London Luton Airport

LLAOL FASI-S Stage 2A

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London Luton Airport Operations Ltd
FASI-S ACP ACP-2018-70

Design Principle Evaluation
CAP1616 Stage 2A Gateway Submission Document

Document Control

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Glossary

Acronym	Term	Description
AD6	Swanwick Airspace Improvement Programme - Airspace Deployment 6 (SAIP AD6)	ACP-2018-65 (known as SAIP AD6) was an ACP co-sponsored between LLAOL and NATS which made improvements to arrivals to address a latent risk identified. The ACP was implemented in February 2022.
AMS	Airspace Modernisation Strategy	UK Government has tasked the aviation industry to modernise airspace in the whole of the UK. The long-term strategy of the CAA and the UK Government is called the Airspace Modernisation Strategy (AMS). The AMS identifies fifteen initiatives to modernise airspace. Its CAA document reference number is CAP1711.
AONB	Area of Outstanding Natural Beauty	
-	Approach Transition / arrival transition	The part of a PBN arrival route, defined to either RNAV1 or RNP1 standard, between the last part of the hold and the final approach path to the runway
ATC	Air traffic control	
CAA	Civil Aviation Authority	The UK Regulator for aviation matters
CAP1616	Civil Aviation Publication 1616	The airspace change process regulated by the CAA
	Capacity	A term used to describe how many aircraft can be accommodated within an airspace area without compromising safety or generating excessive delay
CAS	Controlled Airspace	Generic term for the airspace in which an air traffic control service is provided as standard; note that there are different sub classifications of airspace that define the particular air traffic services available in defined classes of controlled airspace. Abbreviated to CAS.
-	Centreline	The nominal track for a published route

Acronym	Term	Description
-	Concentration	Refers to a density of aircraft flight paths over a given location, this generally refers to high density where tracks are not spread out; this is the opposite of Dispersal
CCO	Continuous Climb Operations	An aircraft operating technique facilitated by the airspace and procedures design and assisted by appropriate ATC procedures, allowing the execution of a flight profile optimised to the performance of aircraft, leading to significant economy of fuel and environmental benefits in terms of noise and emissions reduction
CDO	Continuous Descent Operations	An aircraft operating technique in which an arriving aircraft descends from an optimal position with minimum thrust and avoids level flight to the extent permitted by the safe operation of the aircraft and compliance with published procedures and ATC instructions
-	Conventional navigation	The historic navigation standard where aircraft fly with reference to ground based radio navigation aids
-	Conventional route	Routes defined to the conventional navigation standard, i.e. using ground based radio navigation beacons to determine their position.
-	Dispersal	Refers to the density of aircraft flight paths over a given location, this generally refers to lower density – tracks that are spread out; this is opposite of Concentration
-	Easterlies	When a runway is operating such that aircraft are taking off and landing in an easterly direction
-	Final Approach	The final part of an arrival flight path that is directly lined up with the runway
FUA	Flexible Use Airspace	Airspace which is not solely designated for a single purpose, but can be allocated flexibly according to need, or switched entirely on/off according to a schedule or agreed process.
-	Flight-path	The track flown by aircraft when following a route, or when being directed by air traffic control
ft	Feet	The standard measure for vertical distances used in air traffic control

Acronym	Term	Description
FASI-S	Future Airspace Implementation Strategy South	Under the Government's Airspace Modernisation Strategy (AMS, ref 15) airports in the southern UK are required to update their airspace and routes in a coordinated way. LLA is a part of FASI-S and accordingly has a separate longer term airspace change proposal.
GA	General Aviation	All civil aviation operations other than scheduled air services and nonscheduled air transport operations for remuneration or hire. The most common type of GA activity is recreational flying by private light aircraft and gliders, but it can range from paragliders and parachutists to microlights, balloons and private corporate jet flights.
LR	Luton Rising	London Rising are the owners of the airport (a separate company from LLAOL – see next)
LLAOL	London Luton Airport Operations Ltd	London Luton Airport Operations Ltd are the operators who run the airport (a separate company from LLAL – see above)
-	Lower Airspace	Airspace in the general vicinity of the airport containing arrival and departure routes below 7,000ft. Airports have the primary accountability for the design of this airspace, as its design and operation is largely dictated by local noise requirements, airport capacity and efficiency
NATS (ATC)		NATS ATC - the air navigation service provider at Luton Airport under commercial contract for the aerodrome control provision and via the London Licence for the approach control function.
NATS NERL		NATS NERL - The UK's licenced air traffic service provider for the en route airspace (upper network) that connects our airports with each other, and with the airspace of neighbouring states.
nm	Nautical Mile	Aviation measures distances in nautical miles. One nautical mile (nm) is 1,852 metres. One road mile ('statute mile') is 1,609 metres, making a nautical mile about 15% longer than a statute mile.
-	Network Airspace / Upper network	En route airspace above 7,000ft in which NATS has accountability for safe and efficient air traffic services for aircraft travelling between the UK airports and the airspace of neighbouring states.

Acronym	Term	Description
NTK	Noise Track Keeping	A system that monitors and records radar data to monitor aircraft operations and report statistics focused around noise.
PBN	Performance Based Navigation	Referred to as PBN; a generic term for modern standards for aircraft navigation capabilities including satellite navigation (as opposed to 'conventional' navigation standards)
RNAV / RNAV 1	aRea NaVigation	This is a generic term for a particular specification of Performance Based Navigation. The suffix '1' denotes a requirement that aircraft can navigate to with 1nm of the centreline of the route 95% or more of the time. In practice the accuracy is much greater than this.
RNP-RF	Required Navigation Performance – Radius to fix	An advanced navigation specification under the PBN umbrella. The suffix '1' denotes a requirement that aircraft can navigate to with 1nm of the centreline 95% or more of the time, with additional self-monitoring criteria. In practice the accuracy is much greater than this. The RF means Radius to Fix, where airspace designers can set extremely specific curved paths to a greater accuracy than RNAV1.
RNP-AR	Required Navigation Performance – Authorisation required	An advanced navigation specification under the PBN umbrella. 'Authorisation required' refers to aircraft and operators complying with specific airworthiness and operational requirements. RNP-AR allow airspace designers to set extremely specific curved paths to a greater accuracy than RNAV1, these can be designed before and after the Final Approach Fix.
-	Separation	Aircraft under Air Traffic Control are kept apart by standard separation distances, as agreed by international safety standards. Participating aircraft are kept apart by at least 3nm or 5nm lateral separation (depending on the air traffic control operation), or 1,000ft vertical separation.
SID	Standard Instrument Departure	Usually abbreviated to SID; this is a route for departures to follow straight after take-off
	Tactical Intervention	Air traffic control methods that involve controllers directing aircraft for specific reasons at that particular moment (see Vector)

Acronym	Term	Description
TMA	Terminal Manoeuvring Area (Terminal Airspace)	An aviation term to describe a designated area of controlled airspace surrounding a major airport or cluster of airports where there is a high volume of traffic; a large part of the airspace above London and the South East is defined as terminal airspace (or Terminal Manoeuvring Area – TMA). This is the airspace that contains all the arrival and departure routes for London Heathrow, London Gatwick, London Stansted, LLA and London City from around 2,000ft-3,000ft up to approximately 20,000ft.
-	Vector / vectoring	An air traffic control method that involves directing aircraft off the established route structure or off their own navigation – ATC instruct the pilot to fly on a compass heading and at a specific altitude. In a busy tactical environment, these can change quickly. This is done for safety and for efficiency.
-	Westerly operation	When a runway is operating such that aircraft are taking off and landing in a westerly direction

Contents

Introduction

Following the publication of the strategic rationale for airspace modernisation[1], the Government directed the Civil Aviation Authority (CAA) to "prepare and maintain a coordinated strategy and plan for the use of UK airspace up to 2040, including its modernisation". As a result, in 2018 the CAA published the Airspace Modernisation Strategy (AMS)[2], which replaced the earlier 2011 Future Airspace Strategy. The AMS sets out the initiatives required to modernise the existing Airspace System by upgrading the airspace design, technology and operations. The CAA is in the process of reviewing the AMS and expects to publish an updated version of the strategy in early 2022.

One of the most important initiatives required to achieve the AMS objective is known as FASI (Future Airspace Strategy Implementation). 21 airports in the UK comprise FASI and London Luton Airport is one of them. This FASI initiative is considered the UK's Airspace Change National Infrastructure Programme (the Programme). The Programme encompasses the requirement to fundamentally redesign the National Airspace System at lower altitudes and in the terminal airspace that serves commercial air transport across the busiest regions of the UK, making the most of the capabilities of modern aircraft and satellite-based navigation technology. These airspace design projects are sponsored by the 21 airports (for the local arrival and departure routes below 7000ft) and by NERL (for the airspace structures and route network above 7000ft).

Today's national route network is designed with reference to a grid of ground navigation beacons distributed across the UK. Some of these beacons are outdated and reaching their end of life. Meanwhile, 99% of the current commercial air transport fleet operates almost exclusively using avionics that rely on satellite navigation. Aircraft are able to follow routes designed to satellite navigation standards (known as Performance-based Navigation or PBN) with greater precision than conventional ground navigation. The widespread deployment of routes designed to satellite navigation standards is a cornerstone of airspace modernisation. The opportunity to design a new network of PBN routes with far greater accuracy and flexibility offers the potential to address many of the issues set out in the Government's strategic rationale. Significant improvements in airspace capacity and efficiency can be achieved by positioning routes so that they are safely separated and optimised by design.

Whilst more precise routes can be used to avoid noise sensitive areas, they may also concentrate the impacts of overflight. For this reason, the use of multiple route options that can distribute the impacts more equitably, or be configured to offer predictable relief from noise, must be considered in consultation with local stakeholders when routes are being developed for deployment at lower altitudes.

The number, complexity and overlapping scope of the individual Airspace Change Proposals (ACPs) needed to deliver the Programme requires a strategic coordination mechanism in the form of a single joined up implementation plan or Masterplan.

[1] Upgrading UK Airspace Strategic Rationale
[2] UK Airspace Modernisation Strategy, CAA CAP1711, 2018

Given the large number of organisations involved (21 airports and NATS EnRoute Limited (NERL)), the CAA and Department for Transport (DfT) also required NERL to set up an impartial body, The Airspace Change Organising Group (ACOG) to develop a Masterplan, coordinate the Programme and lead the necessary engagement with external stakeholders. In this context, ACOG was established in 2019 as a unit within NERL, separate and impartial from the organisation's other functions.

Masterplan Iteration 2[3] was accepted by CAA on 27th January 2022. The purpose of Iteration 2 is to provide a system-wide view of the scope of the constituent ACPs and identify the potential interdependencies between the proposals. Collectively, the ACPs that are included in the Masterplan are referred to as the 'constituent airspace change proposals'. Each individual ACP is developed following the same detailed process steps laid out in the CAA's guidance for changing the airspace design – known as CAP1616[4]. The CAA evaluates the progress of every ACP through each stage of the process, via a series of (seven) regulatory gateways and make decisions on whether to approve further development and ultimately the implementation of the proposed changes. A summary of the CAP1616 process is available in the next section.

Iteration 2 places London Luton Airport in the 'LTMA[5] regional cluster' alongside Biggin Hill, Bournemouth, Heathrow, Gatwick, London City, Manston, RAF Northolt, Southampton, Southend and Stansted airports.

London Luton Airport Operations Limited (LLAOL) began their ACP to modernise their airspace in December 2018 and passed through Stage 1 of CAP1616 in June 2019. Stage 2A Options Development began shortly afterward with initial airspace design options shared with stakeholders in Q1 2020. At this time, the project and much of the wider Programme was paused due to COVID-19 pandemic whilst the aviation industry focussed on managing the pandemic and its recovery from it. The Programme was remobilised in March 2021 following the provision of DfT grant funding, allowing LLAOL to recommence their ACP in July 2021.

This document forms part of the London Luton Airport Operations Limited (LLAOL) Stage 2 submission to the CAA. It sets out how LLAOL has developed its Comprehensive List of Options for the ACP and how it evolved those options through stakeholder engagement. It then explains the methodology used to evaluate the options against the Design Principles as well as containing a summary of that evaluation.

All airspace design options in this document are subject to change throughout the airspace change process as options are matured in detail and refined in accordance with safety requirements, our design principles, our appraisals and stakeholder engagement and consultation with all our stakeholders.

[3] Link to Iteration 2
[4] CAA CAP 1616, edition 4, March 2021
[5] London Terminal Manoeuvring Area

The CAP1616 Airspace Change Process

In December 2017 the Civil Aviation Authority (CAA) published CAP1616[6] Airspace Design: Guidance on the regulatory process for changing airspace design, including community engagement requirements. The guidance sets out the process for the airspace change process, which a change sponsor of any permanent change to the published airspace design must follow. The airspace change process is split into 7 Stages;

Figure 1: CAP1616 Process

[6] CAP1616

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Where London Luton Airport Operations Ltd is in their Airspace Change Proposal

This Airspace Change Proposal is required to follow the CAP1616 process detailed in the section above. Table 1 below summarises the CAP1616 stages already undertaken for this ACP and the stage where we are at now, providing links to previous submission documents with further information.

Airspace Change Stage	Summary	Link to Documents (Also available on the ACP portal)
Stage 1A	In December 2018, LLAOL submitted the following statement of need (SoN) to the CAA: *The Department for Transport have notified aviation stakeholders via the Upgrading UK airspace: strategic rationale, published in February 2017, that the controlled airspace in southern England used to support commercial air transport operations is capacity constrained, it has evolved over time and does not exploit modern navigation technology.* *The Future Airspace Strategy Implementation South (FASI South) programme has been established by NATS and a number of key airports operating in southern England, including London Luton Airport Operations Ltd. to coordinate a series of linked ACPs that will modernise the overall airspace structure and route network.* *London Luton Airport Operations Ltd is using this opportunity to look at options of aircraft reaching higher altitudes sooner on departure and remaining higher for longer on arrival enabling significant environmental benefits.*	Statement of Need on CAA's Airspace Change Portal
	LLAOL participated in an assessment meeting with the CAA on the 22nd January 2019 as part of Step 1A of the CAP1616 process. The purpose of the assessment meeting is for the change sponsor to present and discuss their SoN and to enable the CAA to consider whether the proposal falls within the scope of the formal airspace change process.	Assessment meeting minutes
Stage 1B	At Stage 1B LLAOL developed a set of design principles with identified Stakeholders. The aim of the design principles is to provide high-level criteria that the proposed airspace design options should meet. They also provide a	Stage 1B Design Principle Submission Report

	means of analysing the impact of different design options and a framework for choosing between or prioritising options. The final design principles outlined within the Stage 1B submission, and also shown here in this document, were given a priority order.	
Stage 2A	Stage 2A requires change sponsors to develop and assess options for the airspace change. In Stage 2A, the change sponsor develops a comprehensive list of options that address the Statement of Need and that align with the design principles from Stage 1. We then share those options with our Stakeholder representatives (the same ones engaged with on the Design Principles). Feedback from the engagement is then used to refine and/or generate further options where feasible. Finally, we qualitatively assess all options developed against the Design Principles and produce a Design Principle Evaluation. This is where we are now. The following sections of this document outline how we have developed airspace change options, engaged with Stakeholders, and then assessed the options against the design principles developed at Stage 1B.	**This Document**

Table 1: LLAOL ACP to date

LLAOL's Design Principles for this ACP

The design principles were set following engagement with representative stakeholder groups as part of CAP1616 Stage 1. The table of design principles and their relative priorities is shown in Table 2 below:

	Design Principle
1	Must be safe
2	Must meet the 3 aims of the NPSe, Air Navigation Guidance 2017 and all appropriate Government aviation policies, and updates thereof.
3	Should not constrain the airport's capacity, providing the environmental objectives/requirements have been met
4	Should enable continuous climb/descent to/from at least 7000ft & facilitate continuous climb/descent above that
5	Should provide an equitable distribution of traffic where possible, through eg; • Use of multiple routes • New route structures • Options (mechanisms) for respite
6	Should avoid overflying the same communities with multiple routes, & take into account routes of other airports, below 7000ft
7	Should minimise tactical intervention by ATC below 7000ft
8	Should minimise the impact on other airspace users through; • Keeping CAS requirements to a minimum • Simple airspace boundaries • Allowing flexible use of airspace, where possible

Table 2: Design Principles

UK Airspace Change Masterplan Iteration 2

The number, complexity and overlapping scope of the individual airspace ACPs needed to deliver the Programme requires a strategic coordination mechanism in the form of a single joined up implementation plan or Masterplan. In their capacity as co-sponsors of the AMS, the Department for Transport and CAA commissioned NERL to create the Masterplan.

Airspace modernisation is a long and complex process. Larger ACPs with many interdependencies can take several years longer to develop than smaller ones with fewer interactions. As a consequence, ACOG proposed (and the co-sponsors accepted) that the final Masterplan is developed through a series of iterations. The iterative approach recognises that different information and levels of detail will be available at different times. ACOG may have an insufficient level of detail about some ACPs to make firm conclusions and need to make assumptions that are refined in later iterations. It also means that the Masterplan remains flexible and responsive to accommodate the evolving context for airspace modernisation, such as changes arising from the AMS review, new policy directions or unanticipated events.

ACOG envisages a minimum of four iterations of the Masterplan. The iterations broadly align with the regulatory gateways of the CAP 1616 process. Each iteration must be accepted separately into the AMS, except Iteration 1, which was a high-level plan that has already been assessed and published[7].

The purpose of Iteration 2 is to provide a system-wide view of the scope of the constituent ACPs and identify the potential interdependencies between the proposals. The assessment of the interdependencies between the constituent ACPs remains at a high level in Iteration 2 because most of the sponsors were yet to produce a comprehensive list of airspace design options at the time of its creation.

The Masterplan becomes, together with the CAP 1616 process, the legal basis against which individual airspace change decisions are made by the CAA. Therefore, the CAA's decisions on airspace change proposals will need to ensure that there is no misalignment with the Masterplan. The CAA must apply its airspace change decisions in accordance with the Masterplan and therefore in the best interests of the overall Airspace System and not just in the interests of the individual ACP sponsor.

The timeline and sequencing of the Masterplan ACPs are complex issues. It is not considered feasible for all the constituent ACPs in the Programme to be developed and deployed at the same time. The Masterplan takes a modular approach to deployment and requires coordination and strong programme management discipline to mitigate the risks of design conflicts, technical misalignments and a lack of transparency for external stakeholders. To help with this, the Masterplan has placed each of the ACPs into a regional cluster and Iteration 2 places London Luton Airport in the 'LTMA regional cluster' alongside Biggin Hill, Bournemouth, Heathrow, Gatwick, London City, Manston, RAF Northolt, Southampton, Southend and Stansted airports.

[7] Airspace Masterplan Iteration One (Southern UK): co-sponsor assessment, CAA CAP 1884, February 2021.

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Large scale ACPs are usually difficult to develop and deploy because of the complexity of the existing airspace design, the intensity of the current operation and the potential impacts on communities, the environment and other airspace users. The Masterplan ACPs bring additional deployment challenges associated with airspace design interdependencies and the widespread introduction of PBN routes, which will replace well established ATC procedures based on controller vectoring with the comparatively new concept of systemisation. Other factors being equal, the greater the complexity of the existing airspace design, and the more interdependencies, the more difficult the ACPs will be to deploy.

Iteration 2 advises that that the LTMA cluster will require a minimum of three separate 'core LTMA' deployment windows to implement the full set of proposed changes (within the LTMA) because of the very large size, high complexity and extensive interdependencies of the constituent ACPs.

The deployment timescales for each individual ACP within a cluster are determined by the size, complexity and interdependencies of the proposal and a series of important programme planning assumptions regarding the activities that controllers and operators must conduct to prepare for changes to the airspace structure and route network.

As a result, Iteration 3 has identified that core LTMA deployments that include Heathrow, must be divided into a minimum of three windows, separated by 12-month intervals and cannot begin before Spring 2027. Noting Luton's dependencies on Heathrow, London City, Northolt and to a lesser extent Stansted (that are explored more here in this document), this means that any change to Luton's route structure that has dependencies on Heathrow and other LTMA airports are not expected before this date. Luton's deployment date could therefore be somewhere between 2027 and 2029, subject to the wider programme remaining on track.

Outside of the core of the LTMA cluster, Iteration 2 states there may be opportunities for some portions of the ACPs to be implemented in advance of the core LTMA deployment sequence. The potential airspace design conflicts and enablers that exist between the LTMA ACPs will likely result in sponsors having to 'split' their ACPs (the first part for the early deployment and the second part for the core LTMA deployment). Any ACP 'split' would require CAA endorsement and must demonstrate that the early part of the deployment will not unreasonably constrain the options associated with the core LTMA deployments later. Some LTMA ACP sponsors may also be able to proceed with smaller, targeted portions of their ACPs that are independent of all other proposals. Each sponsor would need to consider their needs and benefits individually before deciding on what approach to take regarding the potential to split their ACPs in service of an earlier deployment. With this in mind, an 'Early LTMA Deployment window' has been identified within the Masterplan for Spring 2026 where such independent LTMA ACPs could enter operational service.

LLAOL's Potential Interdependencies Identified within Iteration 2

The Masterplan identifies the interdependencies between the constituent ACPs based on an analysis of the broad sections of airspace where a flight path could 'conceivably be positioned' below 7000ft within the scope of each proposal. Based on this broad assessment, the Masterplan identifies that Luton has potential dependencies with flight paths to and/or from Heathrow, RAF Northolt, Stansted and London City airports. This is as we would expect, as explained in the next section of this document.

Luton's Existing Airspace Arrangements (Baseline)

Luton's airspace infrastructure has remained largely unchanged since 2006. However, in November 2021, the CAA approved LLAOL and NERL's joint proposals to make changes to Luton's arrival structures. This change, known as Swanwick Airspace Improvement Programme - Airspace Deployment 6 or 'SAIP AD6' will see the establishment of a new, dedicated holding stack ("ZAGZO") for Luton arrivals which was only very recently brought into operational service on 24th February 2022. There were no changes to Luton's departures in SAIP AD6.

Owing to the timing of Luton's Stage 2 submission to the CAA for this FASI ACP, it is not possible to use actual radar data to support the description of the current airspace arrangements at Luton, as it did not exist at the time of writing. This section therefore assumes the new Luton holding facility is operational and uses material from within the SAIP AD6 ACP to help describe the airspace arrangements.

Full details on SAIP AD6 are available on the CAA's Airspace Change Portal here.

Runway and Local Geography

Luton airport is located 1.5m (2.4km) east of Luton town centre and is 28m (45km) north of Central London. The airport is owned by London Luton Airport Ltd (LLAL), a company wholly owned by Luton Borough Council, and operated by London Luton Airport Operations Ltd.

Luton has one runway (25/07) and with prevailing winds in the UK from the South West, Runway 25 is in operation approximately 70% of the time (westerly operations) and Runway 07 is in operation approximately 30% of the time (easterly operations).

To the North, West and South West of the airport is the Chilterns AONB and there are multiple areas of dense population within the local vicinity of the airport such as Luton, Dunstable, Houghton Regis, Berkhamsted, Harpenden, Hemel Hempstead, St Albans, Hatfield, Welwyn Garden City, Stevenage, Leighton Buzzard, Tring, Hitchin and Letchworth Garden City.

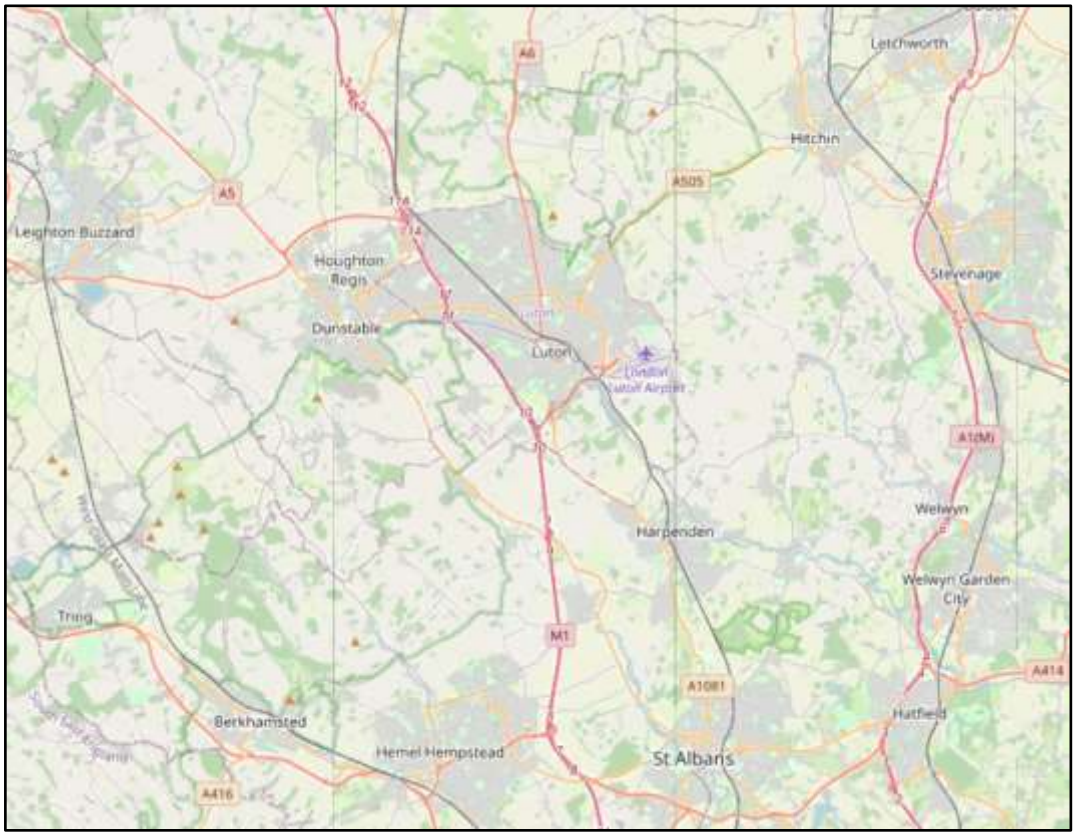

Figure 2: Local population centres

Figure 3: Chilterns AONB.

Arrivals into Luton

There are no defined flight paths routinely used by ATC for arriving until aircraft are established on the final approach. Arrivals into Luton are vectored onto final approach with the majority of arrivals routing via Luton's dedicated holding facility located approximately 30 miles to the North East of Luton.

The Luton Approach Radar Manoeuvring Area (RMA)

To achieve an optimised delivery of aircraft onto the runway, approach controllers are given an area of airspace or, Radar Manoeuvring Area, to keep aircraft under their control within.

The RMA is an Air Traffic Control (ATC) operational area articulated as a volume of airspace by the Air Navigation Service Provider (ANSP). It facilitates the close-in radar vectoring by ATC that is required to take the aircraft safely from a holding stack and established onto final approach. It provides approach controllers with the airspace necessary to perform their primary function of sequencing the aircraft into the required landing order with the distance between each aircraft which is required by the airport at any particular time.

In the case of Luton, their RMA (see Figure 4) is an area within extant notified Controlled Airspace (CAS) and ensures that Luton arrivals remain safely separated from the other flows of traffic to/from other London Airports such as London Heathrow, RAF Northolt, London City and London Stansted.

