SLIGHTLY STEEPER APPROACHES AIRSPACE CHANGE PROPOSAL

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2. INTRODUCTION

2.1.1 This document forms part of Heathrow's formal airspace change submission for the permanent adoption of 3.2º Area Navigation (RNAV)[1] Slightly Steeper Approaches (SSA).

2.1.2 Between 17 September 2015 and 16 March 2016 and between 25 May 2017 and 11 October 2017, Heathrow ran two live trials to investigate the effect of SSA.

2.1.3 The 3.2° RNAV slightly steeper approaches (SSA) are currently in operation at Heathrow and have been since the second trial, as the Civil Aviation Authority (CAA) permitted this on a temporary basis whilst Heathrow submits this Airspace Change Proposal (ACP) for their permanent adoption.

Where we are in the Airspace Change Process

2.1.4 Changes to flight paths are submitted to and approved by the CAA following the Airspace Design Guidance provided in its document known as 'CAP 1616'. This guidance sets out a process framework following a 7-stage approach to implement a permanent airspace change.

2.1.5 The figure below displays the full ACP process as defined in CAP1616. We have completed Stage 1, 2 and 3 of the process and we are now at Stage 4: Update and Submit.

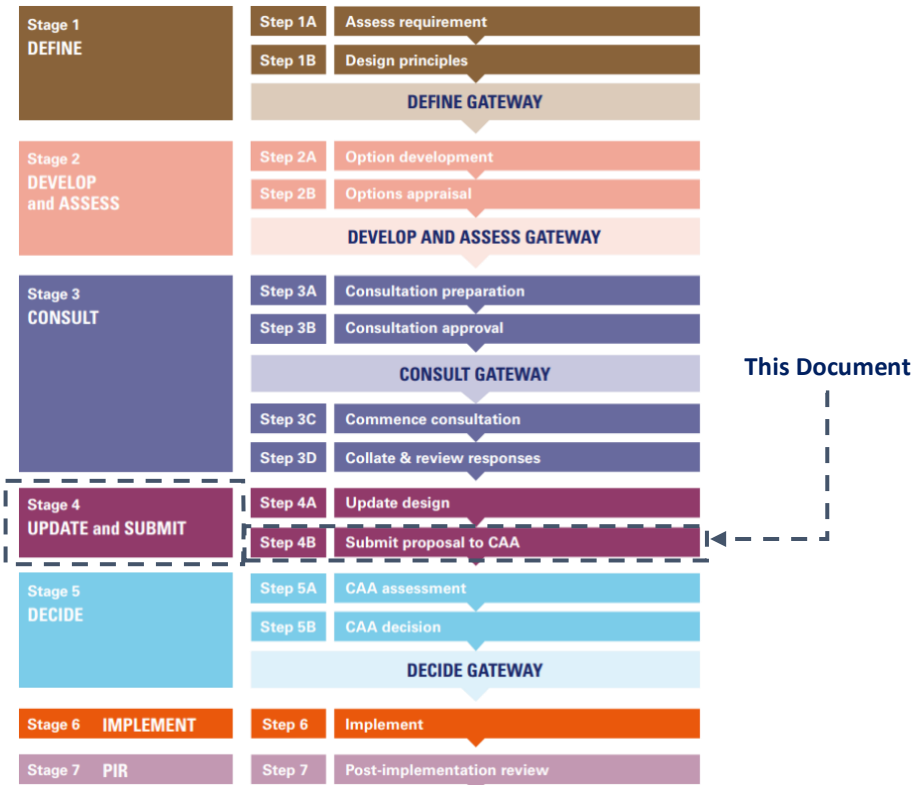


Figure 1 CAP1616 Process

[1] This document refers to 'RNAV (GNSS) approaches' as we have used that term throughout the live trials, engagement and reports to-date and we will remain with this term for this process. The new and correct term is now 'RNP Approach'. When we refer to RNAV approaches we are specifically referring to LNAV and LNAV/VNAV. LPV200 approaches have been excluded from this ACP, initially due to low aircraft equipage within the Heathrow fleet although LPV approaches will no longer be available on the UK from 25th June 2021.

This formal Airspace Change submission document

2.1.6 At Step 4B of the airspace change process, the change sponsor prepares and submits the formal airspace change proposal to the CAA. In particular, the change sponsor must structure its submission in accordance with a standard template that is required by CAP1616.

2.1.7 As per the CAP1616 structure, this document follows the following format:

Table 1 Formal ACP submission document structure

No	Section	Description
1	Contents	
2	Introduction	Introduces this document within the context of the CAP1616 process
3	Executive Summary	Presents a concise summary of the activity undertaken as part of the Airspace Change process to date and includes reference to the Secretary of State's call-in criteria.
4	Current airspace description	Provides information about the current airspace design and operation including the structure and routes, airspace usage, operational considerations, safety issues, and environmental issues.
5	Statement of Need and Justification	Explains the statement of need submitted at Stage 1A of the process and the justification for the airspace change. This section also includes details of the Design Principles agreed with stakeholders at Stage 1B.
6	Proposed airspace description	Includes details of the objectives and requirements of this airspace change, our final proposal for SSA, and how we expect SSA to be used. We also include technical information about SSA.
7	Engagement and Consultation overview	Within this section we outline the engagement and consultation that has taken place with stakeholders, and link this to the identified impacts of the airspace change.
8	Options Development and Analysis	Presents a summary of the options development work undertaken, and the evaluation and appraisal activity which has led to our final airspace change option for SSA.
9	Airspace description requirements	Presents a proforma, as required by CAP1616, with information about Airspace description requirements
10	Safety assessment	Provides a high-level overview of the Safety assessments undertaken prior to the SSA trials held in 2015-18 and outlines any safety concerns to date. More supporting safety assurances are included within Annex A.
11	Operational impact	Presents a proforma, as required by CAP1616, with information about operational impacts.
12	Supporting infrastructure/resources	Presents a proforma, as required by CAP1616, with information about supporting infrastructure/resources.
13	Airspace and infrastructure requirements	Presents a proforma, as required by CAP1616, with information about Airspace and infrastructure requirements.
14	Environmental assessment	Describes at high level the outcome of the Final Options Appraisal in a proforma as required by CAP1616.
15	Appendix A: Draft AIP Information	Shows the current published SSA procedure charts with marked up changes.

2.1.8 The following documents should also be referenced in support of this ACP submission:

Table 2 ACP Supporting Documents

ACP Stage	Document (Linked)
Pre ACP	First SSA Trial Report
Pre ACP	Second SSA Trial Report
Stage 1A	Statement of Need
Stage 1B	Design Principle Submission
Stage 2A	Options Development and Design Principle Evaluation
Stage 2B	Initial Options Appraisal
Stage 3B	Full Options Appraisal
Stage 3B	Consultation Strategy
Stage 3B	Consultation Document
Stage 3B	Consultation overview document
Stage 3D	Consultation categorisation document
Stage 4A	Consultation response document
Stage 4A	Final Options Appraisal
Stage 4B	Formal Airspace Change Proposal Annex A: Safety

3. EXECUTIVE SUMMARY

3.1.1 Heathrow is proposing to permanently adopt 3.2º Slightly Steeper Area Navigation (RNAV) Approaches (SSA) at the airport. SSA increase the angle of aircraft on final approach from 3.0° to 3.2° which enables aircraft to stay higher for longer and therefore helps to reduce noise on the ground.

3.1.2 Between 17 September 2015 and 16 March 2016 and between 25 May 2017 and 11 October 2017, Heathrow ran two live trials to investigate the effect of a slightly steeper 3.2° RNAV approach on a number of factors, covering safety, the airport's operation and the environment.

