs but rolling out to other ACPs as capacity grows. In the short term, the UKADS is likely to be established within a third-party entity, until an End State UKADS can be established, either by putting the Initial UKADS on a statutory footing, or by establishing a new body through primary legislation.

6) Rationale and evidence to justify the level of analysis used in the IA (proportionality approach)

54. This Impact Assessment focuses on costs and benefits arising from airspace changes found within the masterplan for airspace modernisation. While Option 2 would affect other ACPs in the longer term, there is insufficient evidence at this stage to determine what impact a UKADS might have on these. ACPs are undertaken for a range of reasons, and the potential impact of any given future ACP is unknowable. The potential impact of the UKADS is therefore considered qualitatively for these cases. Given the focus on ACPs related to modernisation, costs and benefits are assessed over a 15-year period. This allows for sufficient consideration of ongoing benefits, while not spuriously including long-term impacts for which there remains an unacceptably high degree of uncertainty.

55. An End-State UKADS, established through future primary legislation, would require the development of a further Impact Assessment that would utilise the emerging evidence generated from the experience of operating the Initial UKADS. More detailed analysis of longer-term impacts will therefore be undertaken if Option 2 is chosen. The implications of a UK Airspace Design Support Fund are also not assessed in detail in this Impact Assessment and will be considered as part of a subsequent consultation.

56. This assessment does not consider in detail the implications of different funding mechanisms. Any new charge would be subject to its own assessment and consultation. As any new charge would be designed to follow the user-pays principle, the likely impacts on business are inferred based on similar existing charges. While the choice of funding mechanism will have implications for the wider sector, it is not thought to substantially affect the core outcomes being delivered by the UKADS and assessed in this IA.

57. It is not possible at this stage to quantitatively assess the costs and effectiveness of different delivery models.

58. The quantitative assessment of benefits focusses on changes to airspace in each of the relevant four clusters. While changes may deliver a range of benefits, including the more efficient use of airspace, it is not possible to pre-judge the precise impact of individual ACPs. Potential noise impacts of lower airspace change are therefore considered qualitatively.

59. Substantial efficiencies are also expected to be achieved through NERL's changes to upper airspace outside of the regional clusters. While there are clear dependencies between changes to lower and upper airspace, as the UKADS will have less of a direct impact on upper airspace changes, any potential impact outside of the regional clusters is excluded from the quantitative assessment.

60. The quantitative assessment utilises indicative scenarios to demonstrate the potential impact of a UKADS. It is intended that these scenarios are refined in line with views received during the consultation, and as the specific design of the UKADS further evolves. The three scenarios considered are i) A 'delay' scenario, in which a UKADS results in the earlier delivery of modernised airspace, ii) An 'effectiveness' scenario, in which a UKADS is able to generate airspace designs that result in the more efficient use of airspace, and iii) A 'delay and effectiveness' scenario, in which both benefits are achieved.

7) Monetised and non-monetised costs of each option

61. All costs and benefits are assessed over a 15-year period (2025 – 2039) and presented in 2024 prices and 2025 Present Value. A summary of impacts is provided in Table 3 below.

Table 3: Summary costs and benefits, £m

Impact	Type	Option 1	Option 2
Familiarisation	Cost – Business – Direct – Quantified	0.09	0.10
Modernisation ACPs (Net)	Cost – Business – Direct – Quantified	0.63	0.88
Fuel Use	Benefit – Business – Indirect – Quantified	40.0	43.5
Carbon Emissions	Benefit – Social – Indirect – Quantified	45.1	48.9
Aviation Noise	Unclear – Social – Direct – Unquantified	Noise impacts uncertain – while modernisation will introduce additional technologies to manage impacts, specific outcomes will depend on agreed flightpaths.	
UKADS Start-up	Cost – Business – Direct – Unquantified	Further costs will be incurred when establishing the Initial UKADS.	
Passenger time savings	Benefit – Business / Social – Indirect - Unquantified	Both leisure and business passengers will benefit from reduced delays and journey times.	

7.1) Option 0 – Do-nothing

62. It is necessary to first establish the likely progress and impact of airspace modernisation in the absence of a UKADS in order to create a baseline against which to assess the proposed options. For the purposes of this IA we have made indicative estimates of:

- Fuel burn and CO_2 emissions caused by the inefficient use of airspace (unmodernised airspace).
- The year that modernised airspace designs will be in place for each cluster.
- The proportion of the inefficient use of airspace that modernisation will be able to abate.