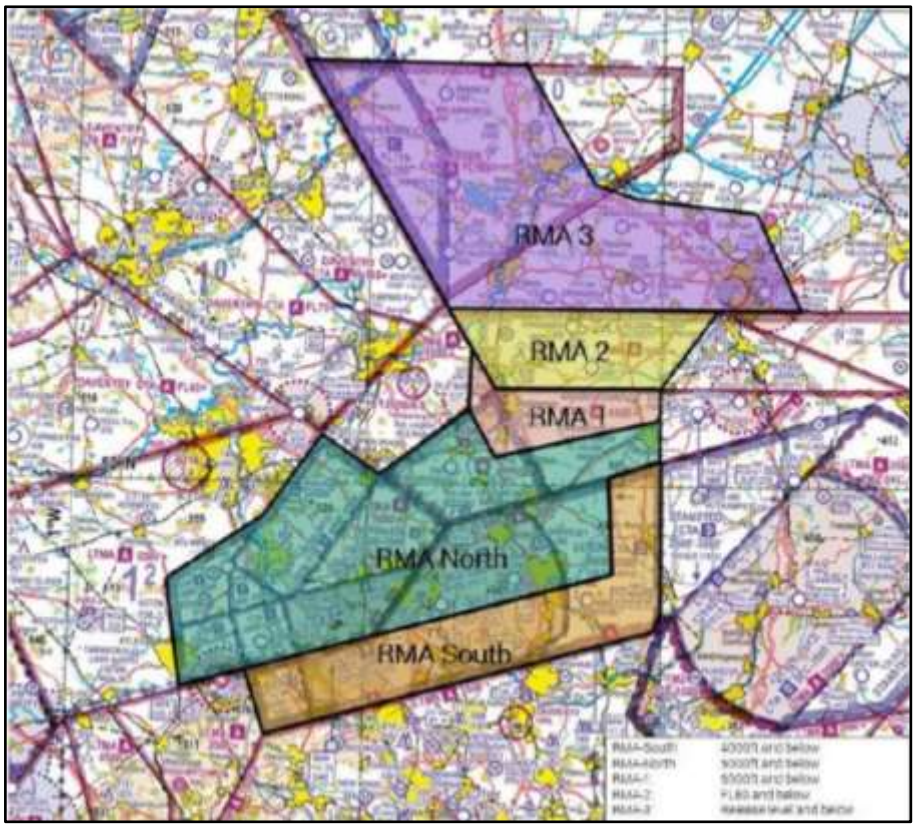

Figure 4: Luton RMA

Owing to other traffic flows to and from other airports within the LTMA (as described below), Luton's arrivals are required to be lower than is optimal from a Continuous Descent Approach (CDA) perspective resulting in periods of level flight at 5,000ft to remain within Luton RMA North.

Luton has Noise Abatement Requirements published in the UK Aeronautical Information Publication (AIP) which detail how far from the runway threshold ATC can position aircraft onto final approach at night:

Between the hours of 2300 and 0700 (local), all jet aircraft and all propeller driven aircraft whose MTOM[8] exceeds 5700 kg, irrespective of the type of approach, are to be vectored onto a closing heading which will position the aircraft for Runway 25 on final approach no closer than 8 nm from touchdown and for Runway 07 no closer than 10 miles from touchdown. Descent below 3000 ft QNH is not to be given until 10 nm from touchdown.

The requirement to avoid overflight of Leighton Buzzard with arrivals to Runway 07

In May 2006 Luton Airport implemented a change to the published airspace arrangement, following a successful airspace chance application. This airspace change was known as "The Western Airspace Extension".

As part of that application, the Directorate of Airspace Policy (DAP) placed a requirement on Luton Airport that *"..arriving traffic should not be routinely radar vectored over the town of Leighton Buzzard, unless tactically unavoidable."*

Figure 5 shows how the main flow of arrivals (yellow tracks) to Runway 07 are predominantly to the south of Leighton Buzzard. Note the outline of Leighton Buzzard (purple) was the outline in May 2006 and is what the requirement was established on.

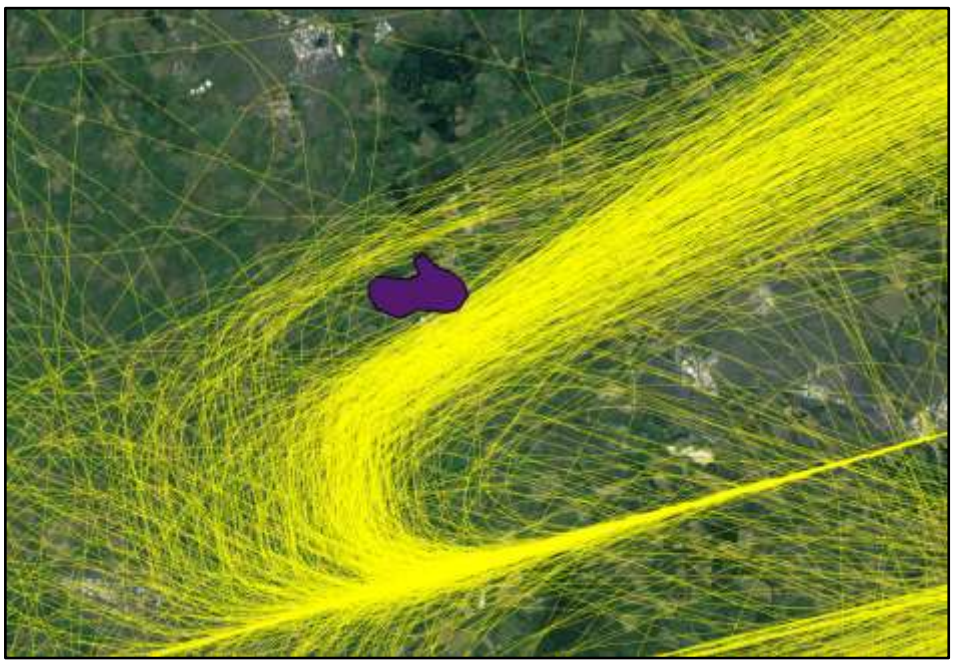

Figure 5: Overflight of Leighton Buzzard 2006 (purple) by easterly Luton arrivals

[8] Maximum Take-Off Mass

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Figure 6 shows the recent outline of Leighton Buzzard compared to when the requirement was set in 2006. It can be seen that easterly Luton arrivals are routinely vectored over that part of Leighton Buzzard which has been allowed to develop to the south, since 2006.

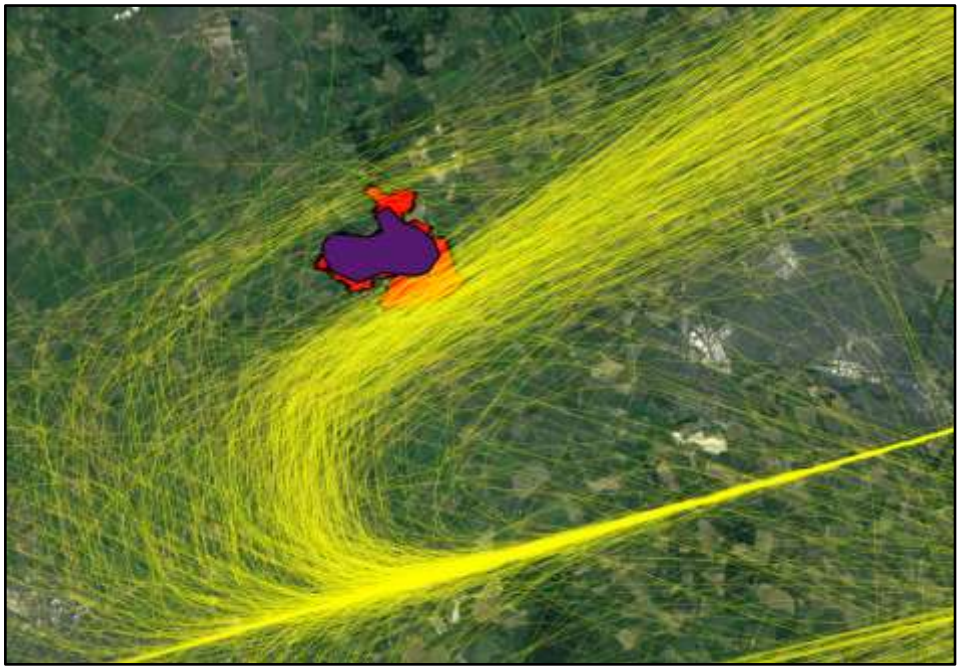

Figure 6: Overflight of Leighton Buzzard 2006 (purple) versus 2019 (red) by easterly Luton arrivals

The Post Implementation Review report (January 2008) recommended that *"…consideration be given to rerouting the easterly arrival track to LLA to a position north of Leighton Buzzard and for aircraft to commence their CDA from a much higher altitude. This would provide less restrictive airspace for tactical sequencing of arrival traffic and further reduce environmental impact."*

Departures from Luton

Aircraft taking off from Luton are required to follow specific flight paths called Noise Preferential Routes (NPRs), unless directed otherwise by air traffic control. Aircraft flying inside this corridor are considered to be flying on-track.

Each NPR is contained in a corridor extending 1.5 km either side of the NPR centre line and departing aircraft must remain within the NPR until reaching an altitude of 3,000ft during the day or 4,000ft at night (the release altitude). For Luton's PBN Standard Instrument Departure (SID) (Rwy 25 Match/Detling), the corridor extends 1km either side of the centreline and the release altitude is 4,000ft day and night.

The NPRs at Luton are designed to avoid the overflight of built-up areas where possible and in the case of Westerly operations, the busy gliding airspace. They set a path for the aircraft to take from the runway until they reach the main UK air traffic routes.

On Westerly operations, all of Luton's NPRs all flow to the south of the airport. The historical reason for this NPR is most likely based on both the avoidance of Luton and Dunstable population centres to the North as well as

the areas of dense gliding activity. Due to the Gliding Areas, the departures have to turn to the south on reaching 500ft above the runway. Figure 7 illustrates Luton's Westerly NPRs and contains data on movements in 2019.

Figure 7: Westerly NPRs and movement data (2019 Annual Monitoring Report)

On Easterly operations, the extant reliance on ground based navigation aids and their position is a likely reason for the departures routing straight ahead to c.3nm before turning. The northbound NPRs aims to then avoid Hitchin and Luton with the Southbound SIDs turning before Stevenage. Figure 8 illustrates Luton's Easterly NPRs and contains data on movements in 2019.

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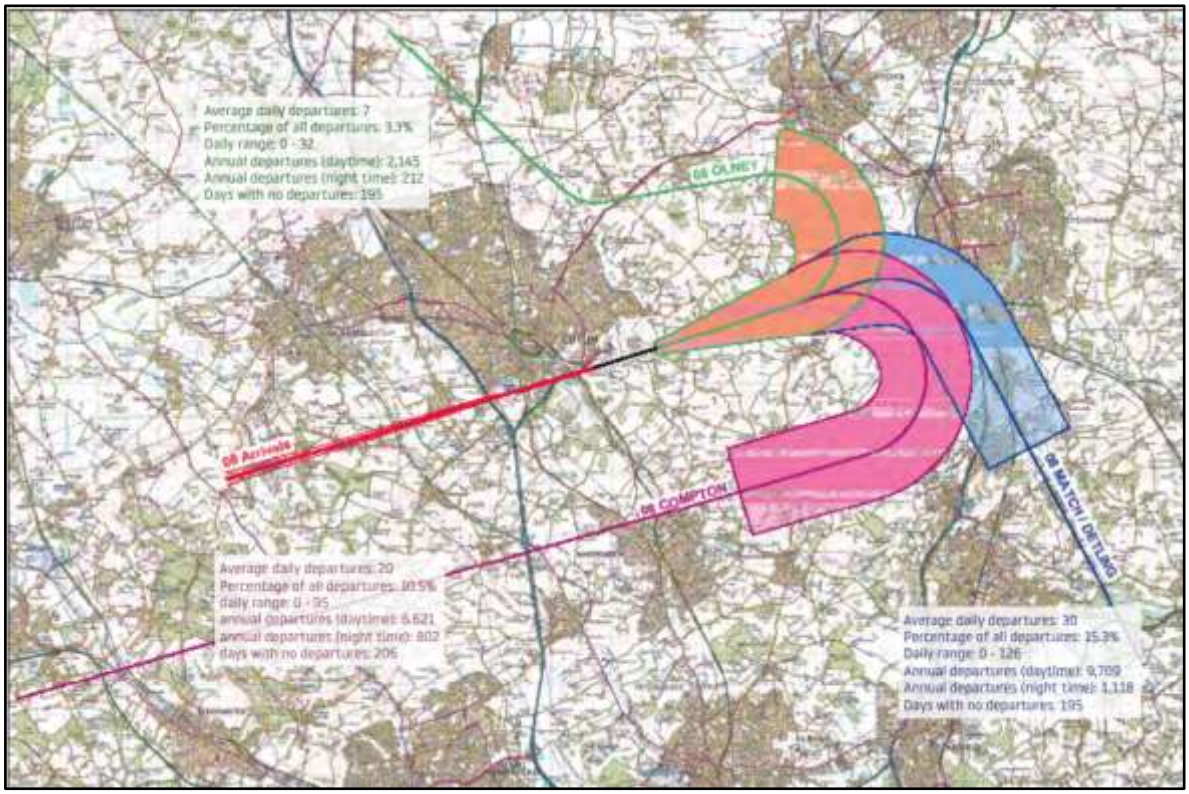

Figure 8: Easterly NPRs and movement data (2019 Annual Monitoring Report)

Once an aircraft reaches the NPR release altitude, air traffic control can instruct it to turn onto a more direct heading to its destination and/or to position against other aircraft, which may take the aircraft outside the lateral NPR corridor - this is called vectoring. There may be occasions where it is necessary for safety reasons (e.g. to avoid severe weather conditions) to vector aircraft off NPRs below the release altitude. Vectoring is more common on some routes than others, which is as a direct result of managing Luton's departures against the other traffic flows within the London airspace. Figures 9 and 10 below show track density plots of all of Luton's traffic across a 92-day summer period 2019. Whilst there is a clear concentration underneath the route centrelines, there is a large amount of dispersion which, for departures, is taking place when the aircraft are above the NPR release altitude. For arrivals, they are dispersed until joining final approach although there are areas of concentration albeit much broader than on departure.

LLAOL FASI-S Stage 2A

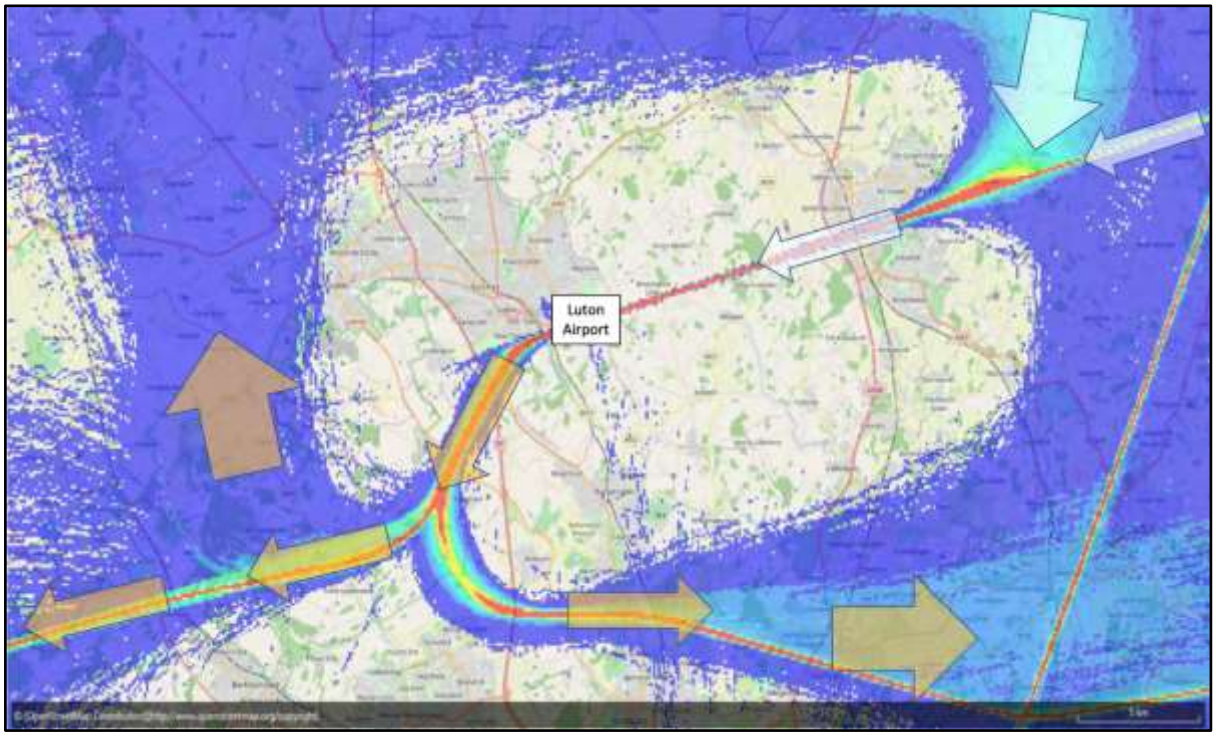

Figure 9: Westerly track density plots (2019 Annual Monitoring Report)

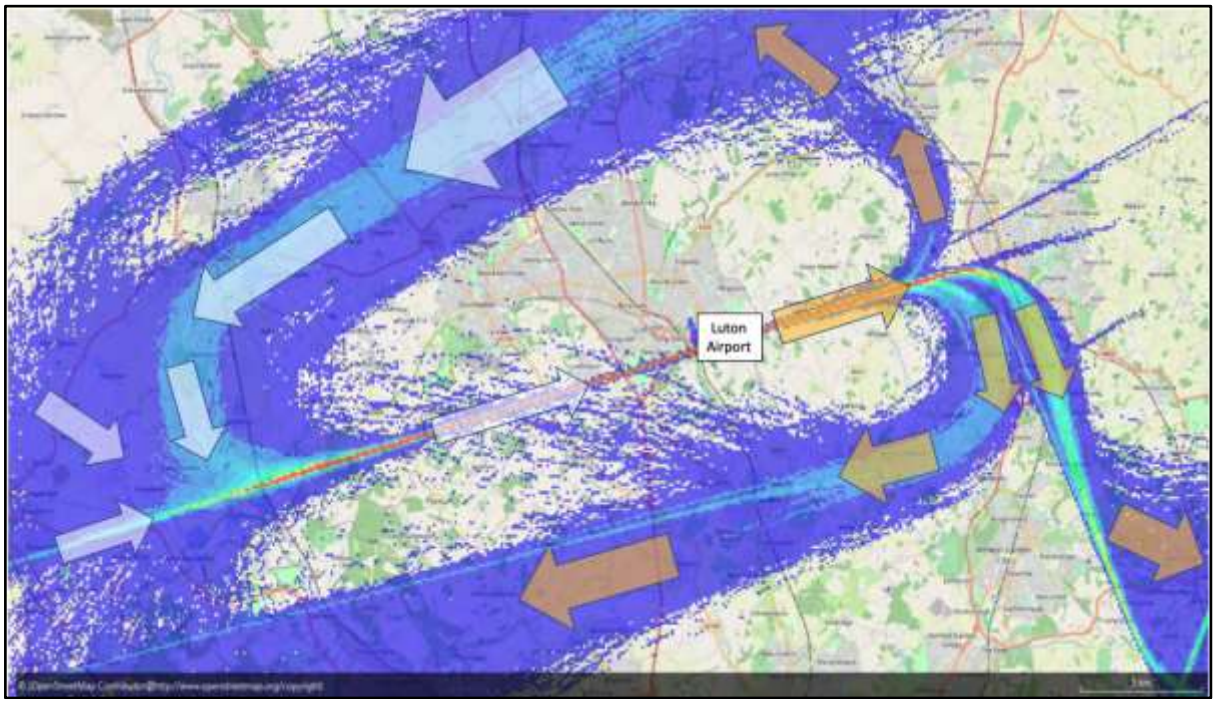

Figure 10: Easterly track density plots (2019 Annual Monitoring Report)

Existing Noise Contours and Associated Planning Constraints

Luton's planning conditions require that they produce and publish daytime (57 dB LAeq,16h) and night-time 48 dB LAeq,8h contours on an annual basis. The *size* of these contours are determined largely by four main factors:

- The type of aircraft using the airport
- The number of aircraft using the airport
- The frequency of use of each flight path
- The height of aircraft on those flight paths

The *shape* of these contours are directly influenced by the position of the flight paths, especially at c.3,000-4,000ft and below.

Figures 11-14 illustrate these contours as they were in 2019 and also in 2020. As a result of the COVID-19 pandemic, the much lower volume of flights operating at Luton airport resulted in much smaller noise contours in 2020 than in 2019. The SAIP AD6 ACP forecast that there were not going to be any significant changes to the contours as a result of the introduction of the new holding stacks. Therefore, it is appropriate to show the actual 2019 and 2020 contours to represent the existing airspace in this section.

LLAOL FASI-S Stage 2A

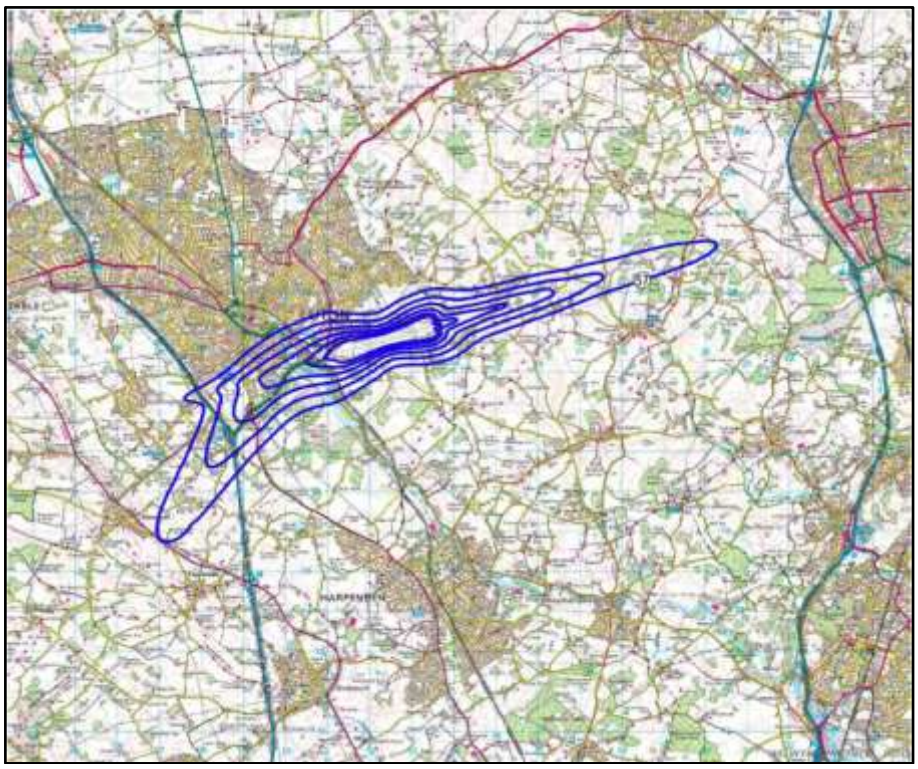

Figure 11: Annual Day Noise Contours Summer 2019 (average)

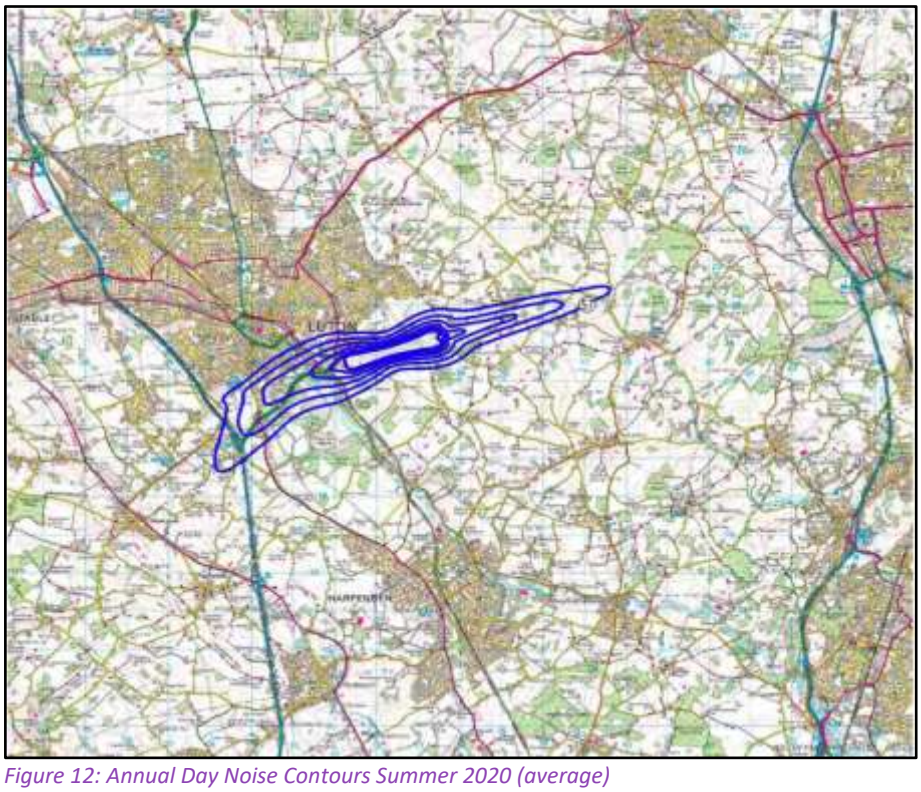

Figure 12: Annual Day Noise Contours Summer 2020 (average)

LLAOL FASI-S Stage 2A

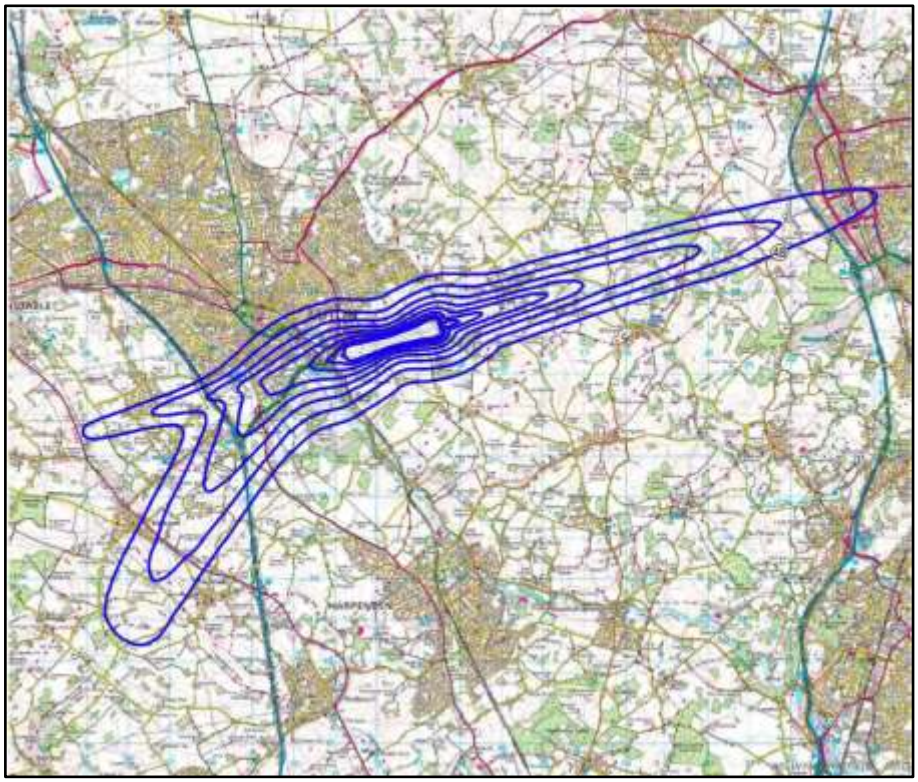

Figure 13: Annual Night Noise Contours Summer 2019 (average)

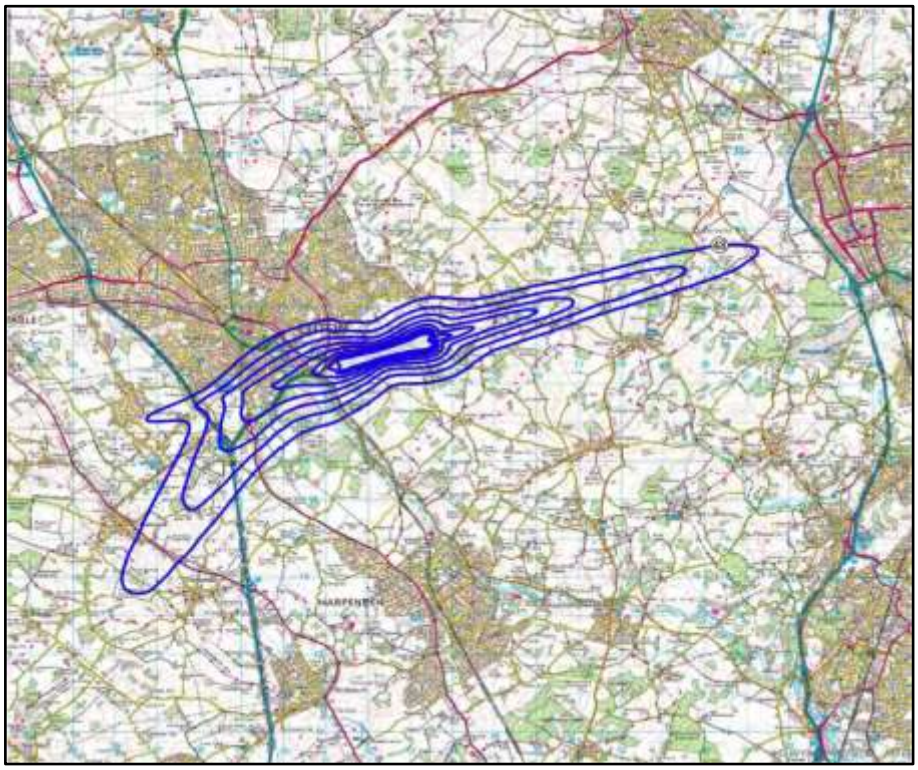

Figure 14: Annual Night Noise Contours Summer 2020 (average)

A constraint within Luton's planning conditions mandates a limit on the area (km^2) of those contours, not the population numbers within them and also requires those contours to reduce in size by 2028.