3.1.3 The 3.2° RNAV slightly steeper approaches are currently in operation at Heathrow and have been since the second trial, as the Civil Aviation Authority (CAA) permitted this on a temporary basis whilst Heathrow submits this Airspace Change Proposal (ACP) for their permanent adoption.

3.1.4 In September 2018 we commenced the Airspace Change Process. As part of stage 1 of the process we initially submitted a statement of need and then developed Design Principles with our stakeholders. At Stage 2 we developed and appraised design options, concluding to take forward to Stage 3 the option of permanently adopting 3.2º RNAV SSA whilst maintaining the Instrument Landing System (ILS) at 3.0º.

3.1.5 At Stage 3 we undertook a vigorous technical and environmental appraisal of SSA and compared it against reverting to all aircraft operating 3.0° ILS and RNAV approaches before consulting with our stakeholders.

3.1.6 The consultation was targeted towards specific Heathrow stakeholders: local community representatives within the impacted area and airspace users/organisations. Although it was a targeted consultation, the public were welcome to respond, and the consultation was publicised on Heathrow's social-media accounts.

3.1.7 As part of the consultation, we asked stakeholders "Do you support the permanent adoption of slightly steeper approaches at Heathrow Airport?". Stakeholders were also given the opportunity to provide further feedback in free text. The consultation was launched on the 5th March 2021 and concluded on the 2nd April 2021. In total 132 admissible responses were received.

3.1.8 Following the close of the consultation, we categorised and analysed the consultation responses. The analysis showed that 91% of stakeholders supported the permanent adoption of SSA and 9% of stakeholders did not.

3.1.9 After consideration of the qualitative responses provided and given the balance of support for SSA, Heathrow decided that no alterations to the proposal were required.

3.1.10 This document presents the formal submission of an ACP for the permanent adoption of 3.2º slightly steeper RNAV approaches at Heathrow Airport.

3.1.11 Heathrow have considered the Secretary of State Call-in criteria and do not believe that any of the four conditions would apply to this ACP (please see table 3).

Table 3 Secretary of State call in criteria

Call in criteria	Applicability to SSA ACP
Is of strategic national importance or,	SSA presents an opportunity to make a small incremental step to reducing the impact of Heathrow airport's noise footprint on health and quality of life. In 2019, 0.6% of arrivals operated SSA and therefore it is not considered of strategic national importance.
Could have a significant impact (positive or negative) on economic growth of the United Kingdom, or	This SSA ACP does not impact capacity.
Could both lead to a change in noise distribution resulting in a 10,000-net increase in the number of people subjected to a noise level of at least 54 dB LAeq 16hr and have an identified adverse impact on health and quality of life, or	Our WebTAG analysis of SSA has shown an overall net benefit in the number of people impacted by noise during the daytime (29,417) and night-time (11,162) When considering the number of people exposed to levels of aircraft noise of at least 54 dB LAeq,16hr, our analysis of SSA shows a net benefit with reduction of 1,823 people.
Could lead to any volume of airspace classified as Class G being reclassified as Class A, C, D or E.	SSA are contained within Heathrow's existing controlled airspace (CAS). This ACP does not propose to make any changes to CAS or its classification.

4. CURRENT AIRSPACE DESCRIPTION

4.1 Airspace Structure and Routes

4.1.1 Between 17 September 2015 and 16 March 2016 and between 25 May 2017 and 11 October 2017, Heathrow ran two live trials to investigate the effect of a slightly steeper 3.2° Area Navigation (RNAV) approach on a number of factors, covering safety, the airport's operation and the environment.

4.1.2 The 3.2° RNAV slightly steeper approaches (SSA) are currently in operation at Heathrow and have been since the second trial, as the Civil Aviation Authority (CAA) permitted this on a temporary basis whilst Heathrow submits this Airspace Change Proposal (ACP) for their permanent adoption.

4.1.3 3.2° RNAV SSA are therefore published in the UK electronic Aeronautical Information Publication (eAIP) as a Supplement. Alongside this, there are published procedures for 3.0° RNAV approaches[2], and 3.0° ILS approaches into Heathrow.

4.1.4 Full technical details and charts of all of Heathrow's the procedures can be viewed on the eAIP under Part 3 AD2 Aerodromes EGLL AD 2.24 and in the UK AIP Supplement Index.

4.1.5 The outcome of Stages 1 – 3 of the Airspace Change Process is that Heathrow proposes to permanently adopt SSA without making any changes to the temporary SSA procedures already in operation. More information about SSA can be found in the Proposed Airspace Description section of this document.

4.1.6 This Airspace Change Proposal therefore does not seek to change Heathrow's existing airspace structure and/or routes. SSA are also contained within Heathrow's existing CAS structures and therefore this proposal will have no impact on Heathrow's CAS.

4.1.7 For further information around the existing CAS structures please see Heathrow's electronic Aeronautical Information Publication (eAIP) AD2.24.

How Aircraft Arrive at Heathrow: Pre and Post ACP

4.1.8 As SSA are already in operation at Heathrow and this airspace change is proposing to permanently adopt SSA, there will be no change to the way aircraft arrive at Heathrow pre and post ACP. The trial reports also demonstrated that there were no changes to the lateral profiles of aircraft arriving into or departing from Heathrow as a result of SSA compared to the previously used 3.0˚ RNAV approaches.

4.1.9 In the following table, we have provided a high-level overview of how aircraft arrive at the airport, the changes that formed part of the original SSA trials from 2015, and the proposed changes post this ACP.

[2] Although 3.0˚ RNAV procedures are currently published, they are not allocated by ATC.

Table 4 How aircraft arrive at Heathrow (Pre/Post ACP)

Phase of Arrival	Pre-Trial (Before 2015)	2015 – Current day	Post ACP
Holding	Aircraft join the holding stacks where they circle above 7000ft until there is space in the queue to land at the airport	Aircraft join the same holding stacks where they circle above 7000ft until there is space in the queue to land at the airport	Aircraft join the same holding stacks where they circle above 7000ft until there is space in the queue to land at the airport
Holding stack to final approach	Aircraft are vectored by ATC towards the final approach	Aircraft are vectored by ATC towards the final approach, as per pre-trial.	Aircraft are vectored by ATC towards the final approach, as per pre-trial.
Final Approach	3.0º ILS approaches 3.0º RNAV approaches	3.0º ILS approaches 3.2º RNAV approaches 3.0º RNAV approaches are published but not routinely allocated by ATC and therefore they are not routinely flown.	3.0º ILS approaches 3.2º RNAV approaches[3]

4.1.10 The majority of aircraft (over 99% in 2019), use the Instrument Landing System (ILS) when arriving at Heathrow.

4.1.11 For a detailed non-technical explanation of how aircraft land, please see section 2 of our Stage 3 Consultation Document.

4.2 Airspace Usage and proposed effect

4.2.1 In 2019, Heathrow's ANOMs data (Noise Track Keeping Database) showed that there were 238,110 arrivals at Heathrow and, out of these, 1378 (0.6%) flew SSA with the remainder flying standard 3.0º ILS approaches. During the trials, an average of 2% of aircraft operated SSA. The 2019 data shows that since the trials the usage of SSA has reduced and this is most likely as the use of SSA was promoted during the trials to enable evidence gathering.

Table 5 2019 Arrival Movements

Approach Type	Number of arrivals (2019)	Percentage of arrivals (2019)
SSA 3.2° Approaches	1378	0.6%
3.0° Approaches	236,732	99.4%
Total	238,110	

[3] Following the permanent adoption of 3.2 º RNAV SSA, 3.0 º RNAV approaches will no longer be published

4.2.2 There will be no change in traffic numbers due to the permanent adoption of 3.2° arrivals and the present traffic cap of 480,000 movements per annum remains.