63. Future inefficiency due to unmodernised airspace is based on modelling presented in Masterplan Iteration 2.[13] This provides estimates for the total amount of excess CO_2 emitted in 2019 as a result of the inefficient use of airspace in each of the four clusters. These are calculated using NATS' 3Di indicator, which calculates environmental efficiency by comparing the actual flight path of an aircraft to the 'preferred profile' (or the most efficient possible flight path).[14]

64. These estimates are first adjusted to 2023 levels, proportionately in line with changes to passenger numbers since 2019. While excess CO_2 emissions and fuel burn will not correlate perfectly with changes to passenger numbers, it is deemed sufficiently correlated to undertake this initial adjustment. These impacts are grown at 2% per year to account for future growth in aviation activity, broadly in line with the average long term forecast passenger growth under Scenario 1 of the department's Jet Zero passenger forecasts (which predict a 74% increase by 2050).[15] CO_2 emissions and fuel burn are reduced by 1.5% per year to account for assumed fuel efficiency improvements, also in line with Scenario 1 of the Jet Zero passenger forecasts. Finally, the impact of the Sustainable Aviation Fuel (SAF) mandate is incorporated, with SAF increasing from 2% of fuels in

[13] UK Airspace Change Masterplan Iteration 2 (caa.co.uk) p.42 - 48

[14] Airspace efficiency - NATS

[15] Jet Zero illustrative scenarios and sensitivities (publishing.service.gov.uk)

2025, to 10% in 2030, and 22% by 2040. The resulting baseline excess emissions for 2025 are presented below.

Table 4: Baseline annual excess CO_2 emissions

Annual excess CO_2 emissions, tonnes	2019 (original estimate)	2025 (adjusted baseline)
Scottish Cluster	35,651	33,535
Western Cluster	81,000	85,595
Manchester Cluster	87,500	83,239
London Cluster	1,234,765	1,163,869

65. Timelines in the do-nothing scenario are broadly based on the timelines set out in Masterplan Iteration 2[16], updated to account for further delays to the programme in the two years since this was published. These do not represent a conclusive assessment by the department of expected future progress, but are intended to provide a sufficiently plausible baseline upon which to base exploratory analysis. These dates are displayed in Table 5 below.

Table 5: Indicative dates for masterplan ACP completion

	Year
Scottish Cluster	2027
Western Cluster	2026
Manchester Cluster	2029
London Cluster[17]	2034

66. The proportion of inefficiency that airspace modernisation will be able to abate is subject to significant uncertainty. Observed differences between actual and ideal flightpaths may occur for a number of reasons, including ones that cannot be controlled (such as the actions of other countries' air traffic control organisations). Furthermore, even with modernised airspace, the London area in particular will remain highly congested – it is unlikely that all flights from all airports would be able to fly their optimal path. For the purposes of this IA we have utilised a range of indicative estimates for each cluster.

Table 6: Proportion of current inefficiency avoided with modernised airspace

	Low	Central	High
Scottish Cluster	10%	20%	50%
Western Cluster	10%	20%	50%
Manchester Cluster	10%	20%	50%
London Cluster	10%	20%	50%

67. Based on the above, the baseline excess amount of CO_2 emitted over the appraisal period can be estimated. This is presented in Table 7 below.

Table 7: Baseline 'excess' CO_2 emissions, thousand tonnes (Central)

	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039
Scottish Cluster	34	33	26	26	26	25	25	25	25	24	24	24	24	23	23
Western Cluster	86	68	67	66	65	64	64	63	63	62	62	61	60	60	59
Manchester Cluster	83	82	81	80	63	63	62	62	61	60	60	59	59	58	57
London Cluster	1164	1150	1136	1123	1108	1094	1085	1075	1065	844	836	828	820	812	804

68. Costs incurred by airports to undertake masterplan ACPs in the baseline are based on preliminary cost estimates for small, medium and large ACPs, broken down by stage (see Figure 2).[18] The specific costs incurred by any ACP will be highly dependent on individual circumstances, and as

[16] UK Airspace Change Masterplan Iteration 2 (caa.co.uk) Appendix A

[17] Due to the complexity of London airspace redesign the process is expected to occur in 3-4 deployment phases, with this date marking the indicative completion of all phases.

[18] ACOG, 2023

such these figures only serve as broad indicators. These costs have been adapted to 2024 prices and uplifted by 25% to account for contingency / risk.

Table 8: Estimated cost of delivering an airspace change, by size of change and stage of process, £m

Single ACP Cost	Small ACP	Medium ACP	Large ACP[19]
Stage 3	£0.64	£1.02	£3.83
Stage 4	£0.42	£0.66	£2.49
Stage 5	£0.06	£0.10	£0.38
Stage 6	£0.16	£0.26	£0.96
Stage 7	£0.06	£0.10	£0.38

69. ACOG have made initial categorisations of the airspace changes within the masterplan as either small, medium or large. These are summarised at cluster level below.

Table 9: Categorisation of ACPs within masterplan

	Small ACPs	Medium ACPs	Large ACPs
Scottish Cluster	0	2	0
Western Cluster	1	1	0
Manchester Cluster	1	2	1
London Cluster	6	3	3

70. Finally, costs are profiled to align with the indicative dates for each cluster's completion of their masterplan related ACPs. Costs for Stage 6 (implementation) are assumed to fall in the year of completion, as stated in Table 5. Costs for Stage 7 (Post Implementation Review) are assumed to fall in the year following this. Costs for Stages 3-6 are aggregated and allocated linearly between 2025 and the year prior to assumed implementation. The resulting cost profile is displayed below.