This condition is extremely important for this ACP, as it means that if any airspace design option is assessed as breaching this condition or in any way limiting LLAOL in achieving future reductions to the size of these contours, the option would be not progressed by LLAOL. However, to determine the size of the forecast contours based on the new airspace design option, requires noise modelling at a system level. This requires a complete system design of Westerly and Easterly arrivals and departures modelled with a forecast schedule and fleet mix which is very detailed and time-consuming work and not practical with a myriad of different combinations of arrival and departure options. This modelling will be therefore performed in the Full Options Appraisal in Stage 3 on LLAOL's shortlisted options.

Contour Population Counts

Whilst Luton's planning condition is associated only with the size of their noise contours and not the population numbers within them, CAP1616 and Air Navigation Guidance 2017 policy means that the CAA and, if required, DfT, use different primary decision-making metrics, which are more focussed on the population density within contours. This is because typically, the airspace design and position of routes don't tend to significantly affect the size of the contours, but it does affect the position/shape of the contours and therefore the population numbers within it. The population numbers are used to help determine the scale of any adverse effects from aircraft noise. The dwelling and population counts are given for the 2019 and 2020 daytime and night-time contours in Table 3 below. The values in these tables have been rounded to the nearest 50, except where less than 50 when the actual value is given.

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$L_{Aeq, 16\ hour}$ Daytime	2019		2020	
	Dwellings	Population	Dwellings	Population
>72	0	0	0	0
>69	0	0	0	0
>66	11	26	0	0
>63	650	1,850	150	400
>60	1,950	4,950	750	2,050
>57	4,350	10,200	2,400	5,900

$L_{Aeq, 8\ hour}$ Night-time	2019		2020	
	Dwellings	Population	Dwellings	Population
>69	0	0	0	0
>66	0	0	0	0
>63	0	0	0	0
>60	150	450	9	21
>57	750	2,000	450	1,200
>54	2,300	5,950	1,400	3,700
>51	4,900	11,450	3,600	8,500
>48	8,750	20,450	6,350	14,800

Table 3: 2019 and 2020 daytime and night-time contour dwelling and population counts

Constraints from other LTMA Traffic Flows

The close proximity of major airports within the LTMA generate significant complexity and dependencies on one another, often resulting in delay and inefficient profiles. There are significant dependencies between Luton, Northolt, London City, Heathrow and, to a lesser extent, with Stansted. These dependencies are likely to exist with any future LLAOL airspace design option which requires CCO/CDO to/from higher levels than today or moves routes closer to those airports.

The leading constraint to all these airports is the Heathrow arrival operation including its holding stacks. Heathrow departures are limited to 6000ft, underneath their own arrivals. Many, many years ago when the LTMA airspace was designed this wasn't a constraint, as the aircraft climbed so slowly that levelling off below arrivals was not a factor. Aircraft now climb much more quickly and so reach 6000ft well before they cross underneath the arrivals.

Departures from Luton, London City and Northolt are all prohibited from continuous climb due to Heathrow departures as well as Heathrow arrivals. In addition, there are dependencies between Luton, Northolt and London City departures as their routes are not all vertically or laterally deconflicted meaning each airport generates delays for one another.

Figure 15 illustrates, at a very basic level, the reason why Luton departures are often restricted to 4000ft and 5000ft on departure and Luton arrivals are required to be descended early to 5000ft.

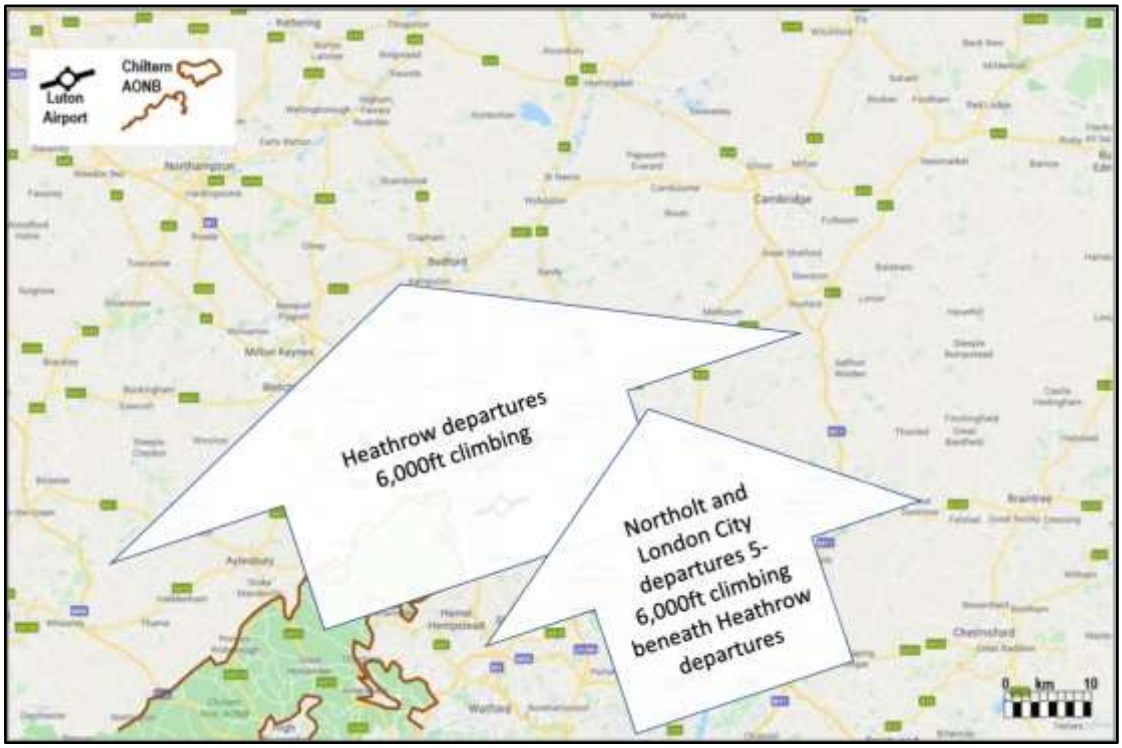

Figure 15: Basic LTMA airspace constraints

It's important to note that this is the baseline published airspace design which is restricted in this way. An airspace design assumes there is always conflicting traffic on an adjacent route, except where adjacent routes are not separated from each other, in which case, the arrival or departure is delayed until the conflicted traffic has passed. However, Air Traffic Control (ATC) do not rely just on the route structure, otherwise every single departure from Luton would level at 5,000ft and not climb higher until joining the network airspace many miles from Luton and delays would be intolerable. In reality, there is not always conflicting traffic and ATC can tactically climb aircraft above their published flight path altitudes earlier and they also vector aircraft to laterally deconflict from each other to enable more direct routings, continuous climb and continuous descent.

To illustrate this, the table below shows the percentage of Luton departures than receive continuous climb to at least Flight Level (FL) 100 (c.10,000ft) in 2019 and 2020. The tables show a direct correlation between traffic levels and complexity in the LTMA and CCO performance. In 2019 c.61% of Luton's departures received tactical CCO to at least FL100 whereas in 2019 whilst traffic levels in the LTMA were much lower, this number rose to c.80%. Lower controller workload through enabled through improved airspace design will enable improved tactical CCO performance.

		2019												
RWY	SID	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
25	CPT	58	60	50	51	53	51	51	53	51	53	57	59	54
25	MATCH	72	67	66	64	65	64	66	65	65	64	65	66	66
25	OLNEY	78	76	75	63	71	66	70	71	71	65	76	72	71
														64%
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
07	CPT	52	50	37	45	39	37	35	54	40	39	44	49	43
07	MATCH	69	65	62	64	63	54	57	70	65	55	68	70	64
07	OLNEY	75	66	73	69	64	60	70	70	61	64	71	70	68
														58%

		2020												
RWY	SID	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
25	CPT	56	57	66	83	97	90	88	90	88	85	88	85	81
25	MATCH	61	62	67	97	92	91	87	83	84	85	84	84	81
25	OLNEY	75	69	77	83	79	83	90	88	91	85	89	89	83
														82%
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
07	CPT	45	44	63	86	64	75	71	71	69	57	75	83	67
07	MATCH	63	64	83	97	97	94	84	83	87	85	90	94	85
07	OLNEY	78	60	77	92	57	88	84	80	84	83	95	93	81
														78%

Table 4: % of Luton deps receiving continuous climb to at least FL100 (2019/2020)

Transition Altitude

Even with a redesign and modernisation of the airspace there is another significant and fixed constraint to consider, the Transition Altitude (TA). In the LTMA this is 6,000ft.

This section will not explain what the TA is in detail, other than to say the way aircraft reference their height above ground changes above 6,000ft compared to at or below 6,000ft. At or below 6,000ft, they fly at an altitude. Above 6,000ft they fly at a Flight Level (FL).

Whenever aircraft are not laterally separated, they are kept at least 1000ft apart vertically. 5,000ft is obviously 1,000ft below 6,000ft. Similarly, FL70 is 1,000ft below FL80.

However, 6,000ft and FL70 are not always at least 1,000ft apart. In fact, sometimes 6,000ft and FL80 are not always at least 1,000ft apart.

Therefore, in order for Luton departures to be guaranteed continuous climb in the future to even 6,000ft, Heathrow, Northolt and London City northbound departures either need to be routed significantly to the East or West of Luton or those departures need to be guaranteed to make at least FL90 at least 3-5nm before crossing the path of Luton's flight paths. To put this into context, this would mean all aircraft from Heathrow on the current ULTIB SID would be required to climb at a gradient of at least c.8% to enable Luton's Runway 25 MATCH departure to be guaranteed climb to 6,000ft. That is without considering Northolt and London City departures.

Any SIDs that climb above 6,000ft need to climb continuously from the runway, to at least FL90.

The ability to enable continuous climb for all departures within the LTMA to at least 7,000ft (as explained above they would actually need to climb to at least FL90) is an immense challenge. Therefore, enabling as much track distance between Heathrow, Northolt and London City departures and Luton departures is essential in generating the best possible chance of improved vertical performance.

Controlled Airspace Arrangements and General Aviation

Within the Luton RMA, there are numerous controlled airspace boundaries, as well as areas of airspace delegated to gliding activities an intense General Aviation (GA) activity all around. The Gliding Areas are used differently depending on whether Luton are on easterly or westerly operations. Use of the portions of gliding areas within Controlled Airspace is strictly controlled by a Letter of Agreement between various parties.

Luton Approach controllers ensure that all Luton arriving and departing commercial traffic stays within controlled airspace and remains clear of the airspace delegated to gliding activities. Figure 16 shows the controlled and delegated airspace boundaries. Figures 17 and 18 illustrate the density of gliding activity operating to and from RAF Halton and Dunstable Gliding Club in relation to Luton Airport.

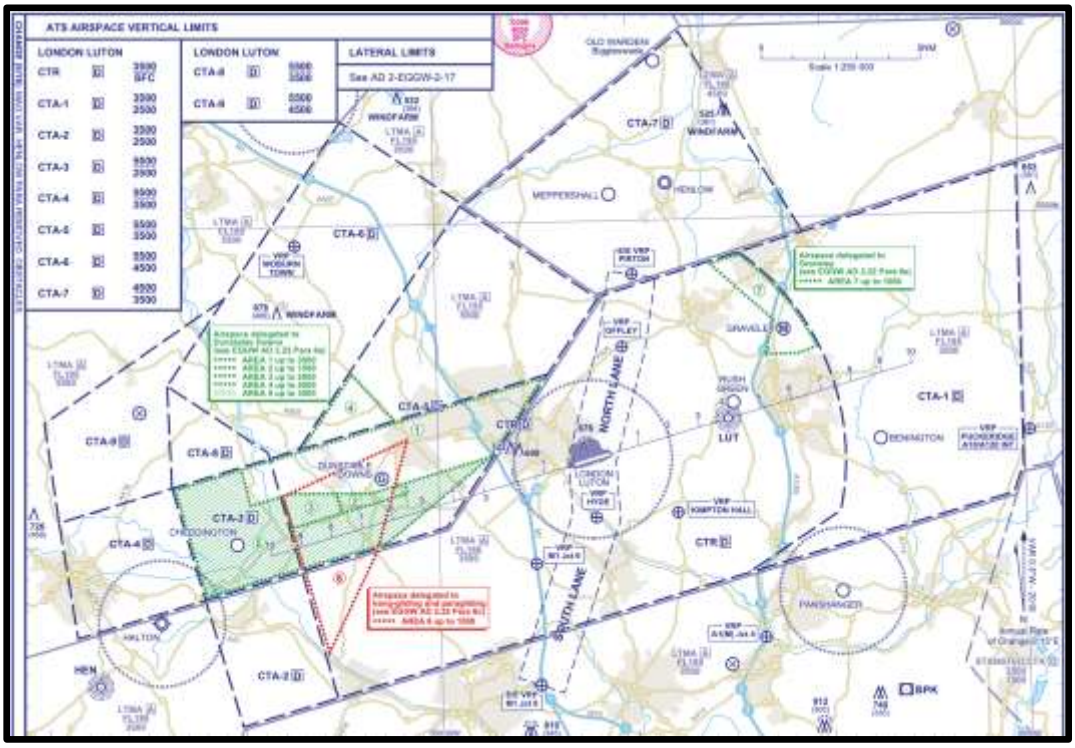

Figure 16: Luton Control Zone and Control Area

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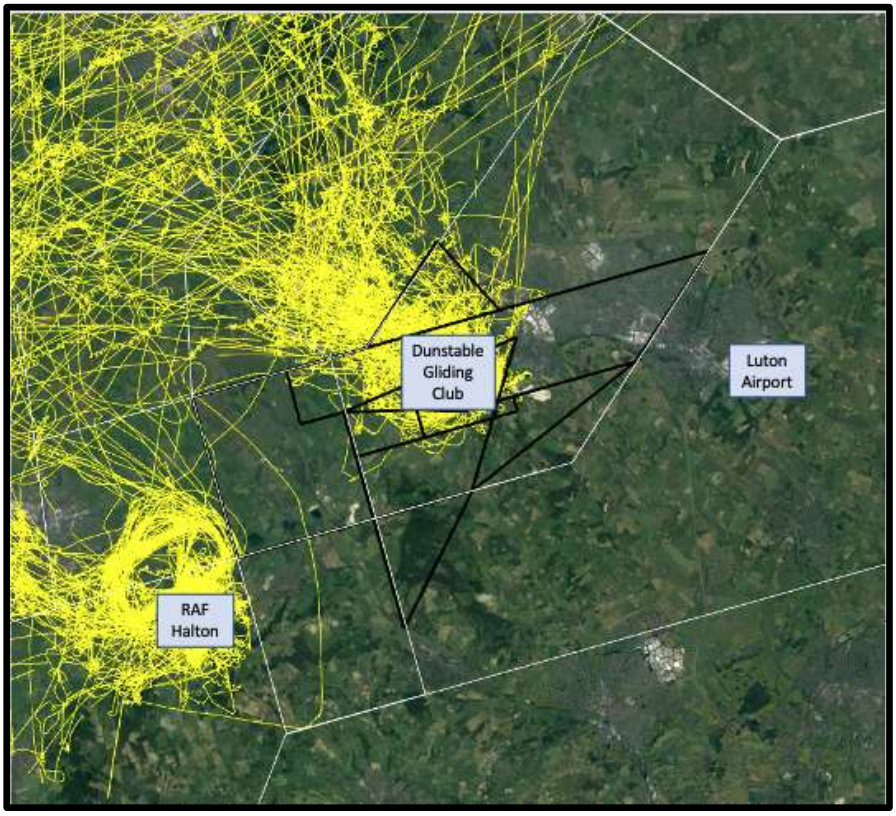

Figure 17: Gliding activity to the west of Luton Airport (FLARM data)

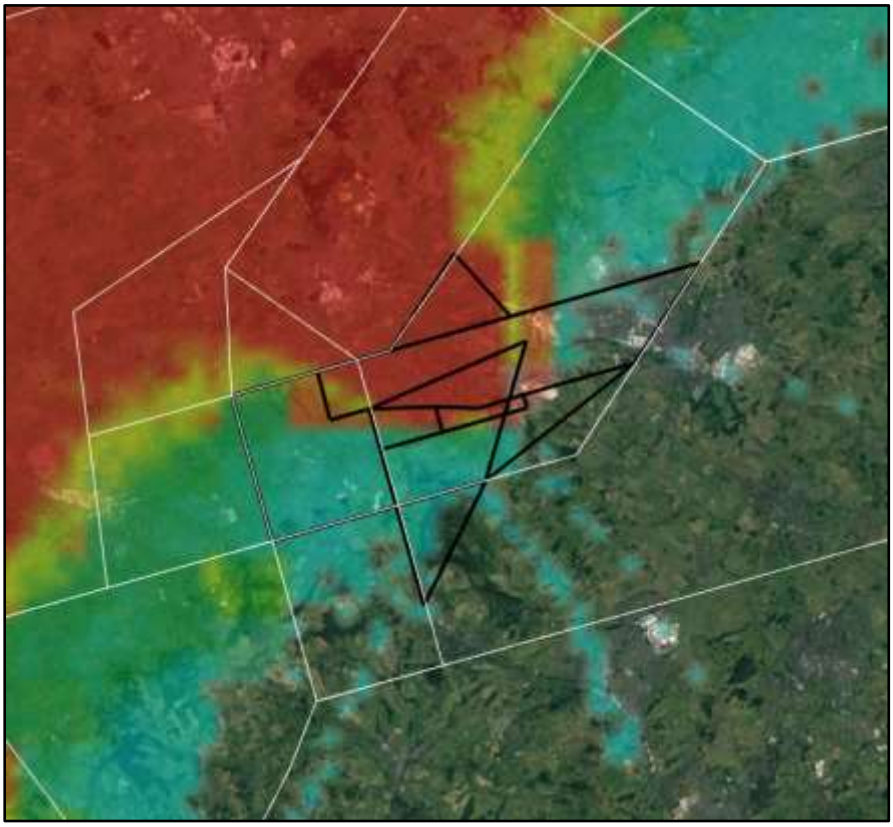

Figure 18: Gliding activity heatmap to the west of Luton Airport (Airspace4All Gliding Significant Areas)

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In 2017, Airspace4All published a piece of work on VFR Significant Areas (VSA). The term VFR Significant Area denotes a volume of airspace which has been identified as being particularly important to VFR operations i.e. General Aviation (GA). A VSA might take the form of a route, a zone or an area chosen for its particular importance to its GA users. These areas do not have any official status but are intended to highlight the importance of a particular area so that any future airspace development plans can take due account of the GA activity.

Of relevance to Luton is the 'Heathrow/Luton gap', the 'Brize Norton-Heathrow-Luton Gap' and the 'Stansted-Luton Gap' which are illustrated in Figures 19, 20 and 21.

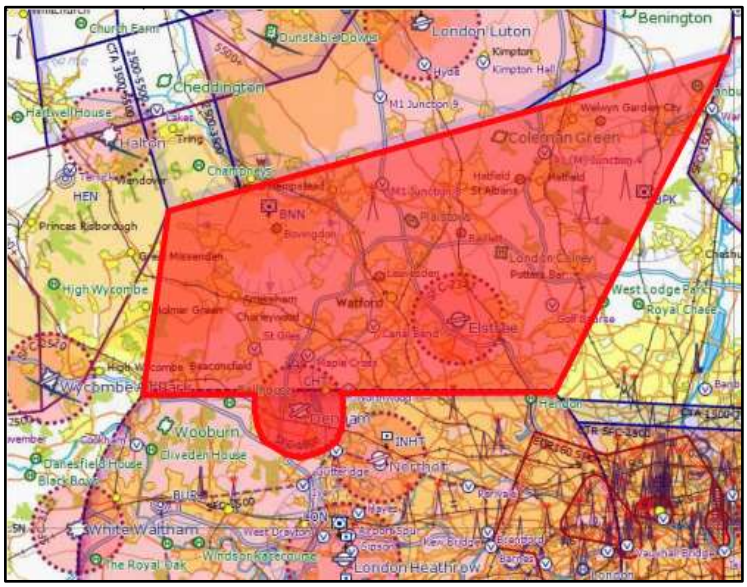

Figure 19: The Heathrow-Luton Gap identified by Airspace4All

The Heathrow/Luton gap' is 8nm wide by 25nm long. It contains two major GA airfields (Elstree and Denham) plus two microlight sites (Plaistows and London Colney), also at least one airstrip and several helipads, all of which require access to this area for inbound, outbound and local flights. The top of the Elstree Aerodrome Traffic Zone (ATZ) is just 168ft below the base of the 2,500ft LTMA making overflight of the ATZ difficult. The gap between it and Luton CTR is 6nm with two microlight sites therein, while the gap between it and Heathrow CTR is 1.1nm. It is a major East-West transit traffic route between the Midlands and the Continent.

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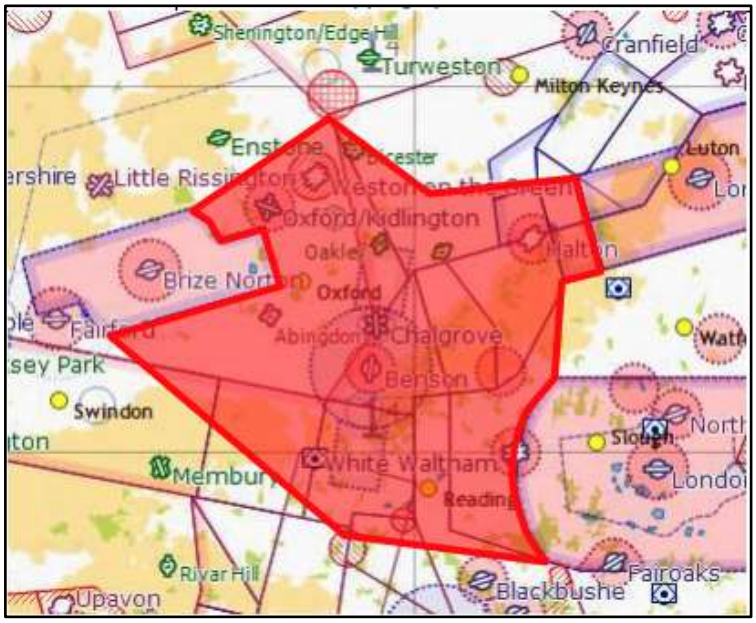

Figure 20: The Brize Norton-Heathrow-Luton Gap identified by Airspace4All

The Brize Norton/Heathrow/Luton gap' is irregularly-shaped, maximum 36nm deep by 41nm wide, though narrower to the East of the Brize CTR. Most of it is within the Oxford Area of Intense Aerial Activity (AIAA). It contains major civil airfields at Oxford, White Waltham and Wycombe Air Park, a major military helicopter airfield and associated Military Air Traffic Zone (MATZ) at RAF Benson.

Restricted Areas 101 and 104 to 2,400ft and Danger Area 129 up to FL120 are within the area. The RAF Benson MATZ runs north/south through the middle of the area and less confident/non radio traffic tend to fly to the west of RAF Benson, the eastern side of RAF Benson having a complex base and traffic associated with Wycombe and White Waltham.

On days with a cloud base of less than 3,000ft the transit round Benson become a challenge both for pilot and the Lower Area Radar Service (LARS), when available. This airspace is essential for access to many airfields and airstrips in and around the local area and for North-South and East-West transit traffic and other traffic avoiding the adjacent CAS.

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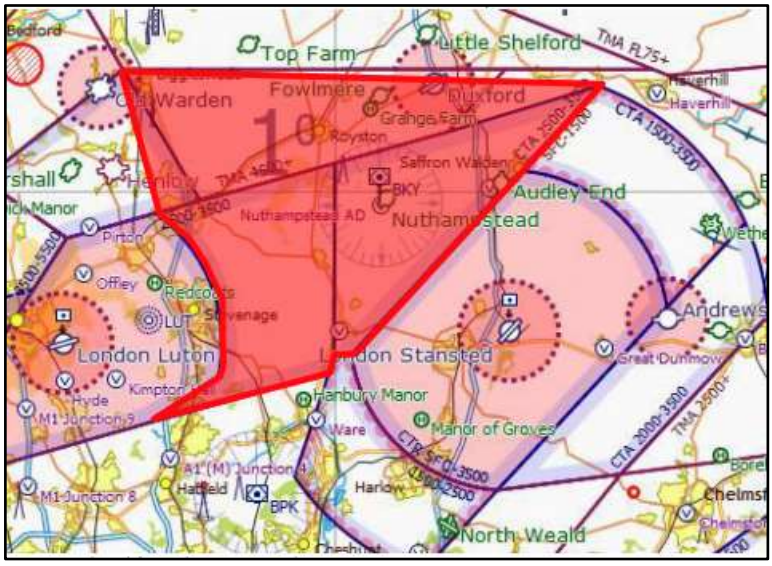

Figure 21: The Stansted-Luton Gap identified by Airspace4All

The Stansted-Luton Gap is roughly triangular with sides of 25nm, mostly limited by the Luton & Stansted CTA at 2,500'. One major airfield at Duxford with based aircraft, scenic flights, training, and air displays. There are aircraft operating at Nuthampstead, Fowlmere, Buntingford, Benington and Audley End airfields. Old Warden and Graveley are immediately adjacent. Flight schools at Elstree, Denham, Stapleford, Andrewsfield use the area for flight instruction and navigation exercises.