4.2.3 This SSA ACP does not change the number of aircraft arriving at Heathrow, how Heathrow's airspace is used, or which airlines are able to operate to/from Heathrow.

4.2.4 More information about SSA usage can be found in the Proposed Airspace Description section of this document.

4.3 Operational efficiency, complexity, delays and choke points

4.3.1 Heathrow is a complex ATM environment where operational efficiency is vitally important. The impact of on operational efficiency was therefore considered as part of the original trials of SSA.

4.3.2 SSA is a type of RNAV approach and RNAV approaches need to be requested by pilots and approved by ATC. As explained above, the standard is to use the ILS approach.

4.3.3 The trials held between 2015 – 2017 identified that SSA result in a higher ATC and pilot workload; however, this is due to the RNAV procedure type rather than the increase in approach angle. This means that the higher workload would apply to the 3.0° RNAV approaches (pre-trial) as well as the 3.2° approaches flown throughout the trial and to date.

4.3.4 For more information about how SSA impacts workload and anticipated usage of SSA, please see the proposed airspace description section.

4.4 Safety Issues

4.4.1 The Slightly Steeper Approach procedures went through a rigorous safety process prior to the flight trails held between 2015-17. Safety data was also gathered during the trials and throughout the time that SSA have remained in temporary operation. To date (May 2021), no safety observations have been raised about SSA from airlines or ATC. For more information, please see the Safety Assessment section of this document.

4.5 Environmental issues

4.5.1 Minimising the impact of noise is a priority for Heathrow. We have been at the forefront of efforts to tackle noise and as a result Heathrow's noise footprint has shrunk considerably over the past few decades. However, we know noise remains an issue and we are committed to continuing to work with local communities to reduce the impact.

4.5.2 The CAA have encouraged airports to consider the potential to use SSA[4], where appropriate, as a means of reducing noise. Within our 2019 – 2023 Noise Action Plan we included our intent to explore the feasibility of SSA.

4.5.3 The permanent adoption of SSA aims to be a small incremental step to reducing the impact of Heathrow airport's noise footprint on health and quality of life. The trials and ongoing

[4] CAP 1165, chapter 5

operation of SSA have shown that this step can be achieved without any overall negative impacts on stakeholders.

4.5.4 For more information around the environmental considerations of SSA, please see the Environment Assessment section of this document.

5. STATEMENT OF NEED/JUSTIFICATION

5.1 Statement of Need

5.1.1 The statement of need was submitted to the CAA and published on the Airspace Change portal as part of Stage1A of this ACP in September 2018. It states:

In accordance with CAP 1165, the Heathrow Noise Blueprint, Airports Commission: Interim Report, Appendix 1: Assessment of Short and Medium-Term Options, December 2013, Recommendation 22, Heathrow's Noise Action plan and as outlined in our sustainability strategy 'Heathrow 2.0, HAL would like to introduce Slightly Steeper Approaches as part of our ongoing commitment to reducing our noise footprint.

This strategy applies regardless of any proposed expansion at Heathrow Airport. It is intended that there will be no changes to the lateral tracks of aircraft over the ground and that the new Instrument Flight Procedures will allow participating aircraft to stay higher for longer enabling only environmental benefit without any operational or environmental dis-benefit. Two operational trials from September 2015 to March 2016 and May 2017 to October 2017 have supported this intention. This proposal will not seek to increase the numbers of aircraft arriving into London Heathrow.

5.1.2 Based on the scope within the statement of need, the impacted area was determined. The area impacted by SSA is based on the extent of the final approaches for Heathrow's runways, extended from the runway threshold out to 10 nautical miles (NM) and this created the defined consultation zone. The impacted area is shown in figure 2 below.

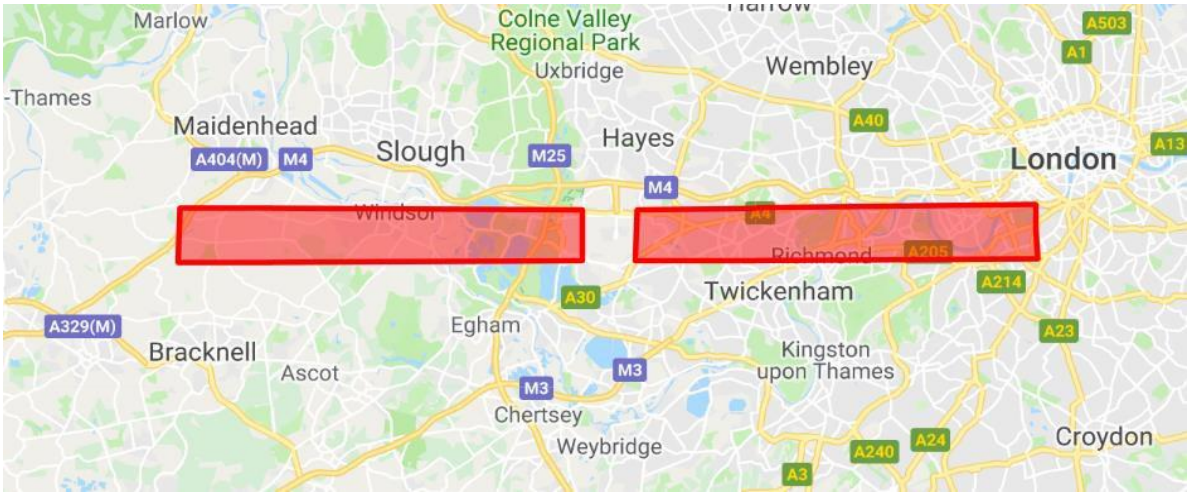


Figure 2 SSA Impacted Area

5.2 Airspace Modernisation Strategy

5.2.1 Airspace in the south-east of England is some of the busiest in the world with five major airports in close proximity: Heathrow, Gatwick, Stansted, London City and Luton. The airspace that these airports use was designed for an age when aircraft and navigation was much less sophisticated, and we didn't have the technology that we do today.

5.2.2 In order to update the airspace and make it more efficient, major changes to flight paths and CAS structures will be taking place across the UK in the coming years as the Government embarks on its airspace modernisation strategy. This programme is being overseen by the Department for Transport (DfT) and Civil Aviation Authority (CAA).

5.2.3 The aim of the strategy is to make the airspace more efficient; improve punctuality; cut CO_2 emissions; reduce noise from less aircraft-holding at low levels and enable aircraft to climb and descend continually; and to ensure there is capacity to meet future demand. This strategy will require all the UK's main airports to modernise their airspace and requires NATS to modernise the network that sits above these airports, which is known as en-route airspace.

5.2.4 SSA is a standalone ACP and does not form part of the plan for delivering the Airspace Modernisation Strategy although its outcomes of reducing noise are obviously aligned. It is intended that the temporary SSA procedures that are operated today are permanently adopted. As part of the wider UK Airspace Modernisation airspace change, currently required by 2030, the application of SSA will be considered within the context of investigating the feasibility of increasing the angle of descent for the ILS. SSA therefore does not conflict with the plan for Airspace Modernisation.

5.3 Design principles

5.3.1 Following the statement of need, at Stage 1B change sponsors are required to develop a set of design principles which provide high-level criteria that the proposed airspace design options should meet. The design principles should be drawn up through discussion between the change sponsor and affected stakeholders.

5.3.2 Due to the nature of this proposal, it was possible to identify a clearly defined geographical area, based on the extent of the final approaches for Heathrow's runways, extended from the runway threshold out to 10 nautical miles. This provided Heathrow with a defined potentially impacted area within which local stakeholders could be identified.