Table 10: Baseline masterplan ACP cost (not discounted), 2024 prices, £m

Total ACP Cost	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Scottish Cluster	£1.79	£1.79	£0.51	£0.20	-	-	-	-	-	-	-
Western Cluster	£2.91	£0.42	£0.17	-	-	-	-	-	-	-	-
Manchester Cluster	£2.85	£2.85	£2.85	£2.85	£1.63	£0.65	-	-	-	-	-
London Cluster	£3.58	£3.58	£3.58	£3.58	£3.58	£3.58	£3.58	£3.58	£3.58	£4.60	£1.84
Total	£11.13	£8.64	£7.11	£6.64	£5.21	£4.23	£3.58	£3.58	£3.58	£4.60	£1.84

7.2) Option 1 – Initial UKADS (London TMA region)

Benefits

Monetised benefits

71. As discussed in Section 6, three indicative scenarios have been developed to demonstrate the potential impact of the UKADS. Under the delay scenario, it is assumed that the ACPs within the London cluster are delivered one year earlier (2033). Under the effectiveness scenario, it is assumed that the proportion of inefficiency that modernisation can abate is 10% greater than in the baseline (22% as opposed to 20% in the central case). Both are selected as small but significant changes that may be deemed achievable by the UKADS. Under the delay and effectiveness scenario, both changes apply. Outcomes for the three other clusters are unchanged. The change in expected CO_2 emissions for the London Cluster under each of the three scenarios is displayed below. Under the delay scenario benefits are only experienced in the additional year in which modernised airspace designs would be in place, with no longer term impacts assumed.

Table 11: Change in CO_2 emissions relative to baseline, London Cluster, thousand tonnes

	2033	2034	2035	2036	2037	2038	2039
Delay Scenario	-213	-	-	-	-	-	-
Effectiveness Scenario	-	-21.1	-20.9	-20.7	-20.5	-20.3	-20.1
Delay + Effectiveness Scenario	-234.4	-21.1	-20.9	-20.7	-20.5	-20.3	-20.1

72. Changes in carbon emissions are monetised in line with DfT appraisal guidance.[20] As such, the expected traded value in future emissions are subtracted from the expected future social value when emissions fall under a carbon trading scheme. Social values are based on the Green Book central

[19] The mid-point of the estimated range for large ACPs has been used.

[20] TAG Unit A5.2 Aviation Appraisal (publishing.service.gov.uk)

scenario[21], while traded values are based on forecast 'Market Carbon Values' for flights under the UK ETS[22], and illustrative price assumptions developed for the Jet Zero Strategy for flights falling under the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA). A small proportion of flights are expected to remain outside of the traded sector. The proportion of flights expected to fall under each trading scheme is taken from the department's Jet Zero Strategy forecasts.

Table 12: Carbon price summary, £/tCO_2

	2031	2032	2033	2034	2035	2036	2037	2038	2039
Social cost	306	310	315	320	325	330	335	340	345
ETS price	96	103	110	114	124	131	138	148	148
CORSIA price	8	8	9	10	11	39	68	95	124
Weighted traded value	32	34	36	37	41	61	82	103	122
Net social cost	274	277	279	282	284	269	253	237	223

73. The reduction in carbon emissions is converted into fuel savings for airlines at a ratio of 1kg jet fuel to 3.16 kg of CO_2.[23] Fuel costs are based on current jet fuel prices[24], grown in line with future Fossil Fuel Price Assumptions for Oil.[25] As the FFPA oil price series remains constant from 2030 onwards, the price of fuel remains constant during the window in which benefits are expected to occur, at £675.65 per tonne.

74. Both benefits are discounted at 3.5% per annum over the course of the appraisal period and are summarised below.

Table 13: Option 1 monetised benefits (Central), Net Present Value, 2024 prices, £m

	Fuel saving	CO_2 emissions reduction	Total benefit
Delay Scenario	£40.04	£45.14	£85.18
Effectiveness Scenario	£21.68	£21.68	£43.36
Delay + Effectiveness Scenario	£65.73	£71.33	£137.05

Non-monetised benefits

75. Alongside reduced expenditure on fuel by airlines, and the associated reduction in emissions, we would expect time savings for passengers to occur as a result of more efficient flightpaths. Marginal time savings would be expected as a direct outcome of more efficient flightpaths, with further potential improvements relating to a reduction in airspace related delays.

76. Airspace modernisation will also result in revised flightpaths in lower airspace. As previously noted, noise impacts are prioritised in such changes, but the precise outcomes will depend on the final airspace design. ACOG[26] highlight four main techniques enabled by airspace modernisation, particularly through the introduction of Performance Based Navigation (PBN) routes,[27] that may be used to limit the effects of aircraft noise:

- **Traffic Dispersion** refers to airspace changes that enable traffic to follow the same general routeing but fly a variety of different flight paths when measured over the ground.
- **Traffic Concentration** is the opposite of dispersion and is a consequence of airspace changes that exploit the accuracy of PBN routes, where aircraft avionics are coded to automatically follow the same flight paths consistently and fly very similar tracks over the ground. The accuracy and predictability associated with PBN routes means it is possible to make more efficient use of the airspace by allowing larger volumes of traffic to fly through smaller areas, potentially avoiding population centres. The disadvantages of traffic concentration may however fall to the minority of populated areas that are affected by more frequent and intense noise impacts.