The area is the main thoroughfare for transiting traffic from the East coast and East Anglia into and out of London. The gap between the Stansted and Luton CTRs is 6nm at its narrowest but the 1,500' Stansted CTA to the south, with a ground level of around 350 feet, further limits the useable width of the southern part of the area. The BKY-BPK track is often used by pilots to assist with navigating the narrow gap and traffic density is high. The area is the only direct route north to/from London without significant detours around the Luton and Stansted CTRs or increased requirements for Class D transits. Unrestricted access to the area enables much improved flight plans, enabling time and fuel savings with associated environmental benefits.

Options Development and Stakeholder Engagement

Community Groups/Local Authorities

On 18 February 2020 Luton Airport began engagement with stakeholders on Stage 2 of the FASI-S airspace change proposal (ACP). The purpose of the engagement was to share the airspace design options developed so far. Initially this took place with the community and local stakeholders identified during Stage 1 of the ACP, with plans to engage with industry stakeholders in the forthcoming weeks.

Luton Airport held a workshop for the community and local stakeholders in which the initial comprehensive list of options was presented. The following table is a list of the community and local stakeholders who attended the workshop:

[redacted] – Bedfordshire Association of Town and Parish Councils	[redacted] – Hertfordshire Association of Parish and Town Councils
[redacted] – Chilterns Conservation Board	[redacted] – LADACAN
[redacted] – Stevenage Borough Council	[redacted] – Breachwood Green Parish Council
[redacted] – Aylesbury Vale District Council	[redacted] – Kings Walden Parish Council
[redacted] – Buckinghamshire County Council	[redacted] – Stop Luton Airport Expansion (SLAE)
[redacted] – Buckinghamshire County Council	[redacted] – Luton Borough Council
[redacted] – North Herts District Council	[redacted] – HarpendenSky
[redacted] – North Herts District Council	[redacted] – St Albans Quieter Skies
[redacted] – PAIN	[redacted] – St Albans Quieter Skies
[redacted] – Buckinghamshire and Milton Keynes Association of Local Councils	[redacted] – Breachwood Green Society
[redacted] – Dacorum Borough Council	[redacted] – East Herts Council
[redacted] – LLACC Chair	[redacted] – Hertfordshire County Council
[redacted] – Bickerdike Allen Partners	[redacted] – London Luton Airport Limited
[redacted] – York Aviation representing London Luton Airport Limited	

Table 5: 18 February 2020 Workshop Attendees

Stakeholders were informed that the purpose of the session was to explore and test the Luton Airport approach to developing the options and any questions relating to the approach. Luton would then use the feedback to understand and address any concerns raised. Options could then be refined based on this feedback.

The presentation provided the audience with:

- A recap of where we were in the CAP1616 process.
- A reminder of the Design Principles and highlighted the request from CAA for the addition of another Design Principle regarding the AMS. We clarified the context of the AMS and the Masterplan and set

out how both interact with our Design Principles. We also advised stakeholders of the letters between CAA and LLAOL which were available on the Airspace Change Portal.
- An overview of the 'Design Space' developed which aligned with the Design Principles, the constraints of the Dunstable gliding airspace as well as the relationship with the SAIP AD6 ACP.
- An overview of the current operation and route usage.
- An image representing each departure/arrival group of options under consideration at that stage together with the approximate percentage of movements within that option.
- A series of images showing each arrival and departure group of options in combination.
- A summary of what we had learned from the options so far, in how the designs were reacting to DP5 and DP6 as well as design issues encountered so far.
- The next steps and timescales (pre-covid) together with a reminder of the need to align with the Masterplan.

Stakeholders were emailed a copy of the presentation and the meeting notes and were given until 31 March 2020 to provide feedback. On the 25 March 2020 this deadline was extended to 10 April 2020 due to the emerging situation in the UK in relation to the COVID-19 pandemic. A copy of the email extending the deadline is at Appendix B, page 19.

Early in the engagement period, we received requests to add more information to the slide pack:

- Approximate 1,000ft height indicators to each of the SIDs
- Images showing the options against a geographical background (we had previously used a background without showing geographical features as we had been requested feedback on the process followed and not the specific pros and cons of each option).

The updated presentation was disseminated after these requests, alongside the deadline extension email, a copy of the presentation is at Appendix B, pages 20-119.

Luton Airport received feedback from 10 stakeholders in relation to the Stage 2A options development. Full copies of all feedback received is at Appendix C, pages 2-30. Table 6 below summarises the feedback and explains what we did as a result. In mid-April 2020 the Luton Airport FASI-S ACP was paused due to the COVID-19 pandemic.

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Topic (from Stakeholder Feedback)	Further Detail	Luton Response
Would like to see better use of airspace used by the gliding club	Luton had previously avoided the gliding club for designs	Feedback asked for more designs to be considered that overfly this area and these will now be created.
Heathrow & RAF Northolt Area	Feedback that designs did not go close enough/went too close to Heathrow & RAF Northolt	Luton believe that the balance is right and plan to keep the design areas the same as this generated the best chances to meet DPs 4, 6 and 7
Designs avoiding Breachwood Green for departures	Breachwood Green is overflown by both arrivals and departures. It should be avoided by departures on easterly operations	Luton will create designs avoid Breachwood Green on departure, if possible.
8% climb gradient	Feedback that 8% climb gradient is too high and that it is also too low	The climb gradient suggested by some operators had actually been 10%. Luton believe that an 8% climb gradient is more suitable at this stage and that there is a risk that if it is increased, some operators would not be able to reach altitude waypoints.
What is 'respite'	Feedback asked for clarification of respite, when multiple routes should be used and what schedule they would operate to	The schedule to which multiple routes would operate is finer detail which would be covered in the Stage 3 Consultation, should such options be progressed.
Better use of airspace above Leighton Buzzard	Feedback asked for designs to be shown which overfly this area	Luton will create designs which overfly Leighton Buzzard.
Number of routes presented	Concerns raised that there were too many routes and having multiple routes in place at once to provide respite could cause confusion for communities or be unsafe for operators and GA, particularly if it changed the areas of controlled airspace (CAS)	The number of routes presented was to show equitable distribution (one of the design principles). At this stage in the process, Luton needs to look at all possible routes, which will be narrowed down through the appraisal processes.

Topic (from Stakeholder Feedback)	Further Detail	Luton Response
Percentages on the routes	Positive feedback for the way routes were presented, with the equitable spread using percentages. Feedback asked for these to be updated with latest traffic.	Luton will continue to use 2019 traffic, as 2020 would not be an accurate reflection of the future.
Maps	Feedback that the maps contained too much information, too little information (not enough geographic reference points) and that there were too many maps to be distributed to other members of organisations	The maps were purposefully large scale, as feedback required is not about specific locations. The flight paths are shown for illustrative purposes to represent the broad proposed positioning of the concept. All flight paths may change throughout the ACP. This stage is the comprehensive list, so the images were to demonstrate that the list of options was comprehensive and therefore the number of images was high due to the number of options being considered.
Noise impacts to be shown on slides	Feedback that the noise impact for routes was unknown and more information would be required before feedback could be provided	Luton will be conducting some overflight contours for options as part of the Initial Options Appraisal (IOA). Luton may narrow down the route options through the Design Principle Evaluation before conducting the noise analysis.
Acronyms	Too complex acronyms	This will be adjusted for subsequent engagement.
Carbon	It was suggested that track miles be presented on maps, to understand an approximation for carbon.	This suggestion will be applied to subsequent engagement.

Table 6: Stage2A Feedback summary

Community Airspace Modernisation Working Group (CAMWG)

During the pause in work due to COVID-19, Luton Airport established the stakeholder group CAMWG. This stakeholder group is formed of individuals from local communities with knowledge and experience of airspace changes and noise impacts. The aim is for CAMWG to provide Luton Airport with additional insights during the design of airspace change proposals, including how best to present complex issues in engagement and consultation material.

Industry Stakeholders

Luton Airport restarted the FASI-S ACP in July 2021 and initially began by engaging with industry stakeholders on Stage 2A, as that had not taken place prior to the pause. The presentation given to the community and local stakeholders in February 2020 was updated and distributed via email to the industry stakeholders identified during Stage 1. The updates involved adding Controlled Airspace boundaries to some of the images and to advise that the SAIP AD6 ACP had been submitted. A copy of the updated presentation is at Appendix B, pages 128-210.

Luton contacted the following industry stakeholders; NATMAC, FLOPC, local airports, local General Aviation organisations, and the MOD. Copies of the emails sent to stakeholders are available at Appendix B, pages 120-127.

Industry stakeholders were asked to provide feedback, not on individual routes, but on the approach Luton has taken in developing the options and the broad concepts. This feedback would then be combined with the feedback received from community and local stakeholders to generate an updated set of options for the design principle evaluation. Stakeholders were asked to provide feedback by 23 August 2021.

Luton Airport received feedback from 8 industry stakeholders. Full copies of all the feedback received is at Appendix C, pages 32-47.

Stakeholder	Summary of Feedback	Luton Response
British Gliding Association	Would like to see no reduction in Class G airspace. Think it is unclear on how the proposals will interact with other major airports and feel that the implementation of PBN will lead to an inefficient use of airspace owing to the CAA's Controlled Airspace Containment policy which results in very inefficient use of airspace as vast volumes are set aside for containment and will never have aircraft in them, precluding its use for other airspace users.	It was not possible to show Luton's options in relation to other airport's options at this time as Luton were more advanced in the process than other airports. The options for how the options can change CAS volumes is also dependent on how changes to other airports' routes enable CCO at Luton. Therefore, CAS options can only be generated in Stage 3 once all adjacent airports' shortlisted routes are available.

LLAOL FASI-S Stage 2A

Stakeholder	Summary of Feedback	Luton Response
	Feels there is an anomaly between no arrival options over Leighton Buzzard, but low-level departure options over Luton, Dunstable and Hougton Regis. Suggest the PBN containment policy or the Leighton Buzzard overflight policy are challenged.	We do acknowledge that the buffers required by the CAA could result in portions of CAS being required that are not routinely used by commercial aircraft However, the DPE and IOA can give a qualitative indication of the impact of each option on CAS. We generated arrival options that overfly Leighton Buzzard as well as options that join final approach closer in
British Helicopter Association	No objection to the proposal as currently outlined.	N/A
Guild of Air Traffic Control Officers (GATCO)	Concerns that SIDs which climb above Min Stack Level (MSL) could increase risk and the current need for ATC instructions to climb above the SIDs. Highlighted that the need to reduce overflying communities and to minimise ATC intervention are not usually compatible.	Agree that there's a balance to find between routes positioned that address environmental issues as well as operational issues. Climbing above MSL could result in issues in today's airspace but the aspiration is that the future airspace caters for this on a routine basis. The Transition Altitude of 6,000ft makes this harder to achieve though.
Heathrow	Options appear to be comprehensive and consider the airspace currently used by Heathrow's operations. Until the location and nature of interactions between Luton & Heathrow are known; ➢ unconstrained climb to 7000ft cannot necessarily be assumed if interacting with Heathrow procedures; ➢ it is not possible to confirm, at this stage, whether all options meet your design principle to "take into account routes of other airports below 7000ft"; and ➢ it is currently difficult to identify what the cumulative or net impact of the options might be, considering areas experiencing overflight from both Luton and Heathrow airports.	Agree with these comments although we can still make a qualitative assessment as to how likely each option will react to DP6, based on geography and proximity to other airports. We understand cumulative impacts will be explored in more detail in the Stage 3 FOA when dependent co-sponsors' shortlisted options are available.

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Stakeholder	Summary of Feedback	Luton Response
London Gliding Club	Any reduction in the LGC's airspace would be unviable and are happy with the current airspace sharing agreement. Think it is unclear on how the proposals will interact with other major airports and feel that the implementation of PBN will lead to an inefficient use of airspace owing to the CAA's Controlled Airspace Containment policy which results in very inefficient use of airspace as vast volumes are set aside for containment and will never have aircraft in them, precluding its use for other airspace users. Feels there is an anomaly between no arrival routes over Leighton Buzzard, but low-level departures over Luton, Dunstable and Hougton Regis. Suggest the PBN containment policy or the Leighton Buzzard overflight policy are challenged	Impact on LGC airspace acknowledged and those options developed which penetrate that airspace would only do so outside of the gliding operations. We generated arrival options that overfly Leighton Buzzard as well as options that join final approach closer in We do acknowledge that the buffers required by the CAA could result in portions of CAS being required that are not routinely used by commercial aircraft
Ministry of Defence /RAF Northolt (MOD)	Welcomed the opportunity to provide feedback and work together. Found it difficult to see how the design principles have been used to shape the initial options.	Luton and Northolt discussed how the designs were created in subsequent bilateral workshops as Northolt had not previously had the benefit of having the Stage2A presentation face to face.
NATS	Looking forward to continuing to work together to deliver airspace modernisation.	N/A
Stansted Airport	Supportive of Luton's Stage 2 process, important that any interactions are carefully considered. The broad proposals are clear on the easterly and westerly split. Would be useful to have the rationale of how the comprehensive list was created, with links to the design principles and any other constraints.	Luton and Stansted discussed how the designs were created in subsequent bilateral workshops as Stansted had not previously had the benefit of having the Stage2A presentation face to face.
NERL	Provided detailed feedback from the perspective of the NERL network above 7000ft only. Available at Appendix C, pages 45-47.	All feedback acknowledged as was as anticipated. Does not yet require changes to the options.

Table 7: Summary of Stage 2A Industry feedback

LLAOL FASI-S Stage 2A

Once all the Stage 2A feedback had been received, we updated the options to address the elements of feedback we had not yet considered and/or felt we could address.

By this time, the SAID AD6 consultation had finished and LLAOL & NERL had determined their preferred option which had been informed by the consultation responses. This option was to rely on vectors from the new ZAGZO stack and not to rely on routine use of PBN arrival tracks. As a result of this, we added vectoring of arrivals to our comprehensive list for this FASI ACP.

Before requesting IFP designers to generate a flyable set of options we shared these updated sketches with CAMWG for feedback as a sense check to make sure we were interpreting the feedback correctly. As part of this session, CAMWG members requested if some other options were possible:

Suggestion	Luton Response
RWY07 OLY to follow A1	This departure route wouldn't enable CCO as it points the departure at the arrivals. The reason they wrap around to the east is so as they get the height on, the Luton arrivals would be getting lower to the North.
RWY07 offset departures to the North	We haven't done a specific option that offsets to the left as it routes over more population (Breachwood Green)
RWY 07 left turn CPT departures that turn back south sooner than currently illustrated.	This might be possible although it pushes the route towards Heathrow and Northolt departures. It is likely that such a turn would be above 7000ft otherwise, the route would go over Luton town centre and is therefore a suggestion for the network which would be an obvious aim for NERL anyway as CO2 is the priority above 7,000ft.
RWY 07 Right Turn CPT departures that go South of Harpenden	We haven't created such an option because routing south will push the departure close to Heathrow and Northolt and inhibit CCO. However, this is potentially an 'optimisation' that can be considered in Stage 3 if this option is progressed when we have Heathrow and Northolt's shortlisted designs.
RWY25 MATCH/OLY that turns right and follows M1 where there is higher ambient noise levels.	Although this is a densely populated area it may have some merits and generated an option to do this (as well as an option with a later turn to avoid Luton and Dunstable).
RWY25 MATCH departures that that climb straight ahead for longer before turning east	We considered this but decided not to generate an option that did this because: • There would be an increase in CO2 due to track length • It would not enable CCO as would be held down due to Heathrow and Northolt departures. (They might get straight to c.5-6000ft but would then fly level until out to the East again) • Flying straight out along RWY07 final approach would likely increase the size of the LOAEL and possibly even the SOEAL due to the cumulative effects of overflight and this would be in breach of Luton's planning conditions.

Options for shorter final approaches	The gliding area prohibits this on easterlies but we have generated an RNP-AR option on RWY08 to do this that would be available when no gliding activity. We created a similar option on Westerlies too
RWY07 left turn CPT/OLY departures that route even further north	Going 'wider' gets even closer to arrivals so those arrivals would then have to go even further north (over or North of Bedford). This would increase CO2 significantly.

Table 8: CAMWG suggestions and Luton response

Co-ordination with interdependent ACP sponsors

In addition to the engagement above, we have also taken part in a number of technical working groups and bilateral workshops with ACOG and adjacent ACP sponsors (Heathrow, Northolt Stansted and London City) as set out below.

Meeting	Date
LTMA Technical Working Group (ACOG)	29 July 2021 26 August 2021 23 September 2021 28 October 2021 (workshop in person) 8 December 2021 27 January 2022
LTMA Programme Coordination Meeting (ACOG)	15 July 2021 22 September 2021 4 February 2022
Heathrow and Luton	13 July 2021 16 September 2021
Northolt and Luton	20 December 2021
London City and Luton	8 December 2021 12 January 2022
Stansted and Luton	13 May 2021 18 October 2021 (ACOG in attendance)
NATS NERL and Luton	20 September 2021 2 December 2021 9 February 2022

Table 9: List of technical meetings/working groups

Technical working groups and Programme co-ordination meetings allow sponsors within the LTMA regional cluster to discuss timelines, risks, deployment strategies, Masterplan integration as well as CAP1616 interpretations and different methodologies to meet CAP1616 requirements. The bilateral workshops were focussed on sharing their ACP design options (where available) to understand the level of interactions and dependencies that exist. In the case of Luton, so far adjacent designs have not driven a change to designs being considered but that is largely because the existing dependencies and relationship between adjacent operations

have been a key consideration from the outset. It is however, obvious that the ability to realise CCO and CDO at Luton will continue to be reliant on the ability for Heathrow, Northolt and London City departures to climb higher, sooner. This places a significant dependency on the viability some, but not all of Luton's options. Where it is not required to make options viable, those adjacent operations will still directly affect the level of achievable benefit (through CCO/CDO) of all the options.

Response to Stakeholder Feedback

As a result of all the feedback, the comprehensive list of options was updated (as set out above) and IFP designers generated a set of tracks for each option which we would then use for the illustration of those options to inform the DPE and IOA. However, those route centrelines are still likely to move as options are refined throughout the ACP. Refinement will be on the basis of integration with the wider airspace network below and above 7,000ft, reacting to ongoing stakeholder engagement, increasing environmental and operational performance and in accordance with more detailed IFP design and validation in Stages 3 and 4. This refinement could potentially include merging some elements of different options into a final design solution if that is considered to provide greater benefit to Luton and/or the wider FASI programme.

This list of options is set out in the next section.

Luton Airport invited stakeholders to attend an in-person workshop on the morning of Tuesday 22 February 2022 to share the options that were updated as a result of the stakeholder feedback and provide an overview of the Design Principle Evaluation and Initial Options Appraisals, ahead of the submission to the CAA. The presentation included Luton's shortlisted options together with the rationale for discontinuing the other options. The same presentation was given to an on-line audience on the afternoon of Tuesday 22 February 2022. The presentation is available in Appendix D. A list of the attendees for both workshops is available in Appendix B, page 222.

Luton's Airspace Design Options at Stage 2A

This section sets out Luton's Comprehensive List of Options at Stage 2A of the Airspace Change Process. Each option has a description of what it is trying to achieve and, for the purposes of incorporating stakeholder engagement so far and allowing for analysis in the Initial Options Appraisal, provisional route centrelines. However, those route centrelines are likely to move as options are refined throughout the project. Refinement will be on the basis of integration with the wider airspace network below and above 7,000ft, reacting to stakeholder engagement, increasing environmental and operational performance and in accordance with more detailed IFP design and validation in Stages 3 and 4. This refinement could potentially include merging some elements of different options into a final design solution if that is considered to provide greater benefit to Luton and/or the wider FASI programme.

As described in the Stakeholder engagement section, Luton has as series of different options broken down into the following categories:

- Westerly SID Group Options
- Easterly SID Group Options
- Westerly Arrivals Options
- Easterly Arrivals Options

Within each of those categories, some options have been identified which do have dependencies on the routes to/from other airports and some options that don't. Those options that do have dependencies are generally envisaged to deliver greater benefit than those options that don't have dependencies. The scale of those benefits will begin to be uncovered in the Design Principle Evaluation and Initial Options Appraisal.

Why generate dependent and independent options?

The reason for generating such options were to enable Luton to potentially progress more quickly with some aspects of their modernisation programme and take part in the Early LTMA Deployment in 2026 as set out by ACOG in Masterplan Iteration 2. Such options are only likely to be progressed as part of an early deployment if they deliver standalone benefit which is deemed considerable enough to return on the project costs and risks.

Any option progressed to a successful early LTMA deployment would not detract from LLAOL's longer-term commitment to progress subsequent changes as part of the core LTMA deployments in 2027 and beyond. For the avoidance of doubt, an early deployment would not constrain LLAOL, any other airport or the wider FASI programme from delivering wider benefits in future deployments.

How is this aligned with CAP1616 and the Masterplan?

All the options, both dependent and independent, form part of Luton's Comprehensive List of Options in Stage 2A. These options will all be assessed against a baseline in the same way, against the requirements set out in CAP1616. The DPE and IOA could generate evidence that results in LLAOL discontinuing an option or options

which, if this is the case, will be articulated within the documentation set. All remaining options will be carried forward into Stage 3 of the process.

As set out in CAA's Assess and Accept Criteria, Sponsors will be unable to progress through the Stage 3 gateway of the CAP 1616 process until the system-wide airspace design of the proposed options, and the cumulative impacts of those options, are represented in an accepted Iteration 3 of the masterplan. To generate Iteration 3, ACOG will require "granular data from ACP sponsors' 'full' options appraisals" and furthermore, Iteration 3 will not be accepted by the CAA until ACOG has published a draft of it and conducted a public engagement exercise on some of its content. This means that LLAOL will not be able to progress options with dependencies on other sponsors until those sponsors are at a similar point in the process. On current timelines, LLAOL's dependent sponsors will not all be into Stage 3 of the process until Q2 2023. The result will be that if LLAOL are successful in this, Stage 2 gateway, any options with dependencies with other airports cannot be progressed for some time.

To enable LLAOL to progress with delivering early benefit in accordance with the AMS as part of a 2026 Early Deployment window, it is proposed that LLAOL would commence the Full Options Appraisal of all remaining independent options once into Stage 3. All dependent options would be 'parked' until adjacent airports short listed options become available throughout 2022 and 2023, at which point they will be integrated, refined and cumulative impacts identified.

If the FOA of independent options identifies that they are truly independent and that benefits can be delivered as part of an early deployment, LLAOL will consider taking those options through into Stage 4 and 5 of CAP1616, as a separate early LTMA deployment. It is expected that such options would be publicly consulted on in Stage 3 as part of a standalone deployment, with impacts and benefits articulated accordingly i.e. the consultation would not be describing or pre-empting the following stages of deployment, but would need to assume a permanent introduction.

In parallel and in accordance with Masterplan timelines, the dependent options would be progressed by LLAOL and taken through Stages 3 and 4. Stage 3 would see the preferred options taken to a public consultation which is coordinated with other co-dependent sponsors. The final solution for LLAOL will be the product of the individual sponsors' proposals, based on the outputs of their CAP 1616 Stage 3 coordinated consultations.

London Luton Airport

LLAOL FASI-S Stage 2A

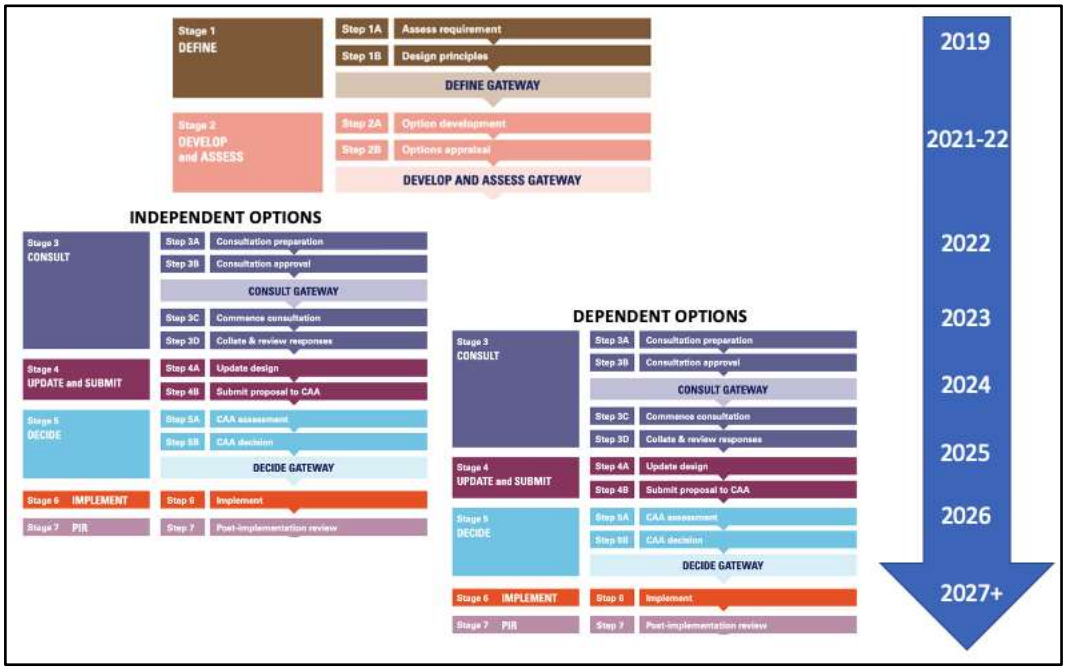

Figure 22: CAP1616 alignment of Different FASI implementations from the same sponsor

Westerly SID Group 1 (Do Nothing)

This option represents the do nothing scenario for Luton Westerly SIDs. More detail on the baseline is described in the section above.

Figure 23 below shows the existing departure swathes (purple) from Luton's westerly runway. The routine vectoring away from the SID centrelines (yellow) can be seen on all routes once aircraft are above 4,000ft, however there is still a clear concentration on the centreline.