5.3.3 Heathrow also identified the existing community and industry forums which would be interested in this airspace change proposal:

- NATMAC (National Air Traffic Management Committee)
- FLOPSC (Heathrow Airport Flight Operations Performance and Safety Committee)
- HCNF (Heathrow Community Noise Forum)
- HCEB (Heathrow Community Engagement Board)
- HSPG (Heathrow Strategic Planning Group)
- Local Authorities within the potentially impacted area

5.3.4 Heathrow took a focused approach to design principle engagement, preparing a briefing document outlining the background and history of SSA. Stakeholders were presented with a list of design principles based on the engagement which took place prior to, and because of, the live trials.

5.3.5 Stakeholders were invited to tell Heathrow whether:

- they agree or disagree with any of the proposed design principles,
- they would like to make any amendments to the proposed design principles, and
- if there are any other design principles that they would like to suggest.

5.3.6 As a result of stakeholder feedback design principle 2 was amended from the originally distributed list and re-worded. Further information can be found in the Stage 1 submission document.

5.3.7 Following engagement with stakeholders, the final list of design principles for the SSA ACP are as follows:

Table 6 SSA ACP Design Principles

	Final Design Principles
1	Must be safe
2	Must achieve the objective of reducing noise compared to a 3.0° approach
3	Must not increase the numbers of go-arounds
4	Must not reduce Heathrow's capacity
5	Must not change the lateral tracks of aircraft over the ground
6	Should not reduce the ability of arrivals to perform Continuous Descent Approach
7	Should maximise the number of aircraft able to fly the Slightly Steeper Approach
8	Should not adversely increase pilot or ATC workload

5.3.8 For more information please see our Stage1B Design Principle Document on the airspace change portal here.

5.3.9 The options development and analysis section within this document describes how the Design Principles were then used when assessing the airspace change options developed.

6. PROPOSED AIRSPACE DESCRIPTION

6.1 Objectives/requirements for the proposed design

6.1.1 Slightly Steeper Approaches have been shown to provide small noise benefits to communities living close to an airport and the CAA has encouraged airports to consider the potential to use Slightly Steeper Approaches (SSA), where appropriate, as a means of reducing noise. Heathrow's intent to explore the feasibility of SSA has been made public for some time and is included in Heathrow's 2019 – 2023 Noise Action Plan.

6.1.2 Between 2015 and 2017, Heathrow ran two live trials to investigate how Slightly Steeper Approaches for arriving aircraft (3.2° as opposed to the extant 3.0° approaches) would impact Heathrow operationally whilst at the same time attempt to measure the benefit in noise reduction that could be achieved.

6.1.3 The trials held between 2015-17 demonstrated that there was a small noise benefit (an average decrease of 0.51dBA) whilst causing no overall negative environmental or operational dis-benefits.

6.1.4 In order to permanently introduce Slightly Steeper Approach procedures, the CAA required Heathrow to follow the Airspace Change Process.

6.1.5 The objective of this ACP therefore was to explore the options for permanently introducing Slightly Steeper Approaches at Heathrow and find a final design that delivers a noise benefit without having any negative environmental or operational dis-benefits.

6.1.6 More information about this process and how we have reached the final design can be found within the options development and analysis section of this document or within our previous submission documents on the Airspace Change Portal here.

6.2 Proposed new design and usage

6.2.1 This formal airspace change proposal intends to permanently adopt the temporary 3.2^{o} RNAV Slightly Steeper Approach (SSA) procedures currently in operation today.

What are SSA?

6.2.2 Most aircraft arriving at Heathrow fly the standard 3.0^{o} approach using the Instrument Landing System (ILS); however, a small percentage operate satellite based slightly steeper 3.2^{o} RNAV approaches (SSA).

6.2.3 When aircraft operate a 3.2^{o} approach, they are higher for longer. The trials and our Final Options Appraisal have demonstrated that this helps to reduce the noise footprint.

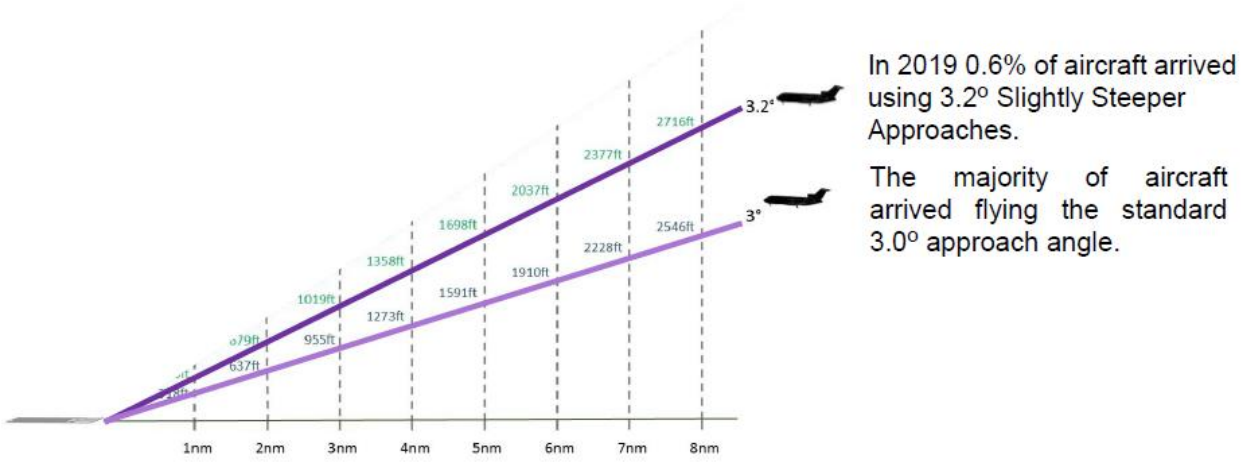


Figure 3 SSA height difference

6.2.4 As the procedures are already flown by some aircraft arriving at Heathrow, there will be no change to airspace or Heathrow's operation as a result of the permanent adoption of SSA. The trial reports also demonstrated that there were no changes to the lateral profiles of aircraft arriving into or departing from Heathrow as a result of SSA compared to the previously used 3.0˚ RNAV approaches.

6.2.5 Some key facts answering common questions about SSA:

- **SSA do no change the lateral flight paths of arriving aircraft**
- **SSA do not change the number of aircraft arriving at Heathrow**
- **SSA apply to easterly and westerly operations**
- **SSA allow aircraft to stay higher for longer, creating a small noise benefit**
- **SSA are elective procedures; the majority of aircraft will continue to fly Instrument Landing System (ILS) approaches**
- **SSA use a type of Performance Based Navigation (PBN). It is important to note that the procedures follow the same lateral profile as the ILS but rely on satellite navigation as opposed to physical infrastructure on the airport.**

Usage of SSA

6.2.6 During the trials, an average of 2% of aircraft operated SSA. The trials identified that SSA result in a higher ATC and pilot workload; however, this is due to the RNAV procedure type, rather than the increase in approach angle.

6.2.7 Due to the higher ATC and pilot workload associated with the RNAV approach type, even if more crews (above 2% of arrivals) elected to fly RNAV approaches, ATC might not be able to accommodate and could decline pilot requests.

6.2.8 In 2019, Heathrow's ANOMs data (Noise and Track Keeping Database) showed that there were 238,110 arrivals at Heathrow, and out of these 1,378 (0.6%) flew SSA with the remainder flying standard 3.0° approaches. During the trials, an average of 2% of aircraft operated SSA. The 2019 data shows that since the trials the usage of SSA has reduced and this is most likely as the use of SSA was promoted during the trials to enable evidence gathering.