[21] Valuation of energy use and greenhouse gas (GHG) emissions (publishing.service.gov.uk)

[22] Traded carbon values used for modelling purposes, 2023 - GOV.UK (www.gov.uk)

[23] IATA CO2 Calculator Guidelines

[24] IATA - Fuel Price Monitor Europe & CIS cost, week ending April 19th 2024. $849.98/ton converted to £/tonne based on an exchange rate of 0.80 GBP per USD (exchange rate as of 25th April 2024).

[25] Fossil Fuel Price Assumptions 2023 (publishing.service.gov.uk) Table 2, Assumption B

[26] UK Airspace Change Masterplan Iteration 2 (caa.co.uk) p.56

[27] PBN is a very accurate way of flying aircraft which uses satellite technology to allow aircraft to fly routes with more precision and consistency.

- **Noise Respite** involves the development of airspace changes to enable greater planning and predictability of aircraft noise impacts. For example, the planned use of different arrival routes (or alternating runway use as implemented at London Heathrow) at different times of day, providing communities with predictable relief from the noise impacts of inbound traffic. Another example could be alternating flights between multiple departure routes according to a pre-planned schedule. Respite can be designed into airspace structures more easily once arrival and departure routes are upgraded to PBN standards because flight paths can be designed with greater accuracy and flexibility, although there are limitations on the number of respite routes that may be deployed due to safety considerations and the technical constraints of air traffic control systems and aircraft avionics.
- **Noise Redistribution** refers to airspace changes that focus on the redesign of airport arrival and departure routes at lower altitudes to allow for existing noise impacts to be redistributed away from more sensitive areas. This assumes that there are adjacent areas that are less sensitive to noise that the routes can be moved over to. The relative noise sensitivity of areas is difficult to estimate and must be carefully considered as part of a coherent and transparent trade-off process when re-distribution is the goal.

77. The London Cluster accounts for the large majority of people affected by aviation noise in the UK and may therefore experience particularly significant impacts as a result of modernisation. Estimates of the scale of population affected are displayed by airport in Table 14. It is evident that the specific redesign of Heathrow's lower airspace will be of most significance in determining overall noise impacts.

Table 14: Population impacted by aviation noise[28]

Airport	Population impacted by noise	Airport	Population impacted by noise
Heathrow	c. 683,700	Southampton	c. 5,600
Gatwick	c. 13,500	Bournemouth	c. 400
Stansted	c. 8,700	Biggin Hill	Not readily available
Luton	c. 17,000	RAF Northolt	Not readily available
London City	c. 75,200	Manson	N/A
Southend	c. 2,200	Farnborough	Not readily available

78. The main constraint on the volume of air traffic using UK airports is the capacity of airports, particularly runway capacity. Subject to operational constraints (including safety), the design of airspace and the airspace change process do not specify, or limit future increases in, the volume of air traffic using a piece of airspace at any given point in time. Airspace modernisation may however remove binding constraints on capacity in some cases, enabling future airport planning applications aiming to grow activity. Further activity would be expected to lead to growth in both the benefits and disbenefits of aviation. Any such planning application would be subject to its own full appraisal.

79. Should the UKADS enable the earlier delivery of lower / middle airspace redesign, this may also help enable the benefits delivered by upper airspace redesign. As terminal airspace was responsible for slightly less than 50% of environmental inefficiency in the UK airspace system in 2019[29], the benefits of upper airspace redesign are considerable. While these benefits are not attributable directly to the UKADS, it is reasonable to conclude that the UKADS reduces the risks to delivery faced by the programme of upper airspace change.

Costs

Familiarisation

80. Entities that currently act as airspace change sponsors will need to familiarise themselves with the new split of responsibilities under a UKADS-managed ACP. Given the proposed timescales for the introduction of the UKADS, this may involve short-term reorganisation of staffing and wider budgets. For this option, we assume that only those airports within the London Cluster become fully

[28] UK Airspace Change Masterplan Iteration 2 (caa.co.uk) p.52-53

[29] UK Airspace Change Masterplan Iteration 2 (caa.co.uk) p.19

familiarised with the process. We assume that the equivalent of one person-month at 'Manager, director or senior official' level is required at each of the 12 London airports in scope, at £46,369 per annum[30] (further uplifted by a factor of 1.265 to account for on-costs). This results in a cost per firm of £4,890, and a total cost of £58,700.