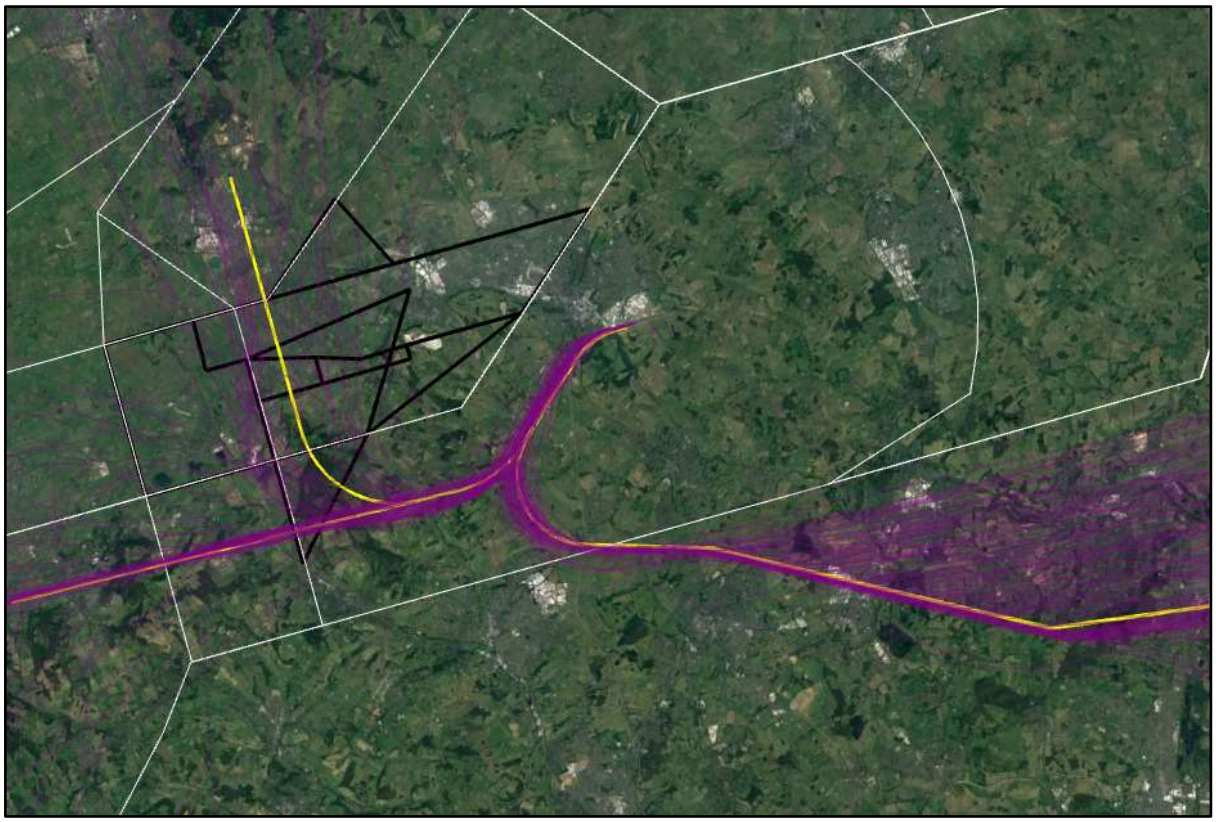

Figure 23: Existing departure swathes (purple) and published centrelines (yellow) from Luton's westerly runway

Westerly SID Group 2

This option would see a replication of the existing OLY and CPT SIDs and a change to the latter part of the MATCH SID to keep to the North of BPK, away from existing Heathrow and Northolt SIDs to enable more frequent, tactical climb. This could take the MATCH SID slightly closer to Hemel Hempstead, however it might be possible to refine that in Stage 3, especially if RNP+RF is considered.

Subject to safety assurances, it is expected this option could be implemented within the current airspace, without affecting adjacent airports, as the published vertical profile of the SIDs would be the same as today and the lateral tracks no further south. However, on the MATCH route, we estimate c.10% of the departures which currently level at 5000ft would receive tactical climb continuously to 7000ft+. This is because the route goes where ATC want the majority of Luton's MATCH departures to go (north of BPK), so they wouldn't need to vector as much and could climb above 5000ft on first call more frequently.

The lateral dispersion currently experienced would be similar to today, as ATC would vector just as frequently as they currently do. The exception to this would be the MATCH SID, where the new positioning north of BPK is expected to result in aircraft being left on the new SID centreline more frequently. However, vectoring south of the new track would still be expected when ATC need to position to the South of Heathrow departures, based on where the respective aircraft are leaving UK airspace.

This option is not expected to be dependent on changes at neighbouring airports.

Figure 24 below illustrates W SID Group 2 and shows the SID centrelines (yellow) that will be used for Stage 2 analysis, against existing departure swathes (purple) from Luton's westerly runway. Actual centrelines may change throughout the process.

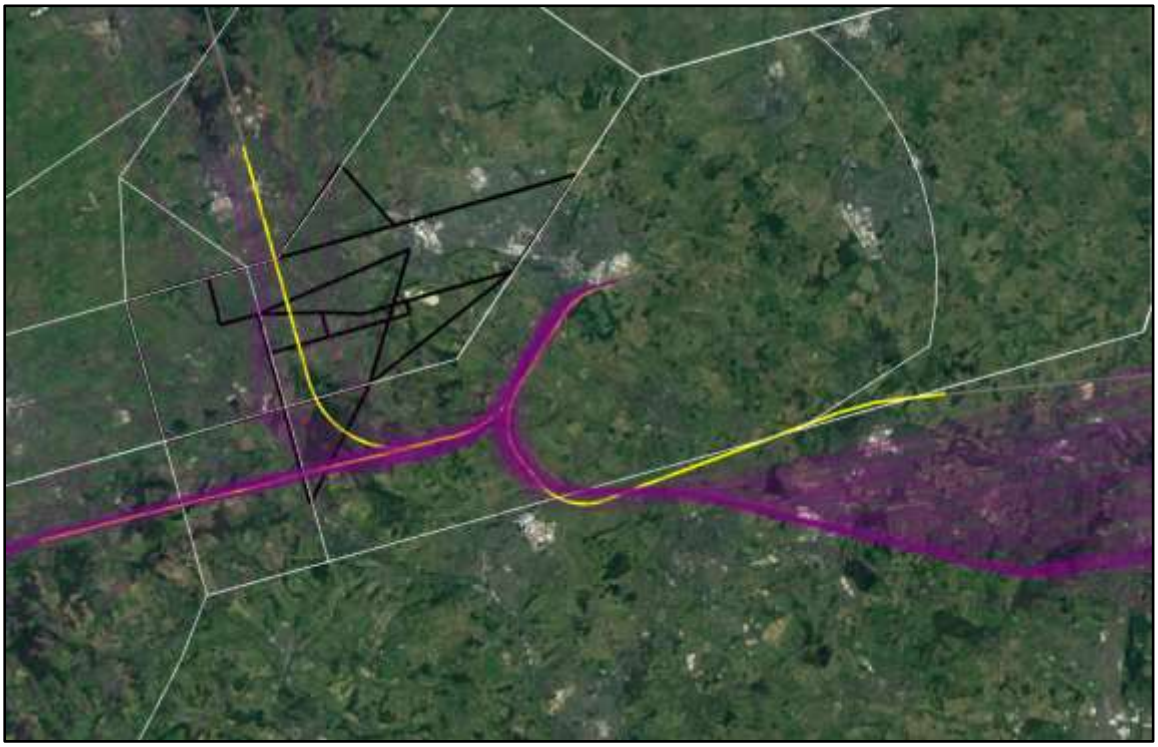

Figure 24: Existing departure swathes (purple) and W SID Group 2 illustrative centrelines (yellow) Luton's westerly runway

LLAOL FASI-S Stage 2A

Westerly SID Group 3

This option would see the initial SID departure tracks split earlier than today to diverge MATCH from OLY+CPT departures and also a change to the latter part of the MATCH SID to keep to the North of BPK, away from existing Heathrow and Northolt SIDs to enable more frequent, tactical climb. This could take the MATCH SID slightly closer to Hemel Hempstead, however it might be possible to refine that in Stage 3, especially if RNP+RF is considered.

The CPT+OLY tracks are closer to the Dunstable gliding airspace but still remain over 1.5nm away. This would require additional safety assurance work to ensure this is safe against the gliding airspace.

Subject to safety assurances, it is expected this option could be implemented within the current airspace, without affecting adjacent airports as the published vertical profile of the SIDs would be the same as today and the lateral tracks no further south. However, on the MATCH route, we estimate c.10% of the departures which currently level at 5000ft would receive tactical climb continuously to 7000ft+. This is because the route goes where ATC want the majority of Luton's MATCH departures to go (north of BPK) so they wouldn't need to vector as much and could climb above 5000ft on first call more frequently. However, vectoring south of the new MATCH track would still be expected when ATC need to position to the South of Heathrow departures, based on where the respective aircraft are leaving UK airspace. We would not expect the new CPT+OLY paths to enable any more CCO than today.

This option is not expected to be dependent on changes at neighbouring airports.

Figure 25 below illustrates W SID Group 3 and shows the SID centrelines (yellow) that will be used for Stage 2 analysis, against existing departure swathes (purple) from Luton's westerly runway. The CPT/OLY centreline represents the earliest split we think we could achieve with the greatest lateral separation from the MATCH centreline that we expect can be safely assured from the Dunstable Gliding Area (black). Actual centrelines and the point at which tracks diverge may change throughout the process.

LLAOL FASI-S Stage 2A

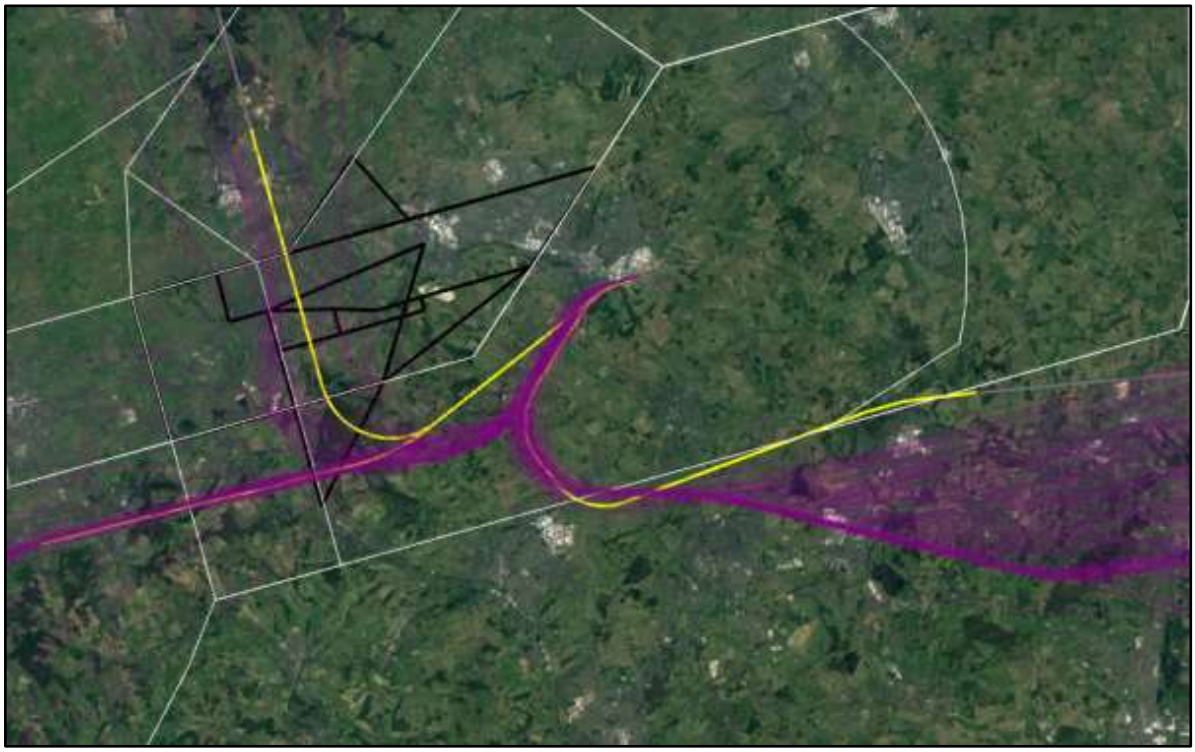

Figure 25: Existing departure swathes (purple) and W SID Group 3 illustrative centrelines (yellow) from Luton's westerly runway

LLAOL FASI-S Stage 2A

Westerly SID Group 4

This option would see 2 x sets of SIDs which turn to the South of Luton that would alternate, in pairs at a set time of day or day of the week. For the Design Principle Evaluation and Initial Options Appraisal, we assume they alternate once per day for a period of 24H, therefore each set of SIDs is in operation an equal amount over a year. The CPT+OLY tracks are closer to the Dunstable gliding airspace but still remain over 1.5nm away. This would require additional safety assurance work to ensure this is safe against the gliding airspace.

Note the MATCH SID in Period 1 represented in the illustration is the earliest and tightest turn possible using RNP+RF within PANS OPS. This particular illustration would result in overflight of Harpenden.

Subject to safety assurances, it is expected this option could be implemented within the current airspace, without affecting adjacent airports, as the published vertical profile of the SIDs would be the same as today and the lateral tracks no further south. However, on the MATCH route, we estimate c.10% of the departures which currently level at 5000ft would receive tactical climb continuously to 7000ft+. This is because the route goes where ATC want the majority of Luton's MATCH departures to go (north of BPK) so they wouldn't need to vector as much and could climb above 5000ft on first call more frequently. However, vectoring south of the new MATCH track would still be expected when ATC need to position to the South of Heathrow departures, based on where the respective aircraft are leaving UK airspace. We would not expect the new CPT+OLY paths to enable any more CCO than today.

This option is not expected to be dependent on changes at neighbouring airports.

Figures 26 (Period 1) and 27 (Period 2) below illustrate W SID Group 4 and shows the SID centrelines (yellow) that will be used for Stage 2 analysis, against existing departure swathes (purple) from Luton's westerly runway. The Period 1 CPT/OLY centreline represents the greatest lateral separation from the MATCH centreline and the earliest 'split' from MATCH that we expect can be safely assured from the Dunstable Gliding Area (black). The Period 2 OLY/CPT centreline would merge with the Period 1 centreline as we cannot go any further South than the existing SID centreline without affecting other airports. Actual centrelines, radius of turns and the point at which tracks diverge may change throughout the process.

LLAOL FASI-S Stage 2A

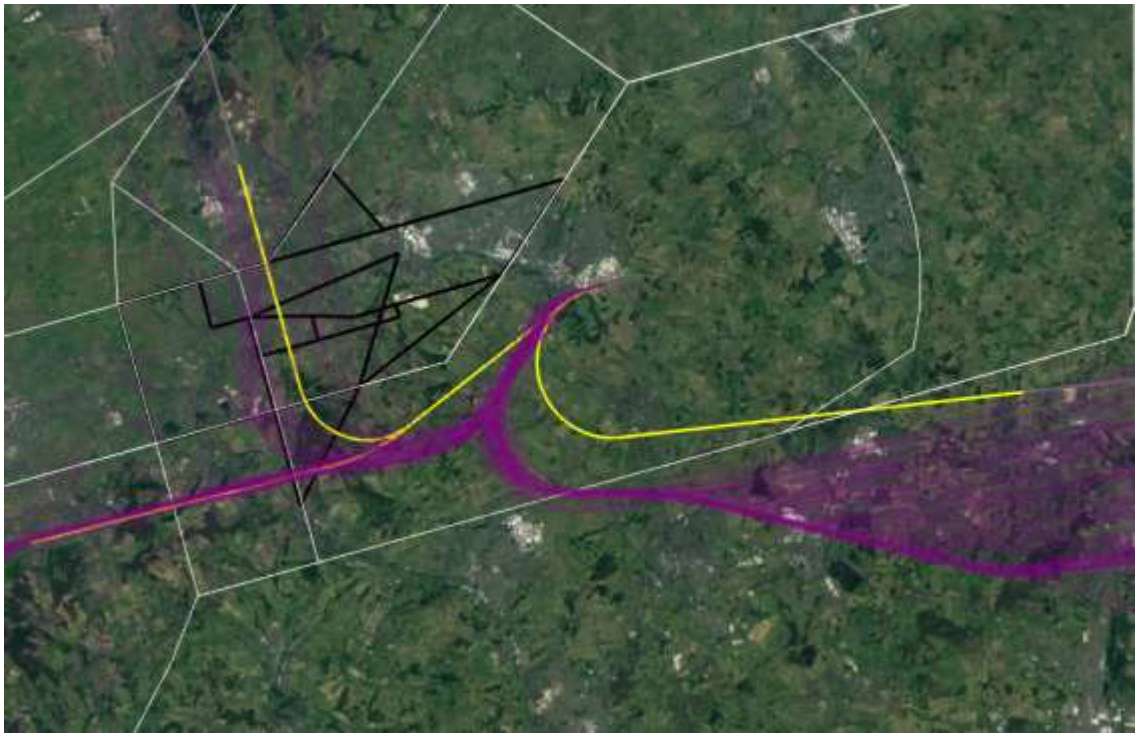

Figure 26: Existing departure swathes (purple) and W SID Group 4 Period 1 illustrative centrelines (yellow) from Luton's westerly runway

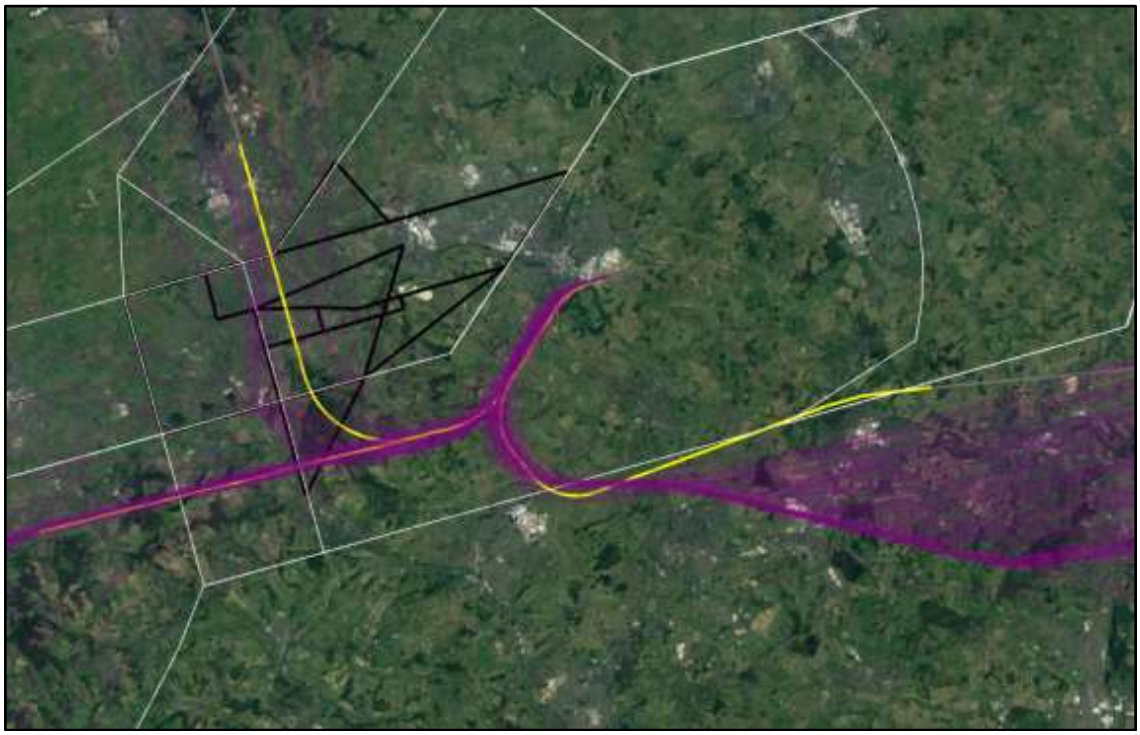

Figure 27: Existing departure swathes (purple) and W SID Group 4 Period 2 illustrative centrelines (yellow) from Luton's westerly runway

LLAOL FASI-S Stage 2A

Westerly SID Group 5

This option is exactly the same laterally as Westerly SID Group 3 with initial SID departure tracks that split early to diverge MATCH from OLY+CPT departures as soon as possible and a change to the latter part of the MATCH SID to keep to the North of BPK. However, in this option, we assume all departures now experience guaranteed climb to above 5,000ft. This is because we assume Heathrow, Northolt and London City departures are deconflicted in a new FASI design enabling CCO. There is therefore a dependency on the adjacent airports' FASI route design.

We would expect aircraft to follow the centrelines more regularly because there is less requirement for controller intervention in this design (due to deconfliction from adjacent SIDs).

Figure 28 below illustrates W SID Group 5 and shows the SID centrelines (yellow) that will be used for Stage 2 analysis, against existing departure swathes (purple) from Luton's westerly runway. The CPT/OLY centreline represents the earliest split we think we could achieve with the greatest lateral separation from the MATCH centreline that we expect can be safely assured from the Dunstable Gliding Area (black). Actual centrelines and the point at which tracks diverge may change throughout the process.

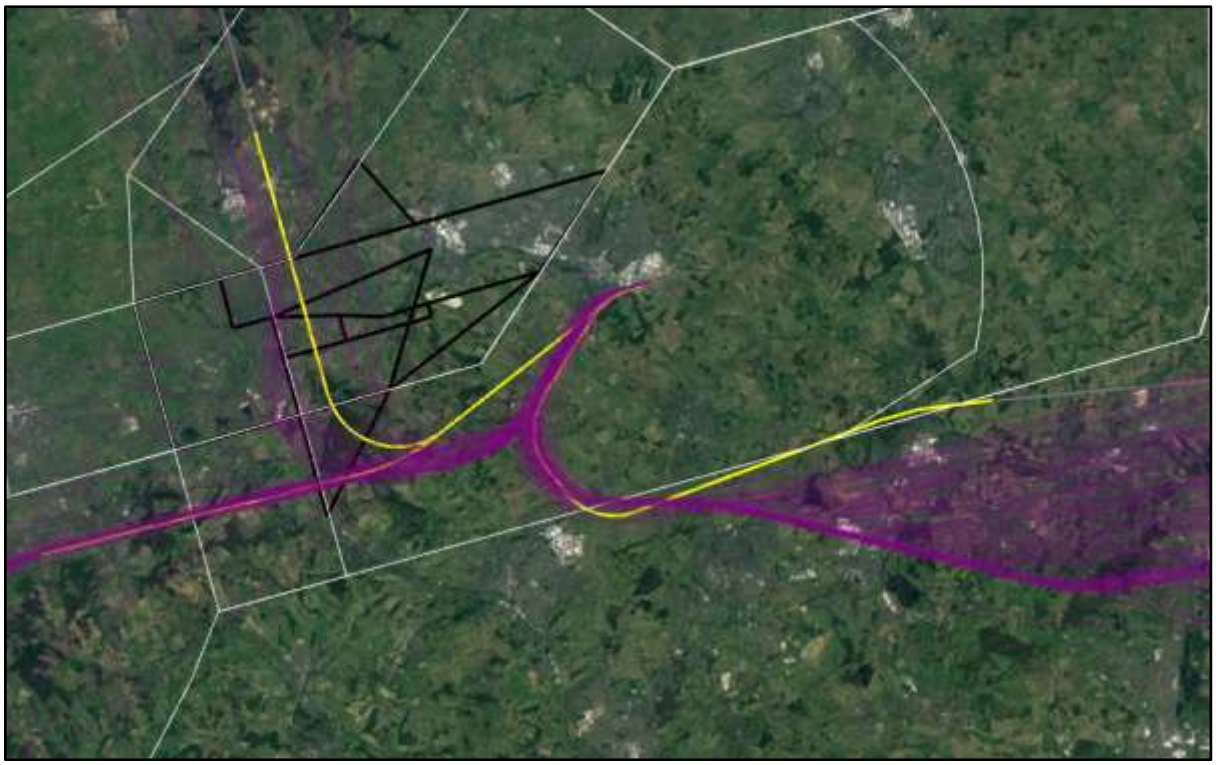

Figure 28: Existing departure swathes (purple) and W SID Group 5 illustrative centrelines (yellow) from Luton's westerly runway

LLAOL FASI-S Stage 2A

Westerly SID Group 6

This is the same laterally as W SID Group 4 except that the Period 2 CPT and OLY SIDs are positioned further to stay apart from the Period 1 SIDs for longer. As these are closer to Heathrow and Northolt it is assumed these could only be implemented with changes to those airports' SIDs and is therefore dependent on wider FASI change, also enabling CCO.

Note the MATCH SID illustrated in Period 1 would only be possible using RNP+RF. The centreline used to illustrate this option is the tightest RF turn possible within PANS OPS. This particular illustration would result in overflight of Harpenden.

As with W SID Group 4, this option would see 2 x sets of SIDs which turn to the South of Luton that would alternate, in pairs at a set time of day or day of the week. For the Design Principle Evaluation and Initial Options Appraisal, we assume they alternate once per day for a period of 24H, therefore each set of SIDs is in operation an equal amount over a year.

We would expect aircraft to follow the centrelines more regularly because there is less requirement for controller intervention in this design (due to deconfliction from adjacent SIDs).

Figures 29 (Period 1) and 30 (Period 2) below illustrate W SID Group 6 and show the SID centrelines (yellow) that will be used for Stage 2 analysis, against existing departure swathes (purple) from Luton's westerly runway. The Period 1 CPT/OLY centreline represents the greatest lateral separation from the MATCH centreline that we expect can be safely assured from the Dunstable Gliding Area (black). Actual centrelines, radius of turns and the point at which tracks diverge may change throughout the process.

LLAOL FASI-S Stage 2A

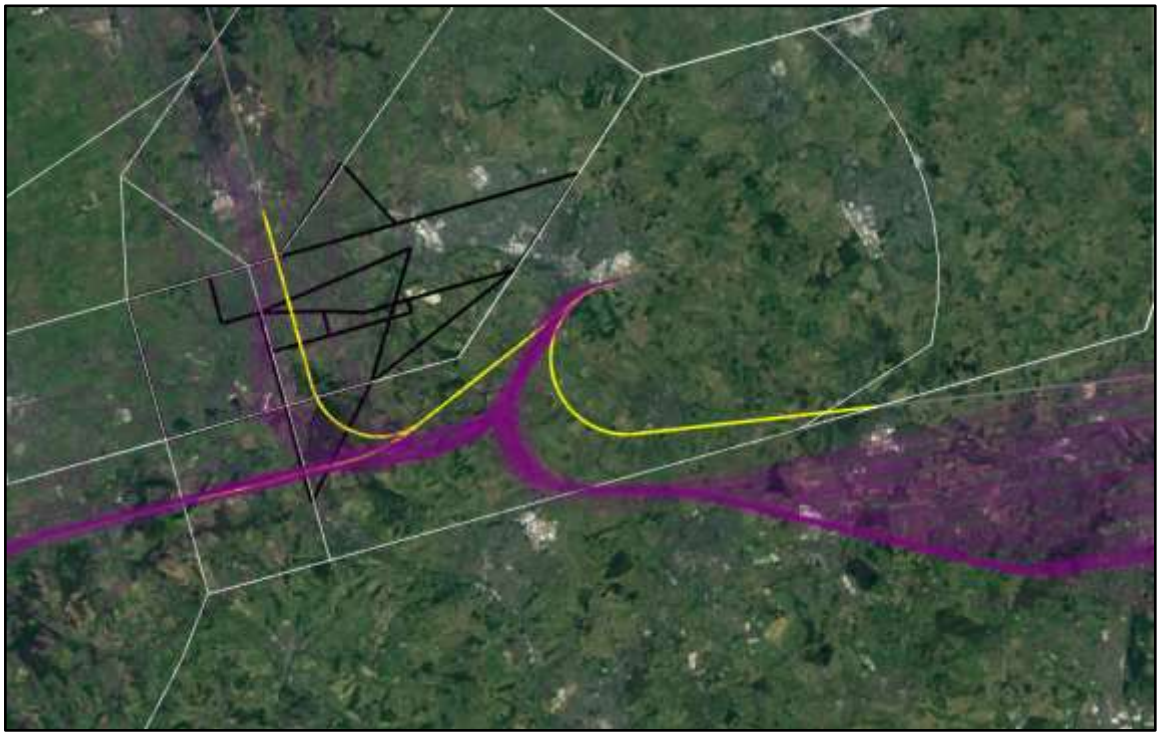

Figure 29: Existing departure swathes (purple) and W SID Group 6 Period 1 illustrative centrelines (yellow) from Luton's westerly runway

Figure 30: Existing departure swathes (purple) and W SID Group 6 Period 2 illustrative centrelines (yellow) from Luton's westerly runway

LLAOL FASI-S Stage 2A

Westerly SID Group 7

This option sees 2 very different sets of SIDs for use when the Dunstable gliding area is inactive. At this stage, we have assumed this is standardised to a 2100-0700 time period but that is subject to negotiation and agreement with multiple industry organisations. During this time, the Period 2 MATCH and OLY SIDs turn right shortly after departure to try and follow the M1 as closely as possible, as suggested by community stakeholders.