6.2.9 In response to comments raised during the SSA consultation, Heathrow have committed to continuing to monitor the use of SSA and, where possible, will consider ways to incentivise the use of SSA to maximise the benefits whilst maintaining a safe operation. We have clearly noted however that the workload limitations as described above will remain, and any incentivisation will be balanced against safety and efficiency.

6.2.10 This SSA ACP does not change the number of aircraft arriving at Heathrow and there will be no impact on capacity with the levels of SSA uptake observed in the trials and current operations.

6.2.11 SSA will continue to be an elective procedure with the majority of aircraft arriving using the published Instrument Landing System (ILS) approaches.

6.3 Technical Information

6.3.1 The published temporary SSA procedures can be viewed on the electronic Aeronautical Information Publication (eAIP) here.

6.3.2 This ACP does not propose to make any design changes to the published temporary procedures.

6.3.3 Subject to a successful ACP outcome, when SSA are permanently adopted the following changes would be made to the eAIP:

- AIP SUP 030/2020 would be withdrawn from the AIP.
- The following 3.0º RNP[5] approach procedures would be withdrawn from the AIP:
    - HEATHROW RNP Z RWY 09L
    - HEATHROW RNP Z RWY 09R
    - HEATHROW RNP Z RWY 27L
    - HEATHROW RNP Z RWY 27R
- The 3.2º RNAV RNP Y charts currently in AIP SUP 030/2020 would be published in EGLL AD Section 2.24, with references to 'Y' removed:
    - HEATHROW RNP RWY 09L
    - HEATHROW RNP RWY 09R
    - HEATHROW RNP RWY 27L
    - HEATHROW RNP RWY 27R

6.3.4 Draft charts for the RNP procedures can be found within Appendix A of this document.

[5] Throughout the live trials, engagement and reports to-date we have referred to the SSA procedures as RNAV (GNSS) approaches, however the correct term is 'RNP Approach' and this is what is published within the AIP.

Procedure Naming Changes

6.3.5 Although there are no changes to the design of the procedure itself or the way it is flown, there will be a minor change to the name of the procedure as described in the AIP section above.

6.3.6 This will result in some very minor knock-on changes to RNP approach clearance instructions; clearance will no longer be requested/given for an 'RNP Yankee approach', instead it will be an 'RNP approach':

Table 7 Approach clearance requests (Pre/post ACP)

Pre/Post ACP	Request Instruction on first contact with Heathrow Director
Current	'Request RNP Yankee'
After permanent adoption of SSA (and withdrawal of RNP Z procedures)	'Request RNP'

Implementation Date and Backup

6.3.7 The targeted AIRAC cycle is AIRAC 12/2021. This has an effective date of Thu 02 Dec 21 and therefore this is our targeted implementation date.

6.3.8 The backup AIRAC cycle is AIRAC 13/2021. This has an effective date of Thu 30 Dec 21.

7. ENGAGEMENT AND CONSULTATION OVERVIEW

7.1.1 Slightly Steeper Approaches were introduced at Heathrow during the trials of 2015 and 2017 and during this period engagement was undertaken with stakeholder groups. Following confirmation from the CAA that to permanently introduce SSA at Heathrow a full CAP1616 airspace change process would need to be followed, Heathrow began the proposal and subsequent engagement.

7.1.2 The following table summarises the stakeholder engagement and consultation carried out by Heathrow for the SSA airspace change proposal with links to the appropriate documentation.

Table 8 Summary of engagement and consultation activity

CAP1616 Stage	Summary of Activity	Links for more information
Stage 1B	Stakeholders were identified through the potentially impacted area map and existing Heathrow forums. • NATMAC • FLOPSC • HCNF • HCEB • HSPG • Local Authorities within the impacted area Heathrow took a focused approach to design principle engagement, preparing a briefing document outlining the background and history of SSA. Stakeholders were presented with a list of design principles based on the engagement which took place prior to, and as a result of the live trials. Following stakeholder feedback one design principle was amended from the originally distributed list. The final design principles are available in section 8. The ACP passed the Stage 1 Gateway on 30 August 2019.	Stage 1 Main Document
Stage 2A	The stakeholders identified during Stage 1 were engaged through different methods for the Stage 2A engagement. Community and local authority stakeholders were given a presentation at existing HCNF, HCEB and HSPG meetings. Industry stakeholders were emailed a copy of the same presentation.	Stage 2A Main Document

	The engagement material provided stakeholders with the comprehensive list of options and explained the process of how Heathrow developed the SSA proposal. All stakeholders were given 2 weeks to provide any comments or feedback. There was very little feedback from stakeholders to inform the options development. The ACP passed the Stage 2 Gateway on 28 February 2020.	
Stage 3	The formal consultation took place for 4 weeks between 5 March – 2 April 2021. In line with the approved Consultation Strategy, the consultation was held online with no public events. The previously identified stakeholders were targeted at the start of the consultation and provided with a link to the consultation website. These stakeholders were also sent email reminders at the consultation mid-point. Although a targeted consultation, it was also open to the wider public and Heathrow promoted the consultation on its website, Twitter, Facebook, and LinkedIn web pages. The main question asked was "*Do you support the permanent adoption of slightly steeper approaches at Heathrow airport?"* After analysis, the admissible total number of responses to the consultation was 132. 120 responses supported the permanent adoption of SSA, and 12 respondents did not support.	Consultation Strategy Main Consultation Document Consultation Categorisation Document
Stage 4	As part of Stage 4 we have reviewed the consultation responses and presented a Consultation Response Document. Within this document we have explained the outcome of our consultation including how many responses we received and how this compared against our target audience. We have then picked out key themes and messages from the consultation responses and provided feedback to the themes.	Consultation Response Document

7.2 Net impacts summary

7.2.1 The following table outlines the outcome of the Final Options Appraisal against the groups identified in CAP1616 Appendix E. As SSA are already in operation, the positive impacts associated with SSA will remain.

7.2.2 For further details, please see the environmental assessment section of this document.

Table 9 Net impact summary

Group	Impact	Slightly Steeper 3.2° Approaches
Communities	Noise impact on health and quality of life	Positive impact remains
Communities	Air quality	Positive impact (marginal) remains
Wider society	Greenhouse gas impact	Positive impact (marginal) remains
Wider society	Capacity / resilience	Neutral impact
Wider society	Social Impact	Neutral impact
Wider Society	Distributional Impact	Neutral impact
Wider Society	Tranquillity	Neutral impact
Wider Society	Biodiversity	Neutral impact
Wider Society	Historic Environment	Neutral impact
Wider Society	Landscape / Townscape	Neutral impact
Wider Society	Safety	Neutral impact
Wider Society	Water Environment	Neutral impact
General Aviation	Access	Neutral impact
General Aviation / commercial airlines	Economic impact from increased effective capacity	Neutral impact
General Aviation / commercial airlines	Fuel burn	Positive impact (marginal) remains
Commercial airlines	Training costs	Neutral impact
Commercial airlines	Other costs	Neutral impact
Airport / Air navigation service provider	Infrastructure costs	Neutral impact
Airport / Air navigation service provider	Operational costs	Neutral impact
Airport / Air navigation service provider	Deployment costs	Neutral impact

7.3 Units affected by the proposal

7.3.1 NATS Swanwick (Terminal Control) and NATS Heathrow ATC have been involved with Slightly Steeper Approaches from the beginning of the project, prior to the commencement of the 2015 trials and then throughout the trial period and whilst SSA have remained in operation.

7.3.2 The trials identified that there is more ATC workload associated with RNAV approaches and therefore the number of aircraft able to fly SSA is limited. This is attributable to RNAV approaches, not because the procedures are slightly steeper. At present, ATC are able to decline requests from pilots to fly SSA when workload could be compromised. This will not change following the permanent adoption of SSA.