81. A total of 121 current / recent change sponsors have been identified on the CAA's Airspace Change Portal.[31] We assume that current change sponsors outside of the London Cluster will undertake a less comprehensive process of familiarisation. Assuming the 109 non-London organisations spend only 8 hours familiarising, with all other assumptions as above (using the equivalent ASHE hourly wage figure), this results in a per-firm cost of £247, and a total cost of £26,900.

82. Total familiarisation costs for Option 1 are therefore £85,600.

ACP Cost

83. The estimated cost of airport-led London Cluster ACPs are presented in Table 10. It is unclear how these costs may vary if the ACPs are instead delivered by the UKADS. There are a number of reasons to assume that costs may be lower – the UKADS may benefit from economies of scale, allowing for individual ACPs to be delivered more cheaply. Furthermore, if the UKADS is able to mitigate the risk of further delays to airspace change delivery, on-going costs may be reduced. There is however insufficient evidence at this stage to form a robust estimate of the potential change in costs. As such, we conservatively assume that the same cost estimates for Stages 3-7 used in the baseline apply in this case. Present value costs therefore increase in the delay scenario, as activity is re-timed to be earlier, and thus discounted to a lesser extent. As assumed costs and timings are unchanged under the effectiveness scenario, net costs are zero. Net Present Costs are displayed below.

Table 15: Option 1 London ACP Net Present Costs, £m

	Net Present Cost
Delay Scenario	£0.63
Effectiveness Scenario	£0
Delay + Effectiveness Scenario	£0.63

84. While there is limited change to the total cost of undertaking these ACPs, the organisations that these costs fall to will differ to the baseline, depending on the selection of funding mechanism. If the en-route and London Approach charges are used to recoup the costs of the UKADS, the gross costs will instead fall on the users of airspace – predominantly commercial airlines (See Small and Micro Business Assessment for further discussion).

85. There will be further costs associated with the establishment of an Initial UKADS, although these would be limited by establishing the UKADS within an existing third-party organisation. Further work to determine the cost of establishing the UKADS will be undertaken during the consultation.

Summary

86. All monetised impacts for the three indicative scenarios are presented below. For reporting purposes within this Impact Assessment, the delay scenario is considered to be the core scenario.

Table 16: Option 1 monetised impacts, Net Present Value, £m

	Fuel savings	CO_2 emissions	Familiarisation	ACP Net Cost	Net Present Value
Delay Scenario	£40.04	£45.14	-£0.09	-£0.63	£84.46
Effectiveness Scenario	£21.68	£21.68	-£0.09	£0	£43.27
Delay + Effectiveness Scenario	£65.73	£71.33	-£0.09	-£0.63	£136.34

7.3) Option 2 – End State UKADS with increasing scope

Benefits

Monetised benefits

87. While Option 2 represents a significantly more expansive role for the UKADS in the longer term, as has been previously noted, we are unable to quantify the likely impact on non-modernisation related

[30] ASHE Provisional Figures, 2023 – Table 14.7a – Median salary for 'Managers, directors and senior officials' uplifted to 2024 prices

[31] DfT analysis of Airspace change portal (caa.co.uk)

ACPs. To demonstrate the potential scale of impact of bringing non-London ACPs within scope of the UKADS, we make a modelling assumption that the UKADS would deliver the Manchester Cluster ACPs under Option 2, in addition to the London Cluster changes. In reality, the specific ACPs to be delivered by the UKADS will be identified closer to the time, based on an assessment of need.

88. Under our delay scenario, delivery of the Manchester Cluster modernisation is brought forward one year to 2028. Under our effectiveness scenario, the proportion of existing inefficiencies that modernisation is able to abate is increased to 22% in the central case. Modelling and monetisation are undertaken using the same approaches outlined in Sections 7.1 and 7.2, the results of which are displayed below.

Table 17: Option 2 monetised benefits, Net Present Value, £m

Net Present Value, £m, 2024 prices		Fuel saving	CO_2 emissions reduction	Total
Delay Scenario	London Cluster	£40.04	£45.14	£85.18
	Manchester Cluster	£3.48	£3.76	£7.24
	Total	£43.52	£48.89	£92.41
Effectiveness Scenario	London Cluster	£21.68	£21.68	£43.36
	Manchester Cluster	£3.08	£3.28	£6.36
	Total	£24.76	£24.95	£49.72
Delay + Effectiveness Scenario	London Cluster	£65.73	£71.33	£137.05
	Manchester Cluster	£6.91	£7.41	£14.32
	Total	£72.63	£78.74	£151.37

Non-monetised benefits

89. As demonstrated by the indicative monetised estimates, it is likely that the greatest potential benefits exist within the London system. However, the non-monetised benefits explored in Section 7.2 would likewise be expected to occur, albeit to a lesser extent, for modernisation ACPs undertaken elsewhere.