The CPT SID doesn't go straight ahead but turns to the north of RWY07 final approach, before turning south once above 7000ft. This is to not overfly the same communities with multiple routes and to try and distribute noise more equitably.

This option is dependent on guaranteed CCO above 6,000ft to enable the Period 2 MATCH SIDs to outclimb arrivals to RWY 25 and therefore dependent on changes to adjacent airports.

We would expect aircraft to follow the centrelines more regularly because there is less requirement for controller intervention in this design (due to deconfliction from adjacent SIDs) and would expect published SID levels above 5,000ft to the South.

Figures 31 (Period 1 0700-2100) and 32 (Period 2 2100-0700) below illustrate W SID Group 7 and show the SID centrelines (yellow) that will be used for Stage 2 analysis, against existing departure swathes (purple) from Luton's westerly runway. Actual centrelines, radius of turns and the point at which tracks diverge may change throughout the process.

LLAOL FASI-S Stage 2A

Figure 31: Existing departure swathes (purple) and W SID Group 7 Period 1 illustrative centrelines (yellow) from Luton's westerly runway

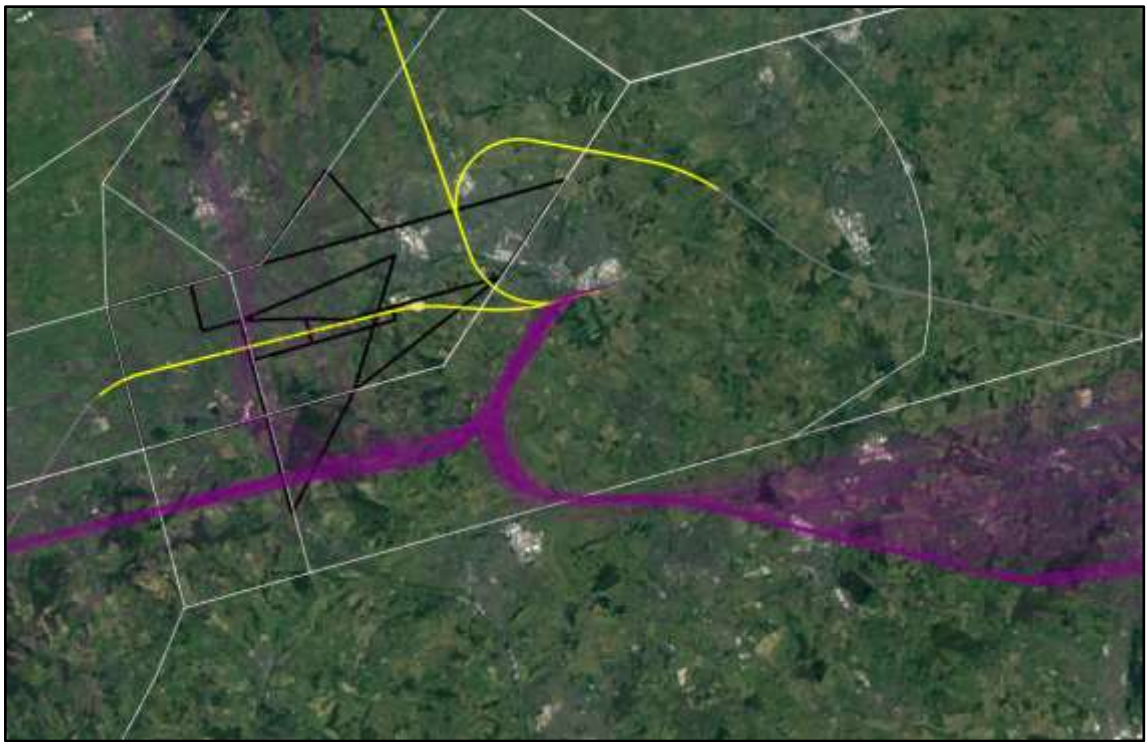

Figure 32: Existing departure swathes (purple) and W SID Group 7 Period 2 illustrative centrelines (yellow) from Luton's westerly runway

LLAOL FASI-S Stage 2A

Westerly SID Group 8

This option is similar to W SID Group 7 but during Period 2, the MATCH and OLY SIDs turn right shortly after departure but not as early as in Option 7, to avoid the populated areas of Luton and Dunstable.

The CPT SID is the same as In W SID Group 7.

This option is dependent on guaranteed CCO above 6,000ft to enable the Period 2 MATCH SIDs to outclimb arrivals to RWY 25 and therefore dependent on changes to adjacent airports.

We would expect aircraft to follow the centrelines more regularly because there is less requirement for controller intervention in this design (due to deconfliction from adjacent SIDs) and would expect published SID levels above 5,000ft to the South.

Figures 33 (Period 1 0700-2100) and 34 (Period 2 2100-0700) below illustrate W SID Group 8 and show the SID centrelines (yellow) that will be used for Stage 2 analysis, against existing departure swathes (purple) from Luton's westerly runway. Actual centrelines, radius of turns and the point at which tracks diverge may change throughout the process.

Figure 33: Existing departure swathes (purple) and W SID Group 8 Period 1 illustrative centrelines (yellow) from Luton's westerly runway

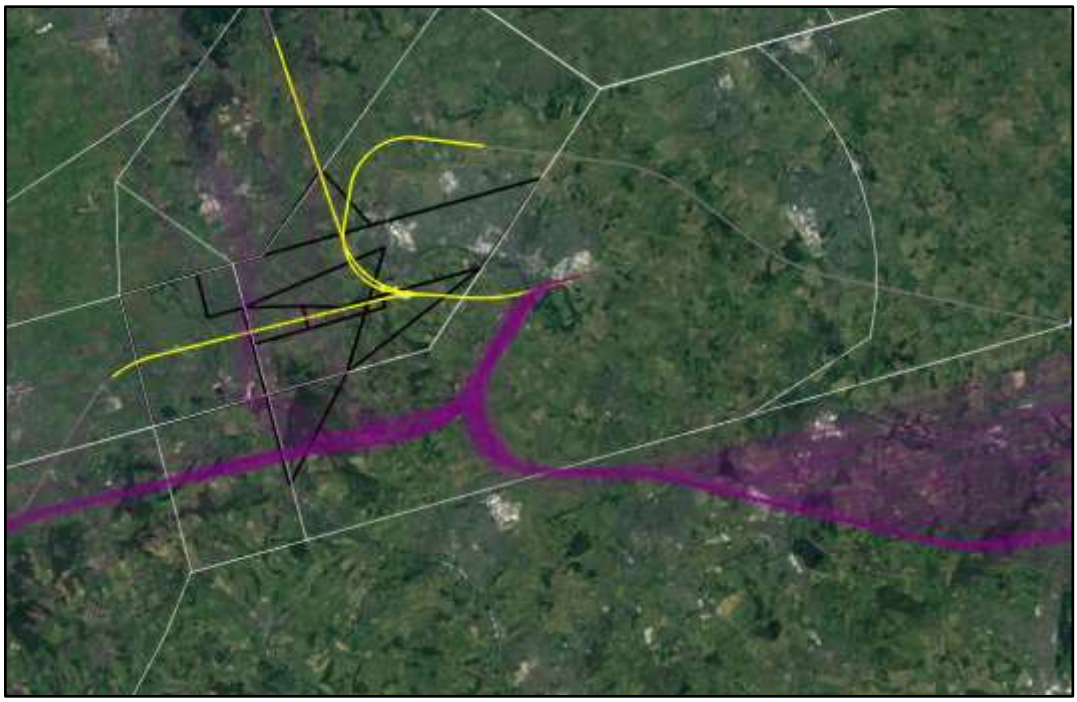

Figure 34: Existing departure swathes (purple) and W SID Group 8 Period 1 illustrative centrelines (yellow) from Luton's westerly runway

Easterly SID Group 1 (Do Nothing)

This option represents the do nothing scenario for Luton Easterly SIDs. More detail on the baseline is described in the section above.

Figure 35 below shows the existing departure swathes (purple) from Luton's Easterly runway and the existing published SID centrelines (yellow). There is quite a variation from the existing centrelines which is for a few reasons:

- They are nominal centrelines, with turns greater than 90˚, based on conventional navigation i.e. they are made up of a mix of radials from different ground-based navigation aids and these can be quite different to what is flyable. The greatest difference is seen on the OLY SID where it's clear there are no aircraft that can accurately fly the first turn which is so tight.
- The OLY SID is not wholly contained within Controlled Airspace so ATC are forced to vector and climb, they cannot be left on the SID.
- There is an ATC requirement to vector CPT departures to the south of the SID track (after the first turn) to ensure separation against arrivals on approach to RWY07.

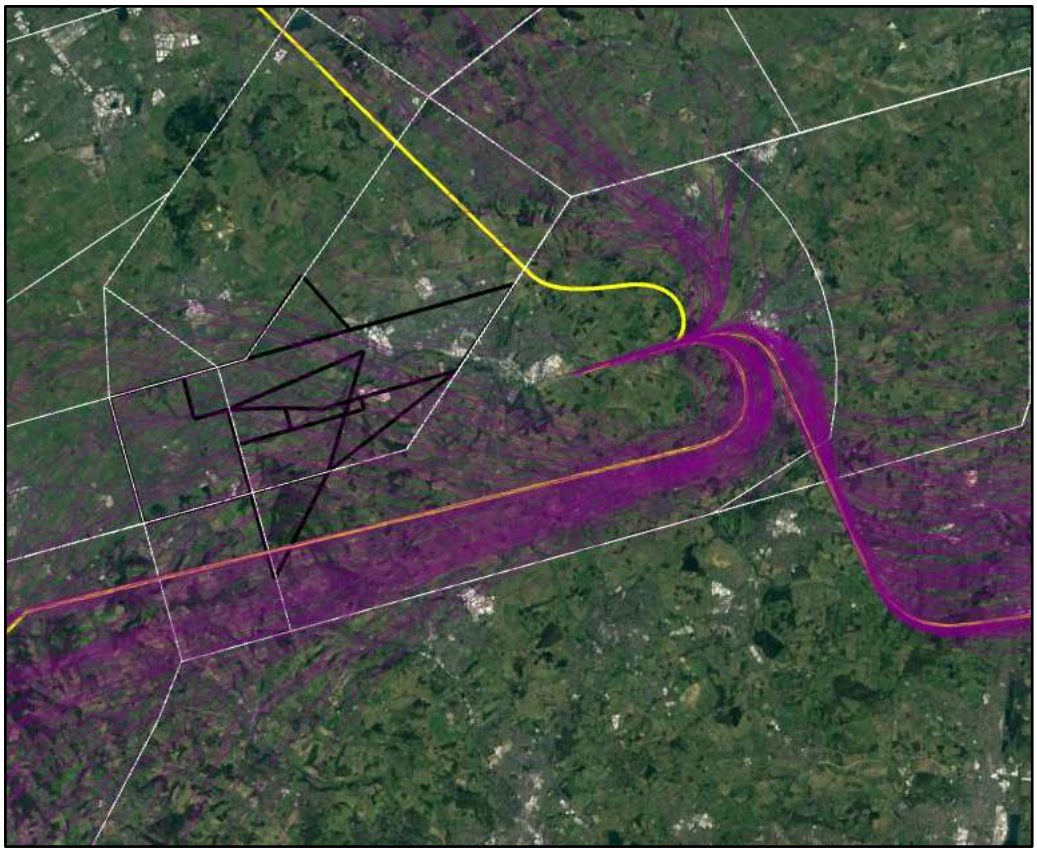

Figure 35: Existing departure swathes (purple) and published centrelines (yellow) from Luton's Easterly runway

Easterly SID Group 2

This option would see a replication of the existing MATCH SIDs and a refinement to the CPT SID to keep the route laterally separated from final approach. The OLY SID would be redesigned to a flyable centreline, however this would position the route over the heavily populated town of Hitchin. Therefore, the route has been proposed to go between Hitchin and Letchworth Garden City.

Subject to safety assurances, it is expected this option could be implemented within the current airspace, without affecting adjacent airports as the published vertical profile of the SIDs would be the same as today and no significant change to the lateral tracks.

We would expect to see minimal change to the swathe of MATCH departures but a concentration of aircraft on the CPT SIDs. The OLY SID would see a shift in concentration around the initial part of the first turn however there would still be a heavy reliance on ATC vectoring making consultation very difficult/confusing i.e. implementing a new SID centreline that wouldn't be flown routinely.

This option is not expected to be dependent on changes at neighbouring airports.

Figure 36 below illustrates E SID Group 2 and shows the SID centrelines (yellow) that will be used for Stage 2 analysis, against existing departure swathes (purple) from Luton's westerly runway. Actual centrelines, radius of turns and the point at which tracks diverge may change throughout the process.

Figure 36: Existing departure swathes (purple) and the E SID Group 2 illustrative centrelines (yellow) from Luton's Easterly runway

LLAOL FASI-S Stage 2A

Easterly SID Group 3

This option is the same as E SID Group 2 but with a CPT departure to the south of the aerodrome that avoids Harpenden. This is only possible with guaranteed CCO to above 5,000ft. This is because the route bends back towards final approach and would not be safe against a Missed Approach, Final Approach or subsequent departures without guaranteed climb.

For this reason, such an option is dependent on changes at other airports. As a result, we would expect the OLY and MATCH routes would experience more concentration but also improved CCO as a result of the wider FASI deployment.

Figure 37 below illustrates E SID Group 3 and shows the SID centrelines (yellow) that will be used for Stage 2 analysis, against existing departure swathes (purple) from Luton's westerly runway. Actual centrelines, radius of turns and the point at which tracks diverge may change throughout the process.

Figure 37: Existing departure swathes (purple) and the E SID Group 3 illustrative centrelines (yellow) from Luton's Easterly runway

Easterly SID Group 4

This option sees all departures offset to the right (south) of final approach to help avoid Breachwood Green and to provide some respite to those under RWY25 final approach. OLY departures would however be required to cross back over final approach.

The CPT departure could turn back west earlier than today to reduce track miles/CO2. This earlier turn would also help to enable reduced departure separations therefore a reduction in ground holding. However, it would result in overflight of Harpenden at lower altitudes than today. The offset right OLY departure would enable an OLY SID which could stay to the West of Hitchin and keep that part of the turn closer to the existing OLY tracks flown today. Although routine vectoring would still be expected above the NPR.

Subject to safety assurances, it is expected this option could be implemented within the current airspace, without affecting adjacent airports as the published vertical profile of the SIDs would be the same as today and the lateral tracks not significantly further south. We would therefore expect similar CCO performance across these routes.

Figure 38 below illustrates E SID Group 4 and shows the SID centrelines (yellow) that will be used for Stage 2 analysis, against existing departure swathes (purple) from Luton's westerly runway. Actual centrelines, radius of turns and the point at which tracks diverge may change throughout the process.

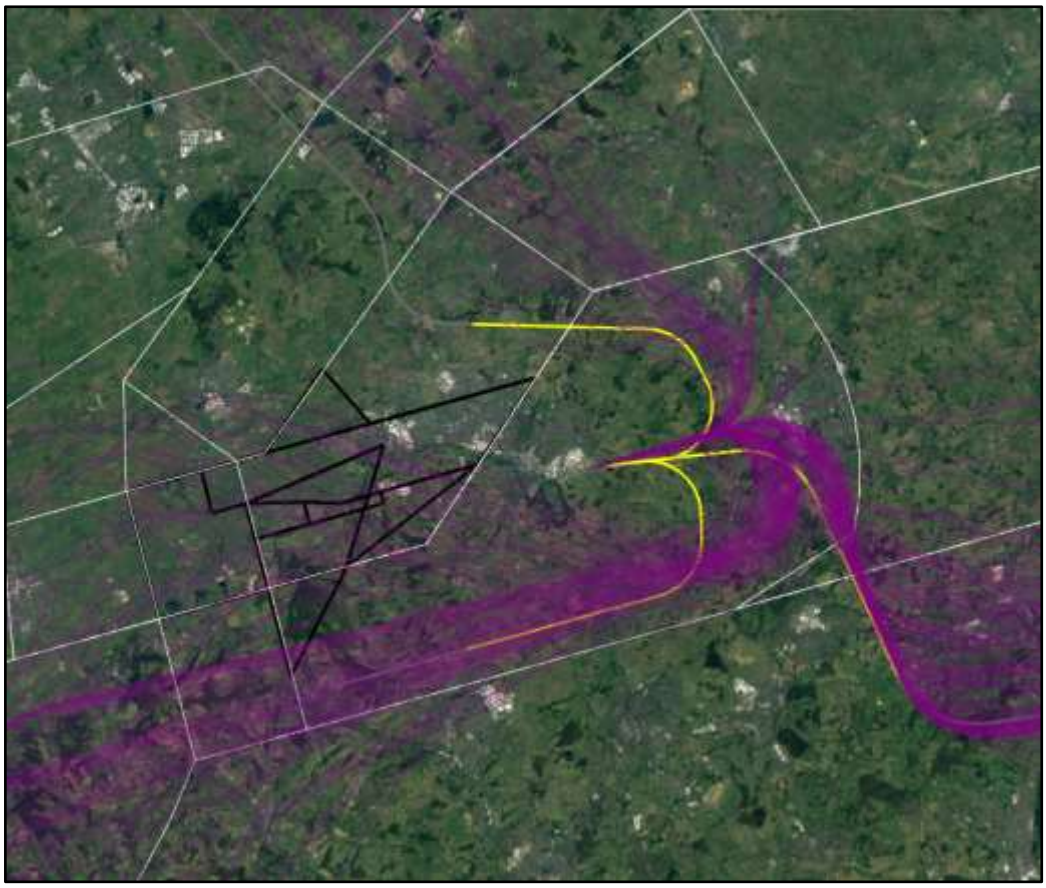

Figure 38: Existing departure swathes (purple) and the E SID Group 4 illustrative centrelines (yellow) from Luton's Easterly runway

LLAOL FASI-S Stage 2A

Easterly SID Group 5

As with E SID Group 4, this option illustration has all departures offset to the right (south) of final approach to help avoid Breachwood Green and to provide some respite to those under RWY25 final approach, although the option is not reliant on that offset. However, this version has CPT departures then turning left to go north of the airport. This will increase the chances of CCO (because the routes will be further away from Heathrow, London City and Northolt northbound departures) but also provide respite for those communities to the South of Luton during easterly operations, who would also be overflown by westerly departures. The OLY and CPT tracks would share the same initial track with the OLY departures tracking to the West for longer.

The MATCH SID is more direct rather than tracking towards BPK. Such CPT, OLY and MATCH SIDs are only possible with guaranteed CCO above 5,000ft. For MATCH this is so the departures can outclimb Stansted Airspace. For CPT and OLY this is because they have to outclimb Luton's arrivals to Runway 07. To enable this, the Luton arrivals would need to have their downwind tracks moved much further north. We would expect greater concentration along all these routes and less routine vectoring.

This option would only be viable with changes to other airports' routes to guarantee CCO above 5,000ft and a move to Luton's own arrivals. See Easterly Arrival Options 3 and 4 which were generated to enable this E SID Group 5 option.

Figure 39 below illustrates E SID Group 5 and shows the SID centrelines (yellow) that will be used for Stage 2 analysis, against existing departure swathes (purple) from Luton's westerly runway. Actual centrelines, radius of turns and the point at which tracks diverge may change throughout the process.

Figure 39: Existing departure swathes (purple) and the E SID Group 5 illustrative centrelines (yellow) from Luton's Easterly runway

LLAOL FASI-S Stage 2A

Easterly SID Group 6

This option is similar to E SID Group 5 but sees 2 x sets of SIDs that would alternate, in pairs at a set time of day or day of the week. For the Design Principle Evaluation and Initial Options Appraisal, we assume they alternate once per day for a period of 24H, therefore each set of SIDs is in operation an equal amount over a year.

As with E SID Group 5, this option would only be viable with changes to other airports' routes to guarantee CCO above 5,000ft and a move to Luton's own arrivals. See Easterly Arrival Options 3 and 4 which were generated to enable this E SID Group 5 option.

Figures 40 (Period 1) and 41 (Period 2) below illustrate E SID Group 6 and show the SID centrelines (yellow) that will be used for Stage 2 analysis, against existing departure swathes (purple) from Luton's westerly runway. Actual centrelines, radius of turns and the point at which tracks diverge may change throughout the process.

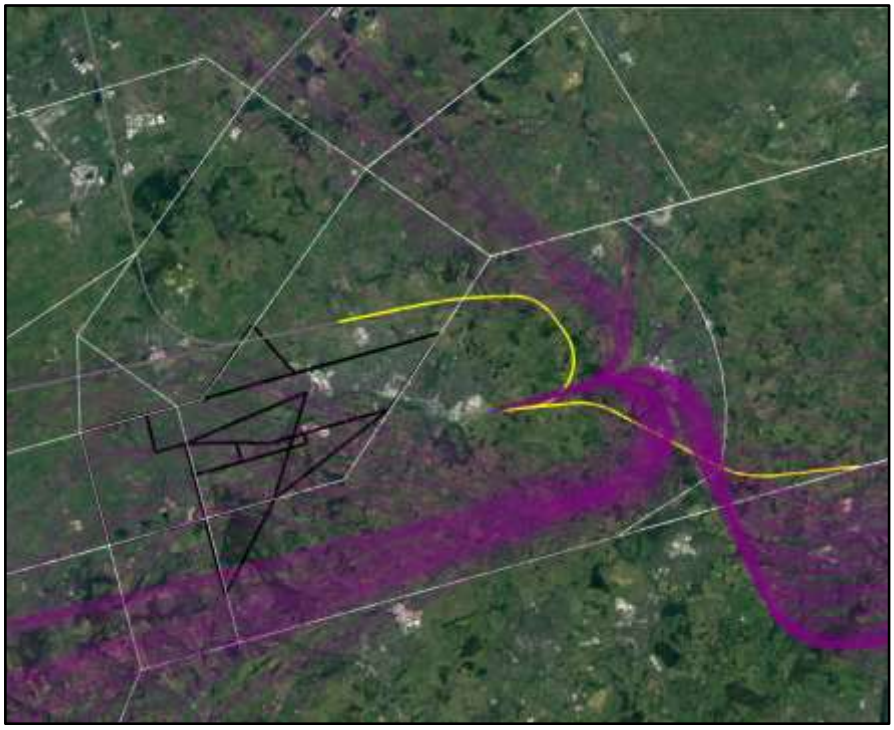

Figure 40: Existing departure swathes (purple) and the E SID Group 6 Period 1 illustrative centrelines (yellow) from Luton's Easterly runway

Figure 41: Existing departure swathes (purple) and the E SID Group 6 Period 2 illustrative centrelines (yellow) from Luton's Easterly runway

Westerly Arrivals Option 1 (Do Nothing)

This option would see all arrivals vectored from ZAGZO exactly as per SAIP AD6, with the same vertical profiles. This is a Do Nothing Scenario for RWY25 arrivals and therefore not dependent on changes to other airports' routes.

At the time of generating this list of options, the AD6 airspace has not been implemented and therefore the illustration cannot be generated using actual radar track plots. The Westerly arrival swathe is indicated by the purple shading in Figure 42.

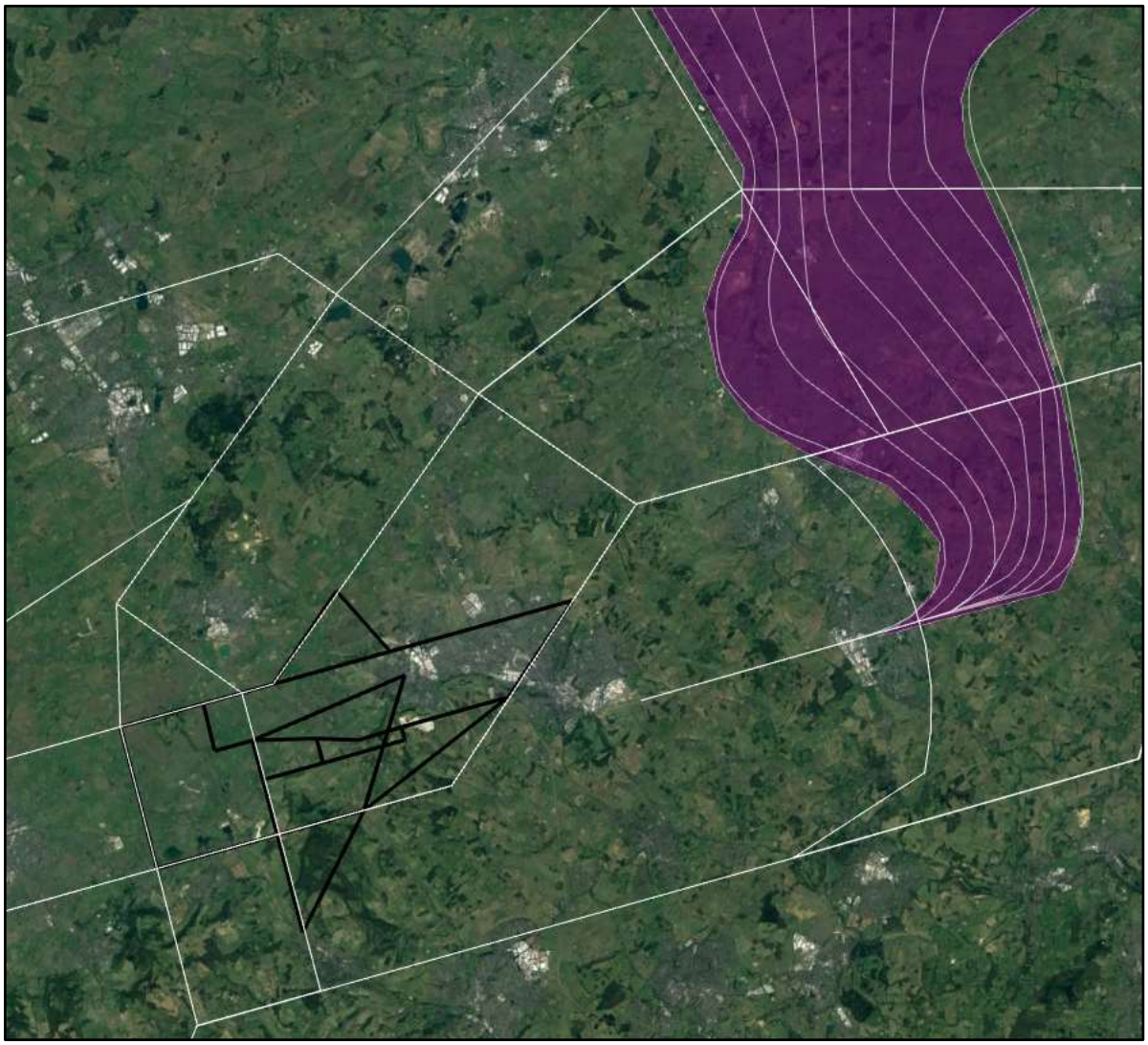

Figure 42: Existing Westerly arrival swathe following SAIP AD6 implementation

LLAOL FASI-S Stage 2A

Westerly Arrivals Option 2

This option would see the majority of all arrivals vectored from ZAGZO as per SAIP AD6, with the same profiles as in AD6, but we also introduce a PBN (RNP-AR) arrival route which some arrivals could use during periods of low traffic. This will reduce CO_2 and help to reduce the frequency of overflight for those under final approach outside c.6nm and reduce overflight of Stevenage. A lowering of the base of CTA 7 would be required to accommodate this route.