7.3.3 NATS (NERL) and Heathrow ATC (NSL) responded to the consultation and supported the permanent adoption of SSA, stating that the increased angle of the procedure as it is currently used has no impact on safety or ATC operations.

7.4 Military impact and consultation

7.4.1 The proposed permanent adoption of SSA has no impact on military operations as it is entirely within existing Heathrow airspace. As part of NATMAC, the MOD has been engaged throughout this airspace change process and responded in support of SSA as part of the Stage 3 consultation.

7.5 General Aviation airspace users impact and consultation

7.5.1 The proposed permanent adoption of SSA has no impact on General Aviation (GA) airspace users, as it is entirely within existing Heathrow airspace. Those GA organisations who are part of NATMAC have been included in the engagement process during Stages 1 and 2 of the CAP1616 process, however as there is no impact on GA organisations they were not targeted in the group of stakeholders for consultation.

7.6 Commercial air transport impact and consultation

7.6.1 In preparation for the trials held in 2015-17 and throughout the ACP process, Heathrow's airlines have been engaged and consulted with.

7.6.2 During the Consultation, the Flight Operations Performance and Safety Committee (FLOPSC) were a targeted audience and we received responses from 5 airline members of the group, all in support of SSA.

7.6.3 The Final Options Appraisal demonstrates that there is a marginal fuel burn benefit to airlines when an aircraft operates SSA, although this is negligible due to the number of aircraft that fly SSA (0.6% of all Heathrow arrivals in 2019). Permanent adoption of SSA will mean that this marginal benefit will remain for those aircraft/airlines that fly SSA.

7.6.4 As SSA are already in operation, are safe and will continue to be an elective procedure, there will be no adverse impact to Commercial airlines as a result of the permanent adoption of SSA.

7.7 CO_2 environmental analysis impact and consultation

7.7.1 As part of the Initial Options Appraisal and the Full Options Appraisal, the CO_2 environmental impact of SSA was assessed, along with impacts to Air Quality.

7.7.2 It was found that were marginal benefits associated with these areas; however, due to the small percentage of aircraft that operate SSA, the overall benefits were very marginal (please see the environmental assessment section for further details).

7.7.3 Throughout the ACP process and during the consultation, we engaged with local community representatives who may have an interest in the CO_2 benefits of SSA. The assessment of CO_2 in the Full Options Appraisal was included in our consultation material and some consultation responses referenced the small environmental benefits as a positive for the ACP.

7.8 Local environmental impacts and consultation

Noise

7.8.1 During the trials held in 2015-17 Heathrow analysed the benefits and impacts of SSA. The trials found that when aircraft fly SSA, they were higher for longer, and therefore there was a small average noise reduction of 0.51 dBA recorded at the noise monitoring sites[6].

7.8.2 As part of the Airspace Change Process, further noise analysis was undertaken as part of the Initial Options Appraisal and the Full Options Appraisal.

7.8.3 It was found that 3.2° RNAV SSA provide a small overall noise benefit which is an incremental step to reducing the impact of Heathrow airport's noise footprint on health and quality of life. For more information, please see the environmental assessment section.

7.8.4 Throughout the ACP process and during the consultation, there was targeted engagement toward specific stakeholders who may have an interest in SSA. These included local community representatives within the impacted area.

7.8.5 At Stage 3, although it was a targeted consultation, the public were welcome to respond, and the consultation was publicised on Heathrow's social-media accounts.

7.8.6 The following table is taken from our Consultation Response Document and provides a breakdown of those who responded to the consultation, and their support:

Table 10 Breakdown of consultation responses

Respondent	Support SSA	Do not support SSA
Individual inside impacted area	65	2

[6] Please see the first and second trial report for further information.

Respondent	Support SSA	Do not support SSA
Individual outside impacted area	36	7
Organisation representative inside impacted area	8	2
Aviation Organisation representative	9	0
Organisation representative outside impacted area	1	1
Unlocatable (Individual)	1	0
Total	120	12

7.8.7 Within the qualitative sections of the consultation responses, noise was the most common theme amongst stakeholders with the balance of comments in support of the noise benefits of SSA.

7.8.8 A small number of consultation responses stated that they support SSA but noted they provide a small change, and they would hope for more significant improvements in the future. Heathrow responded in the Consultation Categorisation Document to these comments, stating that they recognise that SSA presents a small incremental step in reducing the airport's overall noise footprint and Heathrow will continue to monitor the use of SSA and consider ways, where possible, to incentivise the usage of SSA whilst still maintaining a safe operation.

7.9 Economic impacts

7.9.1 The permanent adoption of SSA will not result in any change in traffic numbers or increased capacity. The present traffic cap of 480,000 movements per annum will remain.

7.9.2 Flight trials conducted between 2015 and 2017 reported 'no adverse impact on the daily operation' and 'no impact' on Heathrow airport's landing rate so long as the numbers of RNAV approaches are limited to what is operationally acceptable. As such there is no change in effective capacity and therefore there is no economic impact associated with this SSA ACP.

7.9.3 For more information on the overall cost benefit analysis of the ACP please see the Final Options Appraisal.

8. OPTIONS DEVELOPMENT AND ANALYSIS

8.1 Options Development and Design Principle Evaluation

8.1.1 As part of the preparation for the trials held in 2015, various options were considered to achieve the objective of introducing SSA. This preparatory work was then used when developing options for this ACP.

8.1.2 As part of this ACP, at Stage 2A, Heathrow developed a comprehensive list of options which address the statement of need, and which align with the design principles developed in Stage 1B. Following stakeholder engagement, at Stage 2B Heathrow undertook an initial options appraisal.

8.1.3 This section summarises the outcome of the trials and Stage 2A and 2B of the CAP1616 process, to give an overview of the options that were considered and how we arrived at the final option of 3.2° Slightly Steeper RNAV approaches.

Options development; ILS/and or RNAV Approaches

8.1.4 There are two types of approach typically flown at Heathrow: Instrument Landing System (ILS) approaches and RNAV approaches. SSA at Heathrow have been historically known as RNAV (Area Navigation) GNSS (Global Navigation Satellite System) approaches, although their correct definition is RNP (Required Navigation Performance) Approaches.

8.1.5 The ILS and RNAV approaches are quite different in their technical nature, although they make no tangible difference to the communities overflown in terms of tracks or altitude over the ground.

8.1.6 To begin with, Heathrow needed to determine whether ILS, RNAV or both approaches could be steeper. This decision formed the basis of our first design choice – whether to introduce a slightly steeper approach using ILS and/or RNAV. The table below outlines the factors considered; the full details of this assessment can be found in the Stage 2A document.

Table 11 Options Development: ILS and/or RNAV considerations

Consideration	ILS	RNAV
Contingency for reversion (during the trial)	Heathrow has one ILS per runway. Altering the ILS glide slope angle is not a quick process and involves engineering support, followed by aircraft flight calibration. In the event of any unforeseen issue materialising during the trial, reversion to a 3.0° glide slope is just as time consuming.	In the event of any unforeseen issue materialising during the trial, all operators could revert to using the 3.0° ILS, which could be used in all circumstances.
Visibility	Aircraft approaching to land in the poorest visibility rely on the ILS and can be constrained by maximum approach angles in poor visibility conditions.	Unlike ILS, RNAV approaches are not used when there is very poor visibility.