90. The more extensive remit of the UKADS under Option 2 would mean that a range of other potential ACPs could stand to benefit. Perhaps most crucial are those ACPs related to the integration of Unmanned Aircraft Systems (UAS) and Advanced Air Mobility (AAM) into managed airspace. The department's Future of Flight Action Plan aims to see the routine operation of Beyond Visual Line of Sight (BVLOS) UAS in integrated airspace by 2027, and routine piloted electric vertical take-off and landing (eVTOL) flight operations by 2028.[32] Such changes would, as it stands, see many organisations unfamiliar with the ACP process being required to progress potentially novel and challenging ACPs. A UKADS undertaking many of these ACPs over multiple years would be expected to deliver change, and enable the benefits of the resulting activity, more rapidly.

91. Further benefits may occur if the UKADS takes responsibility for more routine ACPs, which may occur for a myriad of reasons. As the precise goals for each ACP are unique, it is impossible to estimate what kind of impact the UKADS may have – but it is plausible that it would be able to achieve cost savings.

Costs

Familiarisation

92. For this option, we assume that all London and Manchester Cluster sponsors become fully familiarised with the process. We assume that a 'Manager, director or senior official' at each of the 16 organisations in scope spends one person-month to become familiarised and adjust plans, at £46,369 per annum[33] (further uplifted by a factor of 1.265 to account for on-costs). This results in a cost per firm of £4,890, and a total cost of £78,200. The remaining 105 organisations are assumed to spend only 8 hours becoming familiar with the broader implications of the UKADS, with all other assumptions as above (using the equivalent ASHE hourly wage figure), this results in a per-firm cost of £247, and a total cost of £25,900.

93. The total familiarisation cost under Option 2 is £104,000.

[32] UK Future of Flight Action Plan (publishing.service.gov.uk)

[33] ASHE Provisional Figures, 2023 – Table 14.7a – Median salary for 'Managers, directors and senior officials' uplifted to 2024 prices

ACP Cost

94. As per Option 1, it is assumed that the costs of delivering the masterplan ACPs remain the same under the UKADS, although there are reasons to suggest these may be reduced. The Net Present Costs for Option 2, incorporating the effect of re-timed activity to deliver the Manchester Cluster, are presented below.

Table 18: Option 2 London + Manchester Clusters ACP Net Present Costs, £m

	Net Present Cost
Delay Scenario	£0.88
Effectiveness Scenario	£0
Delay + Effectiveness Scenario	£0.88

95. There will be further costs associated with the establishment of an End State UKADS, including likely initial capital and hiring costs. These will be fully examined as designs for the UKADS evolve during the consultation period.

Summary

96. All monetised impacts for the three indicative scenarios are presented below. For reporting purposes within this Impact Assessment, the delay scenario is considered to be the central scenario.

Table 19: Option 2 monetised impacts, Net Present Value, £m

	Fuel savings	CO_2 emissions	Familiarisation	ACP Net Cost	Net Present Value
Delay Scenario	£43.52	£48.89	-£0.10	-£0.88	£ 91.43
Effectiveness Scenario	£24.76	£24.95	-£0.10	£0.00	£ 49.61
Delay + Effectiveness Scenario	£72.63	£78.74	-£0.10	-£0.88	£ 150.38

8) Risks and assumptions

8.1) Assumptions

Airspace Modernisation Impact

97. The above central calculations have considered impacts under different scenarios where airspace modernisation results in 20% of currently experienced excess emissions being avoided. As this represents the potential 'size of the prize', changes to this assumption will have significant impacts on the scale of benefits being estimated. We therefore consider a low and high case assuming 10% and 50% respectively. In the effectiveness scenarios, it is assumed that UKADS continues to deliver a 10% increase in benefits (i.e. avoiding 11% of excess emissions in the low case and 55% of emissions in the high case).

Table 20: Net Present Benefits, Option 1 low, central and high cases, £m

	Low Case	Central Case	High Case
Delay Scenario	£42.59	£85.18	£212.95
Effectiveness Scenario	£21.68	£43.36	£108.39
Delay + Effectiveness Scenario	£68.53	£137.05	£342.63

Indicative delay scenario

98. While the indicative scenarios have been designed around potential impacts that are deemed plausible, these are ultimately arbitrary. It is therefore reasonable to consider how benefits would differ under different time savings potentially achieved by the UKADS. We therefore consider a scenario in which the UKADS only achieves a 6-month reduction in the time taken to deliver the London Cluster ACPs. The impact on Net Present Benefits is shown below.

Table 21: Net Present Benefits, Option 1 central estimate & 6-month delay sensitivity, £m

	Central estimate (1-year delay)	6-month sensitivity test
Delay Scenario	£85.18	£42.59
Delay + Effectiveness Scenario	£137.05	£90.20

Indicative effectiveness scenarios

99. The central effectiveness scenario assumes that airspace changes delivered under a UKADS would be 10% more effective at abating environmental inefficiencies than airport-driven ACPs. We therefore consider the impact of halving this efficiency improvement.