Aircraft using the RNP-AR route would be concentrated on the centreline with no vectoring. The profile of the RNP-AR route would be contained within the existing (AD6) Luton RMA and is therefore not expected to have a dependency on other airports. Note that operator approvals are required for such a route therefore not all operators would be able to use it.

Unlike with SIDs which have to be managed on a more scheduled basis, this arrival could be made available by Luton Approach ad hoc and/or at relatively short notice.

Figure 43 below illustrates W Arrival Option 2. The main arrival swathe is indicated by the purple shading. The RNP-AR route that will be used for Stage 2 analysis is illustrated in red, although the actual centrelines and radius of turns may change throughout the process.

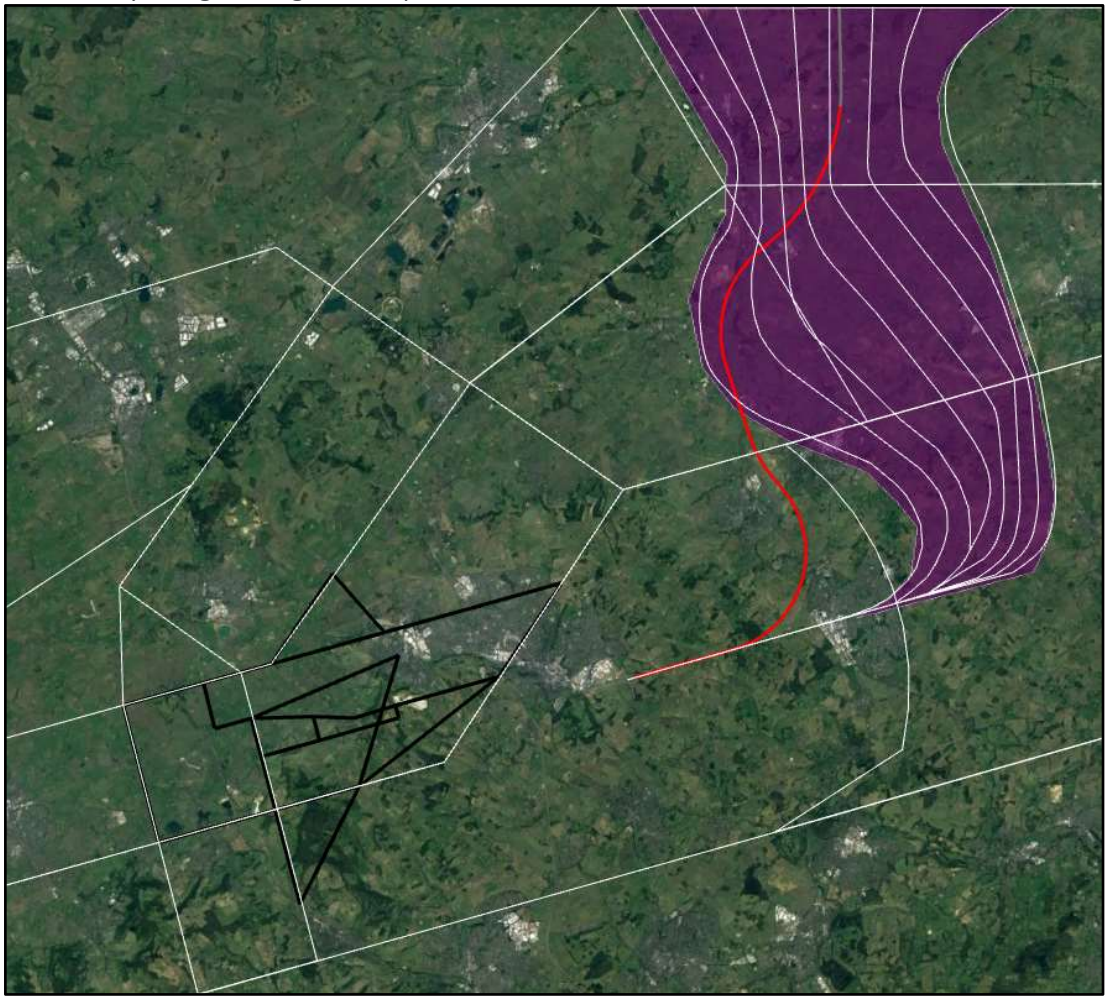

Figure 43: Existing Westerly arrival swathe following SAIP AD6 implementation and RNP-AR arrival route in red

Westerly Arrivals Option 3

This option is the same as W Arrival Option 2 except that the vertical profiles are improved to allow improved CDA performance for the main vectored arrival swathe. This could only be possible with changes to routes to/from adjacent airports.

We would not expect an improvement to the vertical profile of the RNP-AR arrival as the shorter track miles (compared to the main vectored arrival swathe) means staying higher for longer is not possible. Therefore, even with a higher Luton RMA, the RNP-AR arrival would still require a lowering to the base of CTA 7.

Figure 44 below illustrates W Arrival Option 3. The main arrival swathe is indicated by the purple shading. The RNP-AR route that will be used for Stage 2 analysis is illustrated in red, although the actual centrelines and radius of turns may change throughout the process.

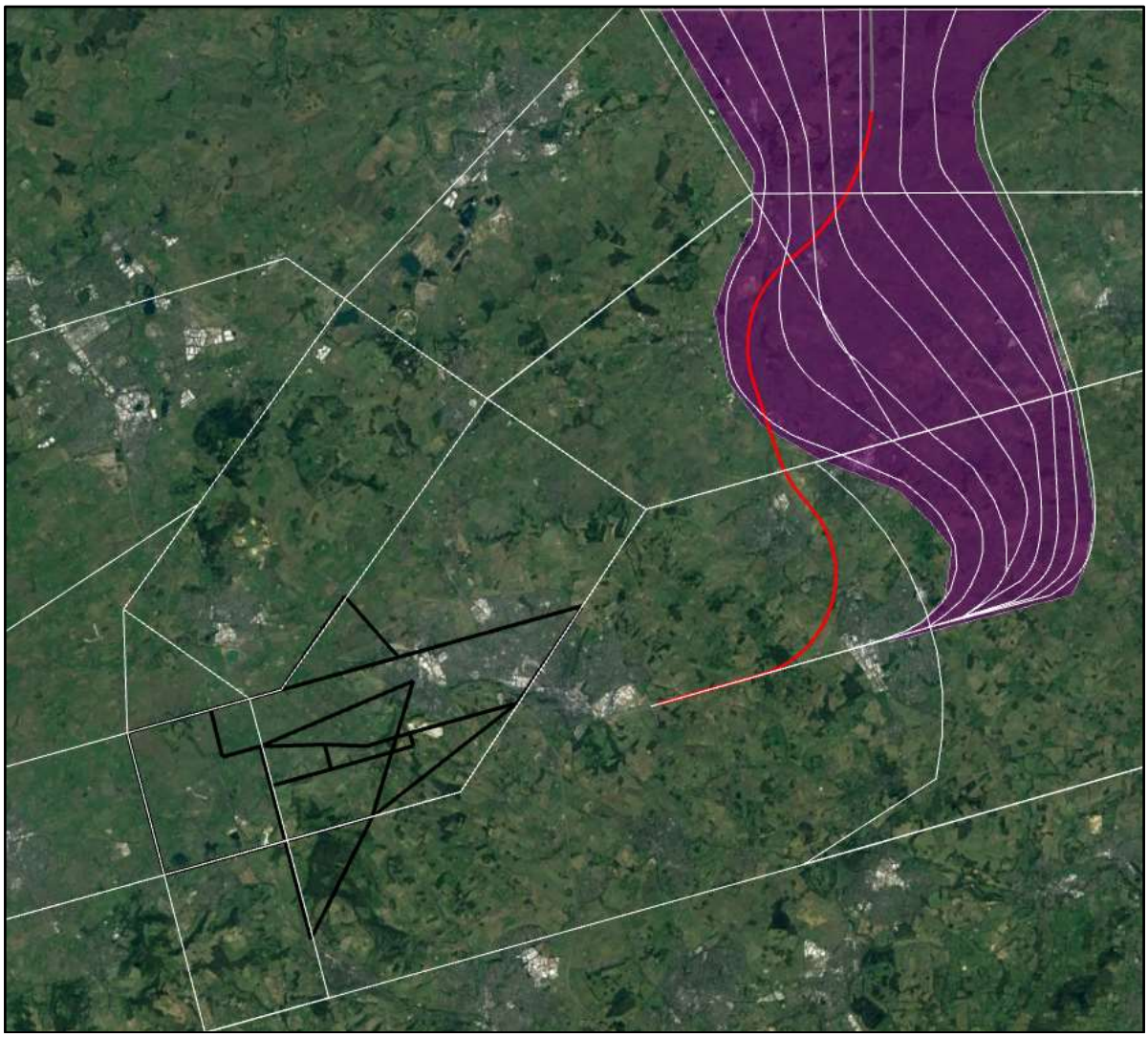

Figure 44: Existing Westerly arrival swathe following SAIP AD6 implementation (but with improved vertical profile) and RNP-AR arrival route in red

LLAOL FASI-S Stage 2A

Westerly Arrivals Option 4

This option would see the use of 2 x PBN Approach Transitions used in rotation instead of a reliance on just vectoring. In addition, the RNP-AR route from W Arrival 2 and 3 would also be available for periods of low traffic for those operators equipped and approved.

As we assume CDA from 7000ft on all three PBN approaches, this introduces a dependency on other airports. The 2 x PBN Approach Transitions would be used in rotation that would alternate at a set time of day or day of the week.

We estimate at this stage that the split of traffic is 45% on each of the PBN approach Transitions and c.10% on the RNP-AR route to the shorter final.

Aircraft would be largely concentrated on the PBN Transitions, however we couldn't guarantee this as in peak arrival flows there would be a reliance on vectoring to deliver the required spacing between pairs of arrivals to the runway. Approach control would continue to need to be able to react to variable spacing requirements from the airport. However, those aircraft on the RNP-AR route would be concentrated on the route with no vectoring.

Figures 45 (Period 1) and 46 (Period 2) below illustrate W Arrival Option 4 and show the arrival centrelines (yellow) that will be used for Stage 2 analysis. The 2 x PBN Approach transitions (in yellow) used in this illustration have the same lateral characteristics as consulted on in SAIP AD6 however if this option is progressed, those centrelines may change throughout the process. Likewise, the RNP-AR arrival centreline (red) could also change throughout the process. The start of the yellow/red lines indicate the 7,000ft point on a CDA.

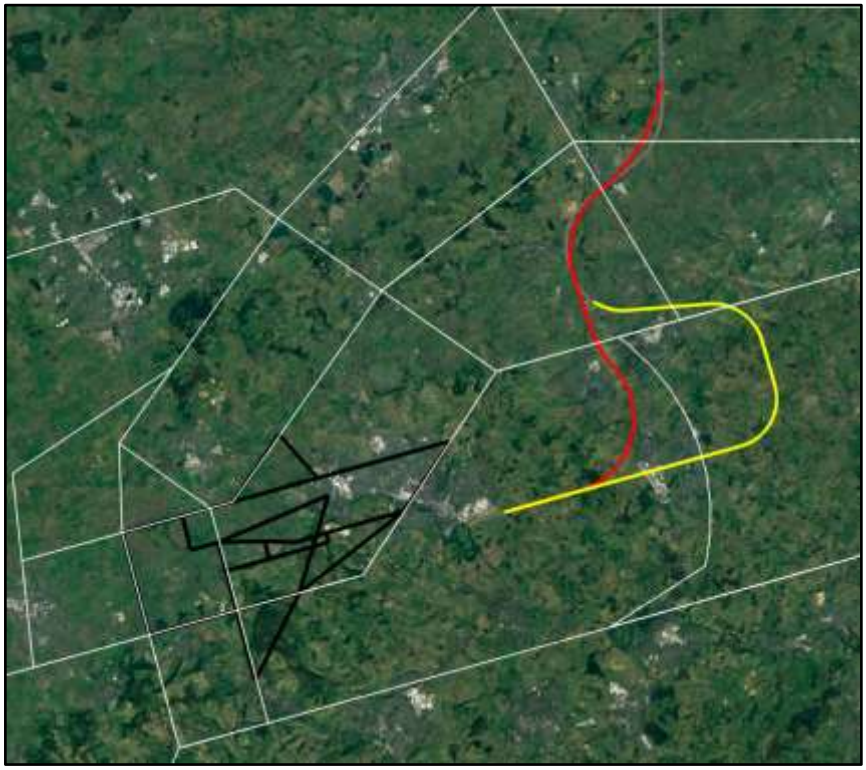

Figure 45: W Arrival Option 4 (Period 1) approach transition (yellow) with RNP-AR arrival (red)

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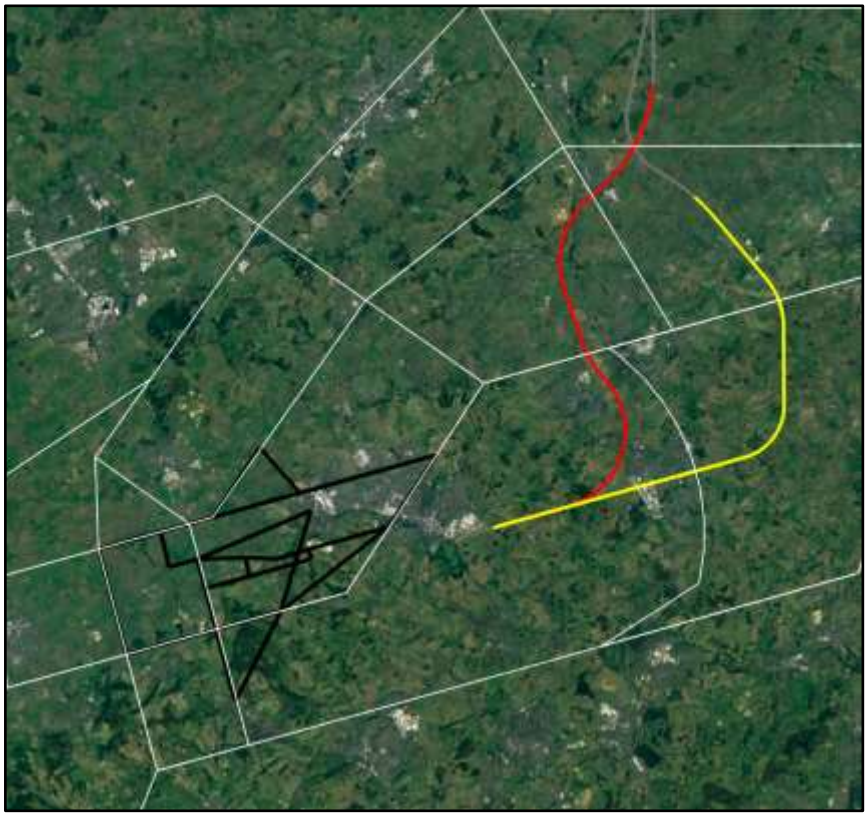

Figure 46: W Arrival Option 4 (Period 2) approach transition (yellow) with RNP-AR arrival (red)

LLAOL FASI-S Stage 2A

Easterly Arrivals Option 1 (Do Nothing)

This option would see all arrivals vectored from ZAGZO exactly as per SAIP AD6, with the same vertical profiles. This is a Do Nothing Scenario for RWY25 arrivals and therefore not dependent on changes to other airports' routes.

At the time of generating this list of options, the AD6 airspace has not been implemented and therefore the illustration cannot be generated using actual radar track plots. The Easterly arrival swathe is indicated by the purple shading in Figure 47.

Figure 47: Existing Easterly arrival swathe following SAIP AD6 implementation

Easterly Arrivals Option 2

This option would see the majority of all arrivals vectored from ZAGZO as per SAIP AD6, with the same profiles as in AD6, but we also introduce a PBN (RNP-AR) arrival route which some arrivals could use during periods of low traffic. This will reduce CO2 and help to reduce the frequency of overflight for those under final approach outside c.6nm. This RNP-AR route would only be available when the Dunstable gliding area is inactive. Unlike with SIDs which have to be managed on a more scheduled basis, this arrival could be made available by Luton Approach ad hoc and/or at relatively short notice for example, on days when the gliding areas aren't being used due to the weather. Ad-hoc use of a route could be problematic from a consultation perspective as we wouldn't say exactly when the route would be used. Also ad-hoc use of a route through flexible airspace used by aircraft (when available) without transponders would require increased safety assurances. However, for the purposes of the Design Principle Evaluation and Initial Options Appraisal, we have assumed use of this route is standardised to a 2100-0700 time period but that is subject to negotiation and agreement with multiple industry organisations.

Such an RNP-AR arrival would require a lowering of part of CTA5 and possibly CTA6.

Aircraft using the RNP-AR route would be concentrated on the centreline with no vectoring. The profile of the RNP-AR route would be contained within the existing (AD6) Luton RMA and is therefore not expected to have a dependency on other airports. Note that operator approvals are required for such a route therefore not all operators will be able to use it.

Figure 48 below illustrates E Arrival Option 2. The main arrival swathe is indicated by the purple shading. The RNP-AR route that will be used for Stage 2 analysis is illustrated in red, although the actual centrelines and radius of turns may change throughout the process.

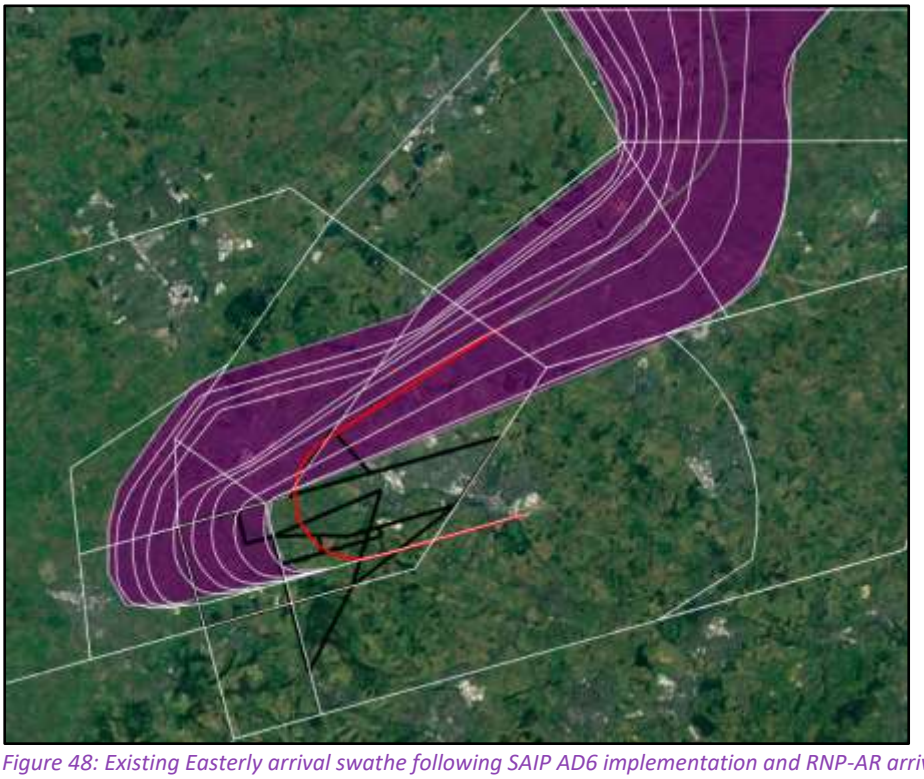

Figure 48: Existing Easterly arrival swathe following SAIP AD6 implementation and RNP-AR arrival route in red

LLAOL FASI-S Stage 2A

Easterly Arrivals Option 3

This option would see the majority of arrivals from ZAGZO vectored but with the swathe moved significantly further north and also with improved CDA from above 5,000ft. This shift in the arrival traffic to the north is to enable E SID Groups 5 and 6.

The CPT+OLY departures turn left to the North of the airport to climb continuously to at least 6,000ft+ and outclimb the Luton arrivals to RWY07. Those vectored arrivals would join final approach in the same place as today (AD6).

There could also be a PBN (RNP-AR) route that could be used when the gliding area is not active to reduce CO2 and help to reduce the frequency of overflight for those under final approach outside c.6nm. This route could only be used when the gliding airspace isn't being used by the gliders (2100-0700) as per Easterly Arrival Option 2.

This option is dependent on changes to other airports' routes to enable CDA and not require more Controlled airspace to facilitate the move to the main arrival swathe. A lowering of CTA 5 and 6 would still be required for an RNP-AR arrival.

Figure 49 below illustrates E Arrival Option 3. The main arrival swathe that will be used for Stage 2 analysis is illustrated by the purple shading. The RNP-AR route that will be used for Stage 2 analysis is illustrated in red although the actual centrelines and radius of turns may change throughout the process.

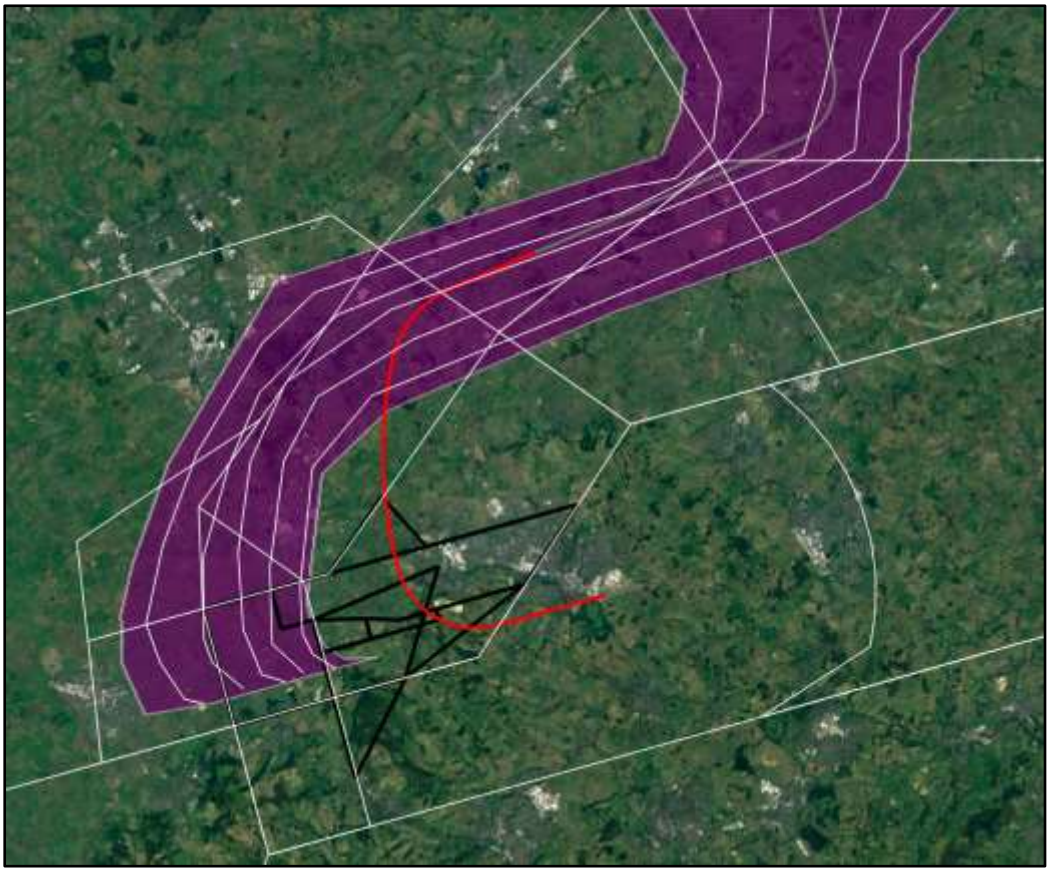

Figure 49: Easterly arrival swath moved North (purple) and RNP-AR arrival route in red

LLAOL FASI-S Stage 2A

Easterly Arrivals Option 4

This option would see the use of 2 x PBN Approach Transitions used in rotation instead of a reliance on just vectoring. The Approach transitions have been positioned further north than the existing arrival swathe to facilitate E SID Groups 5 and 6. There could also be a PBN (RNP-AR) route that could be used when the gliding area is not active to reduce CO2 and help to reduce the frequency of overflight for those under final approach outside c.6nm. This route could only be used when the gliding airspace isn't being used by the gliders (2100-0700) as per Easterly Arrival Options 2 and 3.

The 2 x PBN transitions have been positioned slightly and to the north of Leighton Buzzard although on a CDO profile, aircraft would be 6-7000ft in these areas.

As we assume CDA from 7000ft on all three PBN approaches which introduces a dependency on other airports. The 2 x PBN Approach Transitions would be used in rotation that would alternate at a set time of day or day of the week. We estimate at this stage that the split of traffic is 45% on each of the PBN approach Transitions and c.10% on the RNP-AR route to the shorter final.

Aircraft would be largely concentrated on the PBN Transitions, however we couldn't guarantee this, as in peak arrival flows there would be a reliance on vectoring to deliver the required spacing between pairs of arrivals to the runway. Approach control would continue to need to be able to react to variable spacing requirements from the airport. However, those aircraft on the RNP-AR route would be concentrated on the route with no vectoring. A lowering of CTA 5 and 6 would still be required for an RNP-AR arrival.

Figures 50 (Period 1) and 51 (Period 2) below illustrate E Arrival Option 4 and show the arrival centrelines (yellow) that will be used for Stage 2 analysis however if this option is progressed, those centrelines may change throughout the process. Likewise, the RNP-AR arrival centreline (red) could also change throughout the process. The start of the yellow/red lines indicate the 7,000ft point on a CDA.