Design Criteria	Internationally agreed standards state that ILS approaches in very poor visibility are limited to final approach angles of 3.0°.	Internationally agreed standards allow final approach angles of up to 3.5°.
Infrastructure	Due to limitations with Heathrow's current ILS system and the international design criteria associated with ILS approach angles in poor visibility, four additional ILS systems would have to be purchased, installed and maintained alongside the existing ILS to implement slightly steeper approaches.	RNAV approaches do not rely on ground-based equipment to determine the final approach vertical and lateral path. RNAV approaches are Performance Based Navigation (PBN) procedures that can follow the same vertical and lateral profile as an ILS but rely on on-board equipment and satellite navigation as opposed to physical infrastructure on the airport. Therefore, amending the final approach angle known as the Vertical Path Angle (VPA) is possible without changes to the physical infrastructure on the ground.

8.1.7 Heathrow determined that increasing the gradient on its RNAV approaches is the only viable option for introducing a slightly steeper approach at this time.

8.1.8 The outcome of this initial review helped inform the initial design principle assessment of the two options:

Table 12 Initial design principle assessment of ILA/RNAV approaches

#	Design Principle	Option A Steeper ILS	Option B Steeper RNAV
1	Must be safe		
2	Must achieve the objective of reducing noise compared to a 3.0° approach		
3	Must not increase the numbers of go-arounds		
4	Must not reduce Heathrow's capacity		
5	Must not change the lateral tracks of aircraft over the ground		
6	Should not reduce the ability of arrivals to perform Continuous Descent Approach		
7	Should maximise the number of aircraft able to fly the Slightly Steeper Approach		
8	Should not adversely increase pilot or ATC workload		

Doesn't meet the Design Principle	Partially meets the Design Principle	Meets the Design Principle

8.1.9 Option B: Steeper RNAV only partially meets design principles 7 and 8, in summary because RNAV approaches result in a higher ATC and pilot workload compared to ILS approaches, and not all the aircraft operating at Heathrow have the capability to fly RNAV approaches.

Steeper Approach Angles considered

8.1.10 Once slightly steeper ILS approaches were discounted as non-viable for this ACP, the options left for investigation were for different vertical path angles (VPA) for the RNAV approaches. As part of this, an increase to 3.2°, 3.5°, and steeper than 3.5° were considered against the baseline of 3.0°.

8.1.11 The table below summarises the considerations that were made when reviewing the possible approach angles for SSA. For full details, please see the Stage 2A submission document.

Table 13 Option development: Steeper approach angles considered

Option	Description	Considerations
B1	3.0° RNAV approaches	This option is the baseline. Both the ILS and RNAV approaches remain at 3.0°. This would not achieve a steeper approach than today.
B2	3.2° RNAV approaches	This option would result in an increase in RNAV approach angle from 3.0° to 3.2°. The ILS would remain at 3.0°. Based on the evidence from the trials, we know that this is a safe option which does not impact Heathrow airport's operation.
B3	3.5° RNAV approaches	This option would see an increase in RNAV approach angle from 3.0° to 3.5°. The ILS would remain at 3.0°. When the air temperature is above 15°C, these procedures would be unavailable. There was no data available on the impact of 3.5° approaches in a high intensity operation such as Heathrow. When engaged as part of the first trial, Operators expressed concerns over the ability to adhere to the strict speed limits imposed on final approach at Heathrow, which could lead to increased risks of go-arounds or increased Runway Occupancy Time. In addition, increased spacing on final approach may have been necessary to address the risk of vortex wake encounters from following aircraft on a 3.0° profile.

B4	Steeper than 3.5° RNAV Approaches	To have a final approach angle steeper than 3.5° at Heathrow would require a 'segmented approach' which is where the steeper angles must transition to a shallower approach angle prior to landing. Operations would require crew training and individual operational approval from the CAA to fly segmented approaches and a significant increase in final approach spacing would be required. Such approaches would require individual crew training and approval and therefore the number of approaches flown would be very low. In addition, the additional spacing required would be detrimental to Heathrow's runway throughput.

8.1.12 The information from this review of options was used to inform the design principle evaluation:

Table 14 Design Principle Evaluation of steeper approach angles considered

#	Design Principle	B1 3.0°	B2 3.2°	B3 3.5°	B4 3.5° +
1	Must be safe				
2	Must achieve the objective of reducing noise compared to a 3.0° approach				
3	Must not increase the numbers of go-arounds				
4	Must not reduce Heathrow's capacity				
5	Must not change the lateral tracks of aircraft over the ground				
6	Should not reduce the ability of arrivals to perform Continuous Descent Approach				
7	Should maximise the number of aircraft able to fly the Slightly Steeper Approach				
8	Should not adversely increase pilot or ATC workload				

Doesn't meet the Design Principle	Partially meets the Design Principle	Meets the Design Principle

8.1.13 The design principle evaluation established that the only viable option was to introduce 3.2° RNAV approaches, to be used in conjunction with 3.0° ILS approaches. Option B1 at 3.0° was discounted because it would not achieve the mandatory design principle of reducing

noise compared to a 3.0° approach, but it remained the baseline against which option B2 at 3.2° was assessed.

8.1.14 The live trials had provided Heathrow with all the evidence required that the 3.2° approaches were safe, were not detrimental to the airport operation, and that there was a small noise benefit.

8.1.15 3.2° RNAV approaches were therefore taken forward to Stage 2B of the CAP1616 process.

8.2 Initial Options Appraisal

8.2.1 Stage 2B requires the change sponsor to carry out an 'initial' - principally qualitative - appraisal of the impacts of each of the options identified in Stage 2A. The full details of the Initial Options Appraisal can be found here. The table below summarises the results of the assessment conducted for each category, as set out in guidance for airspace change, CAP1616 Appendix E, comparing Option B2 3.2° RNAV approaches to the Baseline (B1).

Table 15 Summary of IOA outcomes

Category	Summary of IOA Outcome
Communities	Average Sound Exposure Level (SEL) reduction of 0.51 dBA per aircraft on an RNAV approach.
Wider Society	No change in impact
General Aviation	No change in impact
General Aviation / Commercial Airlines	No change in impact
Commercial Airlines	No change in impact
Airport / Air Navigation Service Provider (ANSP)	No change in impact

8.2.2 At Stage 2B Heathrow concluded that Option B2 (permanently adopting 3.2° approaches) was the preferred option compared with the baseline as Option B2 delivers a net benefit compared to the Baseline for the following reasons:

1) Keeping 3.2° approaches reduces the average Sound Exposure Level (SEL) of aircraft on an RNAV approach by up to 0.74 dBA (the average at all noise monitoring terminals across the trials was 0.51 dBA) compared with the Baseline;
2) No construction or other works are required to adopt Option B2;
3) No adverse environmental impact of adopting Option B2 (Subject to the Full Options Appraisal).
4) No identified stakeholder groups are adversely impacted by the adoption of Option B2.

8.2.3 Option B2 - 3.2° RNAV approaches therefore proceeded to Stage 3 in the CAP1616 process.

8.3 Full Options Appraisal

8.3.1 At Stage 3, we undertook a Full Options Appraisal (FOA). The FOA was a vigorous technical and environmental appraisal of the shortlisted options that form the SSA Airspace Change Proposal. These were to either permanently adopt 3.2° RNAV SSA (applicable to 0.6% of aircraft in 2019) or to revert to all aircraft operating 3.0° ILS and RNAV approaches.