Table 22: Net Present Benefits, Option 1 central estimate & reduced effectiveness sensitivity, £m

	Central estimate (10% improvement)	5% sensitivity test
Effectiveness Scenario	£43.36	£21.68
Delay + Effectiveness Scenario	£137.05	£111.12

ACP Costs

100. It has been assumed that the costs of undertaking the monetised ACPs will remain the same under Options 0, 1 and 2, but that the Present Value Cost will increase under some scenarios due to the retiming of activity. While it might be expected that the re-timing of activity would in and of itself result in some cost reductions, it is not deemed proportionate to consider alternate costing assumptions given their relatively limited net impact. Costing assumptions will be developed further during the consultation period.

8.2) Risks

101. There is a risk that current airspace change sponsors may delay progressing their own ACPs if they expect a UKADS to assume responsibility in the future, thus reducing their own costs. In such a case, the UKADS could potentially result in some ACPs being delivered later than under the baseline option. This is not thought to be a substantive risk for two main reasons. Firstly, airports stand to gain some benefit from the modernisation of their airspace and are thus incentivised to ensure it is achieved as soon as possible. Secondly, the Secretary of State has powers under the Air Traffic Management and Unmanned Aircraft Act 2021[34] that allow for the direction of airports to progress their airspace changes to reasonable timescales, with financial penalties for noncompliance.

102. A second risk relates to the ability of the UKADS, regardless of the precise delivery model, to hire sufficient skilled staff to progress the targeted ACPs. The labour pool for certain skills such as instrument flight procedures design is extremely small, and acquiring staff may be highly challenging. However, this may largely be mitigated by the UKADS adopting the same approach of current change sponsors – utilising consultancies to deliver much of this activity. Such a solution may however limit the potential economies of scale that the UKADS could benefit from.

103. Another risk relates to the split in responsibilities for progressing ACPs under the UKADS. Under the preferred option, previous change sponsors would still deliver items such as the safety case, stakeholder consultation and implementation. It is possible that frictions may arise between the UKADS and the former change sponsor. As each creates outputs that the other will require as inputs, relationships between the UKADS and former change sponsors will need to be closely managed, with governance processes ensuring accountability for delivery.

104. Similarly, there is a risk that the UKADS isn't effective as it's not established on a statutory basis and therefore lacks the powers it needs. This would only apply to the initial operating model for the UKADS. This is mitigated both by the longer-term plan for the UKADS and by the accountability for delivery built into its governance model, as well as the generally supportive approach of current ACP sponsors. It is expected that the UKADS will have sufficient capability to meet its remit.

105. Lastly there is a risk that the UKADS isn't set-up in time to progress priority ACPs through stage 3 of the CAP1616 process. This would most likely mean delays while existing sponsors waited for the UKADS to take over their ACPs. However, it is anticipated that the UKADS can feasibly be set-up in broad alignment with current ACPs in the London cluster reaching stage 3, and failure to achieve this could also be mitigated by the co-sponsors working with affected airports to progress specific areas of work, minimising delays without causing duplication.

[34] Air Traffic Management and Unmanned Aircraft Act 2021 (legislation.gov.uk)

9) Wider Impacts

9.1) Small, Micro and Medium Business Assessment

106. The preferred option is likely to have a broadly positive impact on small, micro and medium business. While smaller organisations would have to act as sponsors under the baseline (and experience the costs of doing so) a fully established UKADS may in future undertake this activity on their behalf. This may help to level the playing field between smaller and larger organisations. As such, it is not reasonable to exempt small and micro businesses. Of the 20 airports featured in the latest masterplan, there is one micro firm, 10 medium sized firms, 8 large sized firms, and one Ministry of Defence run airport.[35] The reduction in costs for airports captured by early UKADS activity is therefore likely to accrue to larger organisations. Equally, the main identified familiarisation costs will fall predominantly on these larger organisations.

107. The overall impact will ultimately be dependent on the mechanism used to fund the activities of the UKADS. While the preferred option incorporates the use of a new charge informed by the user pays principle, this remains in the very early stages of development. As such, we consider how impacts would fall under a similar charge, the current en-route rate. Under this funding approach, the UKADS would impose a minimal burden on smaller firms. The en-route rate is charged to users of airspace, with a range of exceptions – most importantly:

- Flights by aircraft of which the Maximum Total Weight Authorised is 5,700 kg or less made entirely in accordance with the Visual Flight Rules of the Air Regulations 2015.
- Flights terminating at the aerodrome from which the aircraft has taken off.

108. The majority of aircraft registered in the UK fall under the weight limit. CAA data shows a total of 12,224 registered fixed wing aircraft, of which 8,977 weigh 5,700 kg or less.[36] A significant proportion of the activity within the general aviation sector, which is more predominantly comprised of smaller businesses, will therefore not face any additional charges. Furthermore, it has previously been reported that 51% of general aviation flights take off and land at the same airport, thus exempting them regardless.[37]

109. The vast majority of the cost would fall on the major commercial airlines, both UK and foreign carriers, with those who run the most flights over the longest distance experiencing the greatest overall cost burden. We approximate the share falling to UK airlines in line with the share of departing flights from UK airports that are accounted for by airlines with UK Air Operator Certificates – which results in 58% of costs falling to UK airlines, and 42% falling on non-UK airlines.[38]

110. Costs for small, micro and medium UK airlines are also estimated by each individual airline's share of total UK departures.[39] Large companies would be expected to account for 88.3% of UK commercial airlines costs, with a further 11.4% falling on medium sized organisations, and 0.3% falling on small firms. This assessment will be updated as the new charge is developed and its distributional impacts become clear.