LLAOL FASI-S Stage 2A

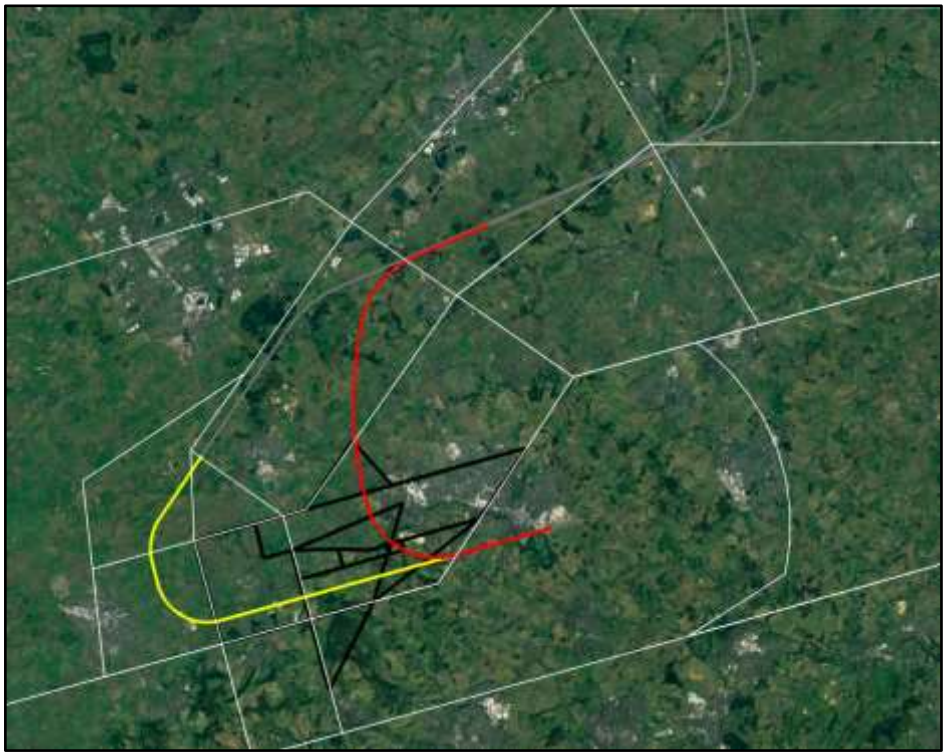

Figure 50: E Arrival Option 4 (Period 1) approach transition (yellow) with RNP-AR arrival (red)

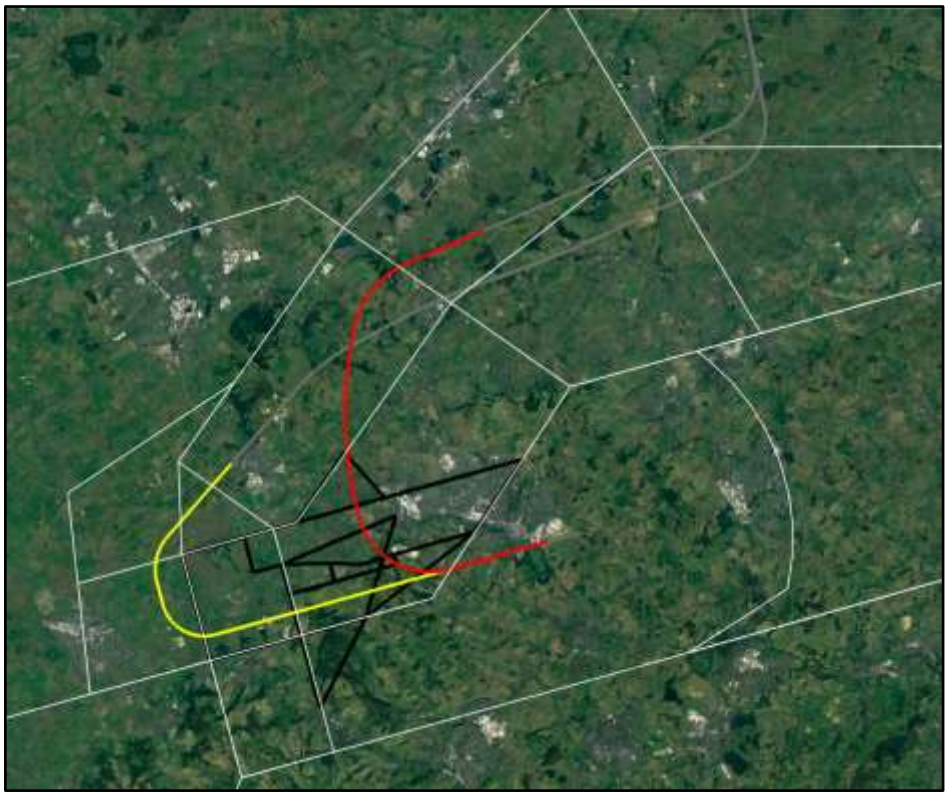

Figure 51: E Arrival Option 4 (Period 1) approach transition (yellow) with RNP-AR arrival (red)

Options for Controlled Airspace and other Procedures

Options for CAS

Luton's CTR/CTA and LTMA dimensions are complex and changes to those boundaries will largely be enabled through guaranteed CCO and CDO operations to/from higher levels than today and with potentially steeper climb gradients. Such improvements to vertical profiles are dependent on changes to routes to/from other airports and the extent of increase to vertical profiles in known at this time.

Airspace containment of IFPs is very closely related to the design characteristics as well as track performance (flyability) along the route centrelines. As describes previously, the provisional route centrelines are likely to move as options are refined throughout the project. Refinement will be on the basis of integration with the wider airspace network below and above 7,000ft, reacting to stakeholder engagement, increasing environmental and operational performance and in accordance with more detailed IFP design and validation in Stages 3 and 4.

The CAS construct needs to be based on both easterly and westerly operations at Luton and other LTMA airports and there could be many hundreds of differing CAS designs to support every combination of airspace design option and operating mode across multiple airports.

It is therefore not proportionate at this stage to design CAS structures to support each possible option and configuration, especially when the fine details of interactions are not known. However, our Design Principle Evaluation and Initial Options Appraisal do provide an initial insight into which options could require an increase in the volume of CAS as well as which options are most likely to enable reductions in the volume of CAS.

Options for other Procedures

Missed Approaches

These procedures are part of an Instrument Approach Procedure and enable aircraft to safely reposition for another approach under certain circumstances if they are unable to land from their first approach. This is a safe and routine part of operations for all pilots and controllers. There are many reasons for a pilot, or a controller, to initiate a missed approach. On average, there is around 1 Missed Approach per day at Luton.

The design of the Missed Approach is very specific to the type of approach and the airspace construct and sometimes, the initial departure tracks. We do not yet know if we will need to change the Missed Approach procedures and if we do, cannot attempt to guess what they will look like due to all the variables and it would not be proportional to attempt to do so.

After the Full Options Appraisal concludes and Luton's preferred options are chosen, we can then consider the Missed Approaches to support the safe operation of the design and include the considerations in the consultation material in Stage 3.

Noise Preferential Routings

All propeller-driven aircraft with Maximum Take Off Weight (MTOW) over 5,700kg and all jet aircraft leaving London Luton Airport are required to follow specific departure routes known as Noise Preferential Routes (NPRs). These are established by consultation with CAA and the London Luton Airport Consultative Committee, and they are designed to avoid flying over built-up areas wherever possible.

There are four Standard Instrument Departure (SID) routes for each runway – OLNEY, COMPTON, MATCH and DETLING which define the NPR centreline, see Figure 52. Associated with each NPR is a swathe of airspace extending 1.5km (1km for RNAV) each side of the NPR centre line, within which aircraft concentrate and are considered to be flying on track. Aircraft must follow the NPR controls applicable to the runway in use at that time.

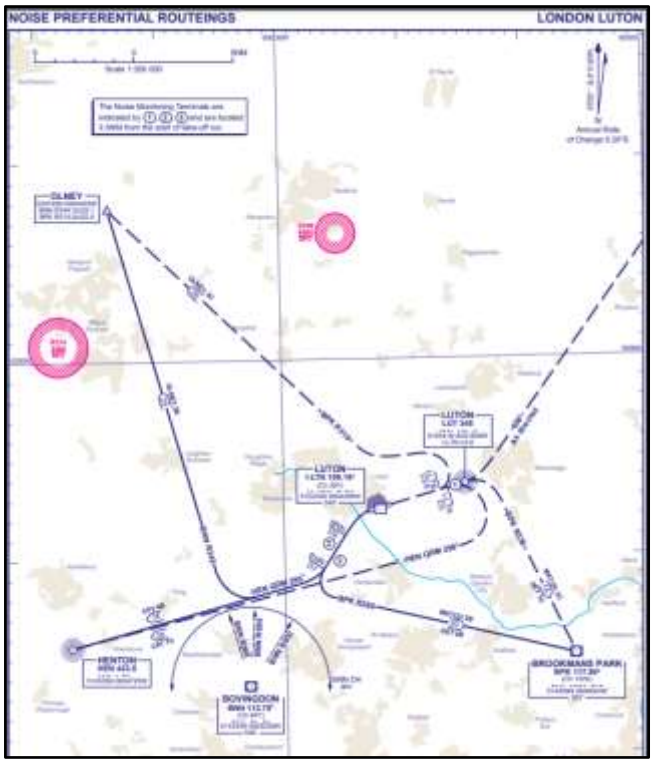

Figure 52: Luton's NPRs

The obligations of Noise Preferential Routings for aircraft following conventional SIDs cease when a height of 3,000ft (between 07:00hrs to 22:59hrs local time) and 4,000ft (during night time, 23:00hrs to 06:59hrs local time) has been reached. The obligations of the RNAV NPR ceases when a height of 4,000ft has been reached at all times.

Once aircraft have reached the NPR restricted altitude, they will be considered no longer on the Noise Preferential Route. At that stage the aircraft may be directed by Air Traffic Control onto a different heading in order to integrate with the overall flow of traffic. However, on RNAV Match/Detling SID aircraft should not be vectored before the railway line between St Albans and Harpenden, unless this is required for safe separation from other aircraft or for other safety issues such as avoiding adverse weather.

As the NPRs are defined by the existing SID centrelines, if those centrelines move the NPRs will need to be amended accordingly. This could result in changes to the lateral track, the width of the NPR and/or the height of the NPR. Options for NPR definitions have not been included in Options Development at this stage, but we will incorporate new dimensions for our NPRs in the public consultation material in Stage 3.

Non-Airways Departures

These procedures allow aircraft that are going to be leaving CAS, and therefore not joining the airways structure and flying a SID, to safely depart the airport whilst still adhering to the NPR requirements. Luton's non-airways departures will therefore change in accordance with the SIDs, the NPRs as well as the CAS dimensions. Options for non-airways departures definitions have not been included in Options Development at this stage but we will incorporate new dimensions for our NPRs in the public consultation material in Stage 3.

Design Principle Evaluation

The Design Principle Evaluation involves taking all of the options developed and qualitatively evaluating them against the Design Principles to understand how they respond. This helps to determine which options best meet the design principles and therefore proceed to the next stage of the airspace change process.

As part of the Airspace Change Process at Stage 1B, LLAOL developed a set of design principles with identified stakeholders. The aim of the design principles is to provide high-level criteria that the proposed airspace design options should meet. They also provide a means of analysing the impact of different design options and a framework for choosing between or prioritising options.

Design Principle Evaluation Methodology

At the DP Evaluation Stage, CAP1616 requires airspace change sponsors to qualitatively evaluate options against the design principles, and categorises each evaluation as either 'met', 'partially met' or 'not met'.

The CAA has requested evidence that the Design Principle Evaluation includes an assessment of how the different Design Options respond to the relevant AMS Design Principle:

"Subject to the overriding design principle of maintaining a high standard of safety, the highest priority principle of this airspace change that cannot be discounted is that it accords with the CAA's published Airspace Modernisation Strategy (CAP 1711) and any current or future plans associated with it."

There are 5 known outcomes, or ends, that are expected from airspace modernisation as detailed in CAP1711 and Luton's Design Principles already encompass 4 out of 5 of these objectives. Table 10 sets out which parts of our Design Principle Evaluation assesses against the 5 AMS known outcomes.

AMS known outcome	Luton's design principle which assesses this outcome
Maintain and enhance high aviation safety standards	Must be safe
Secure the efficient use of airspace and enable integration	Should minimise the impact on other airspace users through: - Keeping CAS requirements to a minimum - Simple airspace boundaries - Allowing flexible use of airspace, where possible
Avoid flight delays by better managing the airspace network	Should not constrain the airport's capacity, providing the environmental objectives/requirements have been met
Improve environmental performance by reducing emissions and by better managing noise	Must meet the 3 aims of the NPSe, Air Navigation Guidance 2017 and all appropriate Government aviation policies, and updates thereof

	Should enable continuous climb/descent to/from at least 7000ft & facilitate continuous climb/descent above that Should provide an equitable distribution of traffic where possible, through: - Use of multiple routes - New route structures - Options (mechanisms) for respite Should avoid overflying the same communities with multiple routes, & take into account routes of other airports, below 7000ft
Facilitate defence and security objectives	We don't have a specific design principle to meet this objective. However, none of our options are assessed as affecting defence and security objectives.

Table 10: AMS known outcomes mapped against Luton's Design Principles

In order to evaluate each option in a fair and transparent way, we have followed the methodologies set out in Table 11 when evaluating against each design principle.

London Luton Airport

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Design Principle		How it is evaluated		Met	Partially Met	Not Met
1	Must be safe	Qualitative SME evaluation which highlights any potential safety concerns and an estimation of if they could be overcome ahead of ACP submission		No safety concerns at this time	Additional work required to generate acceptable safety argument but that is envisaged to be achievable	Acceptable safety assurances not likely to me met and therefore option discounted
2	Must meet the 3 aims of the NPSe, Air Navigation Guidance 2017 and all appropriate Government aviation policies, and updates thereof.	This principle is very difficult to evaluate qualitatively and without a complete design with full noise modelling. In addition, the aims of the NPSe are 'aims' and not concrete requirements. For example, reducing adverse effects from noise, reducing CO2 emissions and minimising local air quality emissions are the goal of the aims but the altitude based priorities within ANG2017 state that Noise is the priority below 4000ft and also 7000ft which therefore does allow for an increase in CO2 at those levels. ANG states that the LOAEL is regarded as the point at which adverse effects begin to be seen on a community basis. At this stage we don't see any reason for an increase in the size of the LOAEL as typically, the airspace design and position of routes don't affect the size of the LOAEL (the size is driven more by movement numbers and fleet mix) but it does affect the position of the LOAEL and therefore the population numbers within it. Steeper Approaches could reduce the size of the LOAEL but these are unlikely to be an option at Luton due to the length of the runway; we will confirm this in Stage 3. Typically at Luton, the LOAEL extends to c.4000ft and Luton's departures already climb continuously and quite quickly (due to the fleet mix and runway length) to at least 4000ft, normally 5000ft and with CDAs from at least 5,000ft. Therefore, enabling continuous climb/descent to/from above 5000ft in a future design could have limited effect on reducing the size of the LOAEL. An increase in the size of the LOAEL is therefore unlikely apart from options where SIDs fly straight out (over final approach) that don't today due to the cumulative effects of overflight. The qualitative assessment of this Design Principle is based on the extent to which we anticipate, at this stage, each option will perform against the Governments key environmental objectives: - Whether at this stage, we think there is a risk of increase in adverse effects. This assessment is based on if we think the population numbers within the day or night time LOAELs could increase as a result of the new flight paths. - We provide an indication of whether we expect there to be an increase or decrease in CO2 emissions - We provide an indication of whether it could be expected to increase local air quality emissions. - Finally we provide an indication of if there is likely to be in increase in overflight of AONBs or National Parks.	Reduce the number of people in the UK significantly affected by adverse impacts from aircraft noise	Option has potential to reduce the population number within the day or night LOAEL	Option is expected to maintain the population number within the day or night LOAEL	Option has potential to increase the population number within the day or night LOAEL
			Make a significant and cost-effective contribution towards reducing global emissions	Option has potential to contribute to a reduction in CO2	Option is expected to maintain the same level of CO2 emissions	Option has potential to contribute to an increase in CO2 emissions
			Minimise local air quality emissions	Option has potential to reduce the level of local air quality emissions	Option is expected to maintain the same level of local air quality emissions	Option has potential to increase the level of local air quality emissions
			Routes below 7,000 feet should seek to avoid flying over Areas of Outstanding Natural Beauty (AONB) and National Parks	Option has potential to reduce the overflight of AONBs or National Parks	Option is expected to maintain the same level of overflight of AONBs or National Parks	Option has potential to increase the amount of overflight of AONBs or National Parks

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Design Principle			How it is evaluated	Met	Partially Met	Not Met
3	Should not constrain the airport's capacity, providing the environmental objectives/requirements have been met		Qualitative SME evaluation of whether the option is expected to degrade, maintain or enhance Luton's operational performance.	Is expected to enhance Luton's operational performance in the future	Is expected to maintain Luton's operational performance in the future	Is expected to degrade Luton's operational performance in the future
4	Should enable continuous climb/descent to/from at least 7000ft & facilitate continuous climb/descent above that		Qualitative SME evaluation of whether the option could be reasonably expected to enable CCO/CDO to/from 7000ft based either on existing airspace arrangements (for an option with no dependencies on other airports) or for those options with dependencies, based on the arrival and departure areas of adjacent airports contained within the Masterplan Iteration 2	Option will most likely enable CCO or CDO to/from 7000ft on some or all routes (but not guaranteed at this time)	Unclear whether it would enable CCO or CDO to/from 7000ft	Would not enable CCO or CDO to/from 7000ft
5	Should provide an equitable distribution of traffic where possible, through eg;	Use of multiple routes	An evaluation of whether the option makes use of multiple routes for the same traffic flow to share the noise more equitably	Option does see the use of multiple routes	N/A (this is a yes or no assessment)	Option doesn't see the use of multiple routes
		New route structures	An evaluation of whether the option generates routes that are substantially different to today, to distribute the noise more equitably	Option does contain new route structures to share noise more equitably	N/A (this is a yes or no assessment)	Option doesn't contain new route structures to share noise more equitably
		Options (mechanisms) for predictable respite	An evaluation of whether the option has options for turning routes on/off to provide predictable respite for communities	Option does contain mechanism for predictable respite	N/A (this is a yes or no assessment)	Option doesn't contain mechanism for predictable respite
6	Should avoid overflying the same communities with multiple routes, & take into account routes of other airports, below 7000ft		Qualitative SME evaluation of whether the option could result in overflight of the same communities with Luton's and other airports' routes below 7000ft. This is based either on existing airspace arrangements (for an option with no dependencies on other airports) or for those options with dependencies, based on the arrival and departure areas of adjacent airports contained within the Masterplan Iteration 2	Option is expected to reduce the overflying of some communities with multiple routes	Option is not expected to change the overflying of communities with multiple routes	Option could increase overflying of the same communities with multiple routes
7	Should minimise tactical intervention by ATC below 7000ft		Qualitative SME evaluation of whether the option is likely to reduce the amount of tactical intervention compared to the existing baseline scenario. For options with dependencies, the assessment is informed by the arrival and departure areas of adjacent airports contained within the Masterplan Iteration 2	Option is expected to reduce the amount of tactical intervention compared to today	Option is expected to maintain the amount of tactical intervention compared to today	Option is expected to increase the amount of tactical intervention compared to today
8	Should minimise the impact on other airspace users through;	Keeping CAS requirements to a minimum	Whether the option is expected to require any more, less or the same volume of CAS than today. This assessment is linked closely to whether the option enables CCO/CDO (DP4) or not. It is assumed that CCO/CDO will enable a reduction in CAS.	Option could be expected to require less CAS	Option could be expected to require no more CAS	Option could be expected to require more CAS
		Simple airspace boundaries	Qualitative SME evaluation of whether the option offers the potential to simplify boundaries, offers no potential to simplify boundaries or if it	Option offers potential to simplify	Option offers no potential to simplify	Option offers potential to increase

Design Principle			How it is evaluated	Met	Partially Met	Not Met
			offers potential to increase the complexity of airspace boundaries. This assessment is linked closely to the row above.	airspace boundaries	airspace boundaries	complexity of airspace boundaries
		Allowing flexible use of airspace, where possible	Whether the option would maintain, improve or degrade the same level of airspace sharing arrangement with Dunstable Gliding as today. The assumption is that no options that utilise the airspace currently available for Dunstable Gliding would do so between the hours of 0700-2100 local. This is different to the existing Dusk to Dawn arrangement.	Option would not change the existing airspace sharing arrangement	Option would require altering the timings of the existing airspace sharing arrangement	Option would not cater for any continued airspace sharing arrangement

Table 11: Methodology

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Summary of the Design Principle Evaluation

The below tables summarise the outcome of the Design Principle Evaluation. The full detail of the Design Principle Evaluation is available in Appendix A. To navigate directly to the specific details of an option, please click the option name in the table.

Westerly SID Group Options		IS OPTION DEPENDENT ON CHANGES TO OTHER AIRPORTS' ROUTES?							
		NO	NO	NO	NO	YES	YES	YES	YES
DESIGN PRINCIPLE		W SID Grp 1	W SID Grp 2	W SID Grp 3	W SID Grp 4	W SID Grp 5	W SID Grp 6	W SID Grp 7	W SID Grp 8
Must be safe									
Must meet the 3 aims of the NPSe, Air Navigation Guidance 2017 and all appropriate Government aviation policies, and updates thereof	Reduce the number of people in the UK significantly affected by adverse impacts from aircraft noise	N/A							
	Make a significant and cost-effective contribution towards reducing global emissions	N/A							
	Minimise local air quality emissions	N/A							
	Routes below 7,000 feet should seek to avoid flying over Areas of Outstanding Natural Beauty (AONB) and National Parks	N/A							
Should not constrain the airport's capacity, providing the environmental objectives/requirements have been met									
Should enable continuous climb/descent to/from at least 7000ft & facilitate continuous climb/descent above that									

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Westerly SID Group Options		IS OPTION DEPENDENT ON CHANGES TO OTHER AIRPORTS' ROUTES?							
		NO	NO	NO	NO	YES	YES	YES	YES
DESIGN PRINCIPLE		W SID Grp 1	W SID Grp 2	W SID Grp 3	W SID Grp 4	W SID Grp 5	W SID Grp 6	W SID Grp 7	W SID Grp 8
Should provide an equitable distribution of traffic where possible, through eg;	Use of multiple routes								
	New route structures								
	Options (mechanisms) for respite								
Should avoid overflying the same communities with multiple routes, & take into account routes of other airports, below 7000ft									
Should minimise tactical intervention by ATC below 7000ft									
Should minimise the impact on other airspace users through;	Keeping CAS requirements to a minimum								
	Simple airspace boundaries								
	Allowing flexible use of airspace, where possible								

Table 12: Summary of DPE - Westerly SIDs

Easterly SID Group Options		IS OPTION DEPENDENT ON CHANGES TO OTHER AIRPORTS' ROUTES?					
		NO	YES	NO	YES	YES	YES
DESIGN PRINCIPLE		E SID Grp 1	E SID Grp 2	E SID Grp 3	E SID Grp 4	E SID Grp 5	E SID Grp 6
Must be safe							
Must meet the 3 aims of the NPSe, Air Navigation Guidance 2017 and all appropriate Government aviation policies, and updates thereof	Reduce the number of people in the UK significantly affected by adverse impacts from aircraft noise	N/A					
	Make a significant and cost-effective contribution towards reducing global emissions	N/A					
	Minimise local air quality emissions	N/A					
	Routes below 7,000 feet should seek to avoid flying over Areas of Outstanding Natural Beauty (AONB) and National Parks	N/A					
Should not constrain the airport's capacity, providing the environmental objectives/requirements have been met							
Should enable continuous climb/descent to/from at least 7000ft & facilitate continuous climb/descent above that							
Should provide an equitable distribution of traffic where possible, through eg;	Use of multiple routes						
	New route structures						
	Options (mechanisms) for respite						
Should avoid overflying the same communities with multiple routes, & take into account routes of other airports, below 7000ft							
Should minimise tactical intervention by ATC below 7000ft							
Should minimise the impact on other airspace users through;	Keeping CAS requirements to a minimum						
	Simple airspace boundaries						
	Allowing flexible use of airspace, where possible						

Table 13: Summary of DPE - Easterly SIDs

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Westerly Arrival Options		IS OPTION DEPENDENT ON CHANGES TO OTHER AIRPORTS' ROUTES?			
		NO	NO	YES	YES
DESIGN PRINCIPLE		W Arrival 1	W Arrival 2	W Arrival 3	W Arrival 4
Must be safe					
Must meet the 3 aims of the NPSe, Air Navigation Guidance 2017 and all appropriate Government aviation policies, and updates thereof	Reduce the number of people in the UK significantly affected by adverse impacts from aircraft noise	N/A			
	Make a significant and cost-effective contribution towards reducing global emissions	N/A			
	Minimise local air quality emissions	N/A			
	Routes below 7,000 feet should seek to avoid flying over Areas of Outstanding Natural Beauty (AONB) and National Parks	N/A			
Should not constrain the airport's capacity, providing the environmental objectives/requirements have been met					
Should enable continuous climb/descent to/from at least 7000ft & facilitate continuous climb/descent above that					
Should provide an equitable distribution of traffic where possible, through eg;	Use of multiple routes				
	New route structures				
	Options (mechanisms) for respite				
Should avoid overflying the same communities with multiple routes, & take into account routes of other airports, below 7000ft					
Should minimise tactical intervention by ATC below 7000ft					
Should minimise the impact on other airspace users through;	Keeping CAS requirements to a minimum				
	Simple airspace boundaries				
	Allowing flexible use of airspace, where possible				

Table 14: Summary of DPE - Westerly Arrivals

LLAOL FASI-S Stage 2A

Easterly Arrival Options		IS OPTION DEPENDENT ON CHANGES TO OTHER AIRPORTS' ROUTES?			
		NO	NO	YES	YES
DESIGN PRINCIPLE		E Arrival 1	E Arrival 2	E Arrival 3	E Arrival 4
Must be safe					
Must meet the 3 aims of the NPSe, Air Navigation Guidance 2017 and all appropriate Government aviation policies, and updates thereof	Reduce the number of people in the UK significantly affected by adverse impacts from aircraft noise	N/A			
	Make a significant and cost-effective contribution towards reducing global emissions	N/A			
	Minimise local air quality emissions	N/A			
	Routes below 7,000 feet should seek to avoid flying over Areas of Outstanding Natural Beauty (AONB) and National Parks	N/A			
Should not constrain the airport's capacity, providing the environmental objectives/requirements have been met					
Should enable continuous climb/descent to/from at least 7000ft & facilitate continuous climb/descent above that					
Should provide an equitable distribution of traffic where possible, through eg;	Use of multiple routes				
	New route structures				
	Options (mechanisms) for respite				
Should avoid overflying the same communities with multiple routes, & take into account routes of other airports, below 7000ft					
Should minimise tactical intervention by ATC below 7000ft					
Should minimise the impact on other airspace users through;	Keeping CAS requirements to a minimum				
	Simple airspace boundaries				
	Allowing flexible use of airspace, where possible				

Table 15: Summary of DPE - Easterly Arrivals

Applying a Weighted Score to the DPE

When we completed the DPE and before we presented its outcomes to our wider stakeholders, we shared the above DPE summaries with CAMWG for feedback. It was suggested to us that as our DPs had been prioritised in Stage 1, application of a weighted scoring assessment would help to articulate how the options reacted to the DPs ranked as a whole, rather than just in a RAG matrix status.

With this in mind, we developed a simple weighted scoring methodology as follows:

Prioritised DP	Met	Partially Met	Not Met
1	10	5	0
2*	9	4.5	0
3	8	4	0
4	7	3.5	0
5	6	3	0
6	5	2.5	0
7	4	2	0
8	3	1.5	0

Table 16: Scoring methodology

*When scoring the baseline (do nothing) options, we felt it would make these options look 'unfairly bad' against all other options if we attributed no points against this DP. We therefore gave a score of 4.5 to these assessments on each of the do-nothing options.

The result of this scoring is articulated below, and the scores have been added to the Design Principle Evaluation matrix in Appendix A.

WSIDGp 1	WSIDGp 2	WSIDGp 3	WSIDGp 4	WSIDGp 5	WSIDGp 6	WSIDGp 7	WSIDGp 8
38.5	62.5	63.5	70.8	66.5	74	52.5	51

ESIDGp 1	ESIDGp 2	ESIDGp 3	ESIDGp 4	ESIDGp 5	ESIDGp 6
38.5	38	53	45.5	66.5	78.5

WArrv 1	WArrv 2	WArrv 3	WArrv 4
48.5	62	62	63.5

EArrv 1	EArrv 2	EArrv 3	EArrv 4
48.5	56	60.5	62.5

Table 17: Results of scoring

Next steps

The next stage of the ACP process involves undertaking an Initial Options Appraisal (IOA) of the options, to understand in further detail the benefits and impacts. All options went through the IOA, and this step of the process will help us to generate a shorter list of preferred options to take into Stage 3.