111. Of the eight affected approved Instrument Flight Procedure design organisations (discussed in section 9.3), there is one micro organisation, four small organisations, and one large organisation. No UK registered business activity could be identified for two of the firms.

112. In delivering the benefits of airspace modernisation either earlier or more effectively, the UKADS will also indirectly benefit all users of airspace, including micro, small and medium-sized businesses.

9.2) Equalities Impact Assessment

113. The policy is not expected to have a disproportionate effect on any protected characteristic groups.

[35] Categorisations based on latest available annual accounts from Companies House. Note that Manston Airport is not currently an operating airport.

[36] Aircraft register statistics | Civil Aviation Authority (caa.co.uk) 2024

[37] https://web.archive.org/web/20061007122800/http://www.gaac.co.uk/gasar/GASAR_NationalPilotSurvey.pdf

[38] DfT Analysis of CAA Airports Data, 2023

[39] Company size categories are estimated based on the latest available annual accounts at Companies House

9.3) Competition Assessment

114. The preferred option may have implications for the market for consultancies currently undertaking work on behalf of airspace change sponsors. While it is expected that the UKADS will continue to use these services, at least in the near to medium-term whilst the new service builds its own capability and capacity, there may be a degree of monopsony power that limits earnings potential for some organisations. This is thought to particularly apply to Instrument Flight Procedure design organisations, who undertake highly specialised activity within this sector – unlike consultancies with a broader remit, for whom work on airspace change will only represent a fraction of their overall business activity. However, these firms operate in an international market, and the UK is unlikely to represent the only market they operate in. Furthermore, it is expected that procurement rules will ensure the UKADS does not unfairly utilise this market power.

115. The funding mechanism used to recoup the costs of the UKADS will also have potential implications for the sector. Under the baseline, airports face the costs of airspace redesign – in the case of a UKADS funded by a new charge, this cost could instead fall entirely on users of airspace (predominantly commercial airlines). This change in the incidence of costs may have impacts on the market for airport charges, which are often negotiated between airports and airlines.

116. A UKADS may also have marginal impacts on the competition between airports. With airport led ACPs, larger airports may be more able to progress changes where conflicts exist with smaller airports, given greater resources to undertake modelling and consultation. A UKADS would take a neutral approach to resolving conflictions, potentially benefiting smaller airports.

117. In the case of an End State UKADS that is responsible for all airspace changes, we would expect a reduction in barriers to entry to some markets, particularly the UAS sector. The requirement to complete the ACP process before undertaking, for example, BVLOS operations, represents an additional cost that may limit smaller firms' ability to enter the market. By moving the incidence of this cost to the UKADS, this barrier is removed. The presence of a UK Airspace Design Support Fund, depending on its design and funding mechanism, may also reduce barriers to entry and encourage growth of smaller firms.

10) Monitoring and Evaluation

118. The performance of the UKADS will be monitored by the CAA and DfT. This assessment will be based around progress through the CAP1616 process for each individual ACP taken forward by the UKADS. Early progress will be measured by successfully passing the 'Consult / Engage' Gateway, while the ultimate measure of success will be receiving approval from the CAA at Stage 5. As this is an administrative process, process data is already captured.

119. ACPs related to airspace modernisation will be assessed against the timelines provided in the latest available masterplan. It is recognised that these changes are unprecedented, particularly for the London TMA region, and as such it is possible that existing estimates for delivery may not be realistic. Future iterations of the airspace masterplan will ensure that performance can be assessed against a plausible target. Any delays from the change sponsor will be notified to the CAA through an "Airspace Change Proposal Change Sponsor Indicative Timeline Update Request From", including a rationale for the delay.

120. While the UKADS will only take forward some ACPs, particularly in the short term, it is not thought reasonable to use the progress of other ACPs as a baseline against which to measure the UKADS's performance. The UKADS will explicitly be dealing with the most complex and challenging ACPs, and so will not be undertaking a directly comparable task.

121. Once airspace changes have been fully implemented, they will be assessed using the 3Di measure of environmental efficiency. While divergence from optimal flight paths, as measured by the 3Di indicator, can occur due to multiple reasons, an improvement in this measure would be expected following the successful implementation of modernised airspace.

122. The UKADS will also be assessed against its running costs, and the subsequent impact that the chosen funding mechanism has on the wider aviation industry.

123. The timing of a Post Implementation Review will be determined by the timing of any End-State UKADS. It is intended to utilise the experience of the Initial UKADS to form the development of this

body. This second phase would be conditional on the outcome of a review of the first phase. That review would determine:

- the extent to which UKADS1 has succeeded in delivering its objectives, and
- what policy, process or legislation changes would address any unfulfilled objectives.