8.3.2 Table 16 below shows the summary of the outcome of the Full Options Appraisal:

Table 16 Full Options Appraisal Summary

Group	Impact	Permanently adopt Option B2 Slightly Steeper 3.2° Approaches	Revert to Option B1 All aircraft operate 3.0° approaches
Communities	Noise impact on health and quality of life	Positive impact	Negative impact
Communities	Air quality	Positive impact (marginal)	Negative impact (marginal)
Wider society	Greenhouse gas impact	Positive impact (marginal)	Negative impact (marginal)
Wider society	Capacity / resilience	Neutral impact	Neutral impact
Wider society	Social Impact	Neutral impact	Neutral impact
Wider Society	Distributional Impact	Neutral impact	Neutral impact
Wider Society	Tranquillity	Neutral impact	Neutral impact
Wider Society	Biodiversity	Neutral impact	Neutral impact
Wider Society	Historic Environment	Neutral impact	Neutral impact
Wider Society	Landscape / Townscape	Neutral impact	Neutral impact
Wider Society	Safety	Neutral impact	Neutral impact
Wider Society	Water Environment	Neutral impact	Neutral impact
General Aviation	Access	Neutral impact	Neutral impact
General Aviation / commercial airlines	Economic impact from increased effective capacity	Neutral impact	Neutral impact
General Aviation / commercial airlines	Fuel burn	Positive impact (marginal)	Negative impact (marginal)
Commercial airlines	Training costs	Neutral impact	Neutral impact
Commercial airlines	Other costs	Neutral impact	Neutral impact
Airport / Air navigation service provider	Infrastructure costs	Neutral impact	Neutral impact
Airport / Air navigation service provider	Operational costs	Neutral impact	Negative impact (marginal)
Airport / Air navigation service provider	Deployment costs	Neutral impact	Neutral impact

8.3.3 Within the Full Options Appraisal we concluded that Option B2, to permanently introduce 3.2° RNAV Slightly Steeper Approaches, is our preferred option for the following reasons:

- Keeping slightly steeper approaches reduces the average SEL of aircraft on RNAV approach by on average 0.51dB compared to the baseline. Whilst the change in SEL is small, the introduction of 3.2° RNAV approaches is an incremental step to reducing the impact of Heathrow airport's noise footprint on health and quality of life.
- Our noise exposure analysis has shown that maintaining RNAV SSA leads to a small reduction in the number of people exposed above the daytime and night-time LOAELs.
- The WebTAG assessment of SSA gives an overall net benefit of £27,632,143 with a sensitivity test outcome of £10,544,020 over the 60-year appraisal period.
- Our environmental analysis of Air Quality and Greenhouse Gas (Carbon Emissions) shows a marginal net benefit of SSA. There is no adverse environmental impact of permanently implementing SSA.
- No stakeholder groups are identified who are adversely affected as a result of retaining SSA.
- There are no other construction or other works required to permanently implement SSA; the current temporary procedure would simply become permanent.
- Reverting to Option B1 3.0° ILS and RNAV Approach procedures would result in a small negative impact to the current noise environment, air quality and carbon emissions.

8.4 Consultation

8.4.1 At Stage 3C, we opened a consultation to our Stakeholders and asked the question 'Do you support the permanent adoption of slightly steeper approaches at Heathrow airport?'. We also gave stakeholders an opportunity to provide qualitative feedback about SSA.

8.4.2 As part of the consultation, we received 132 responses from stakeholders. Following the close of the consultation, we categorised and analysed the consultation responses.

8.4.3 The analysis showed that 91% of stakeholders supported the permanent adoption of 3.2° RNAV SSA and 9% of stakeholders did not.

8.4.4 After consideration of all the qualitative responses provided, it was determined that none would impact the final design and therefore there would be no revisions to the approved Instrument Flight Procedures designs already in operation.

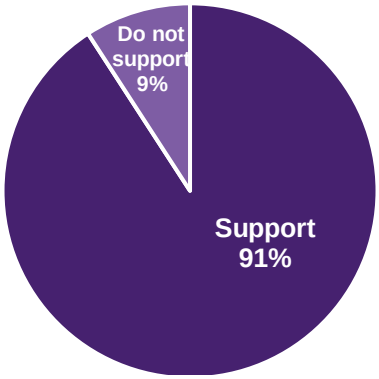


Figure 4 Consultation Outcome: Do you support the permanent adoption of slightly steeper approaches at Heathrow airport?

8.4.5 For further information around the outcome of the consultation, please see our Consultation Response document.

8.5 Our final design option

8.5.1 After careful review of the feedback received as part of the consultation, Heathrow decided to proceed with option B2 and the permanent adoption of 3.2º RNAV SSA. No change to the final option was made between Stage 3 and Stage 4 and therefore option B2 3.2º RNAV approaches is the final option for this ACP.

How does our final design option perform against our Design Principles?

8.5.2 This formal airspace change proposal intends to apply for the permanent adoption 3.2º RNAV Slightly Steeper Approach (SSA) procedures. The below table shows how this final option performs against the Design Principles agreed at Stage 1B:

Table 17 Design Principle assessment of final design

#	Design Principle	B2 3.2° RNAV SSA
1	Must be safe	
2	Must achieve the objective of reducing noise compared to a 3.0° approach	
3	Must not increase the numbers of go-arounds	
4	Must not reduce Heathrow's capacity	
5	Must not change the lateral tracks of aircraft over the ground	
6	Should not reduce the ability of arrivals to perform Continuous Descent Approach	
7	Should maximise the number of aircraft able to fly the Slightly Steeper Approach	
8	Should not adversely increase pilot or ATC workload	

Doesn't meet the Design Principle	Partially meets the Design Principle	Meets the Design Principle

9. AIRSPACE DESCRIPTION REQUIREMENTS

9.1.1 CAP1616 requires the airspace change sponsor to complete the following proforma table regarding the airspace description requirements.

	The proposal should provide a full description of the proposed change including the following:	Description for this proposal
a	The type of route or structure; for example, airway, UAR, Conditional Route, Advisory Route, CTR, SIDs/STARs, holding patterns, etc.	Permanent adoption of 3.2º RNP Approaches (SSA) currently published in AIP SUP 030/2020: HEATHROW RNP Y RWY 09L HEATHROW RNP Y RWY 09R HEATHROW RNP Y RWY 27L HEATHROW RNP Y RWY 27R The 3.0º RNAV approaches will be withdrawn and the 3.2º RNAV approaches will be updated to remove the reference to 'Y'. For further details please see Technical Information.
b	The hours of operation of the airspace and any seasonal variations.	n/a - Hours of operation will continue to be as per current day; this SSA ACP does not propose to change the hours of airspace operation.
c	Interaction with domestic and international en-route structures, TMAs or CTAs with an explanation of how connectivity is to be achieved. Connectivity to aerodromes not connected to CAS should be covered.	SSA procedures are already in operation. Aircraft arriving at Heathrow will continue to be vectored by ATC from the STAR Holding/Initial Approach Fixes before joining the final approach.
d	Airspace buffer requirements (if any). Where applicable describe how the CAA policy statement on 'Special Use Airspace – Safety Buffer Policy for Airspace Design Purposes' has been applied.	n/a. SSA are already in operation and contained within Heathrow's existing controlled airspace (CAS) boundaries.
e	Supporting information on traffic data including statistics and forecasts for the various categories of aircraft movements (passenger, freight, test and training, aero club, other) and terminal passenger numbers.	Please see the Final Options Appraisal for this information. This SSA ACP does not propose to change the number of aircraft arriving at Heathrow.
f	Analysis of the impact of the traffic mix on complexity and workload of operations.	As part of the trials, RNAV approaches have been identified as having a higher ATC and pilot workload compared to ILS approaches. However, the increased angle of the SSA RNAV approaches do not have an impact on ATC. Once permanently adopted, SSA will remain an elective procedure and the ILS will continue to be used by the majority of aircraft arriving at Heathrow.

g	Evidence of relevant draft Letters of Agreement, including any arising out of consultation and/or airspace management requirements.	SSA are already in operation and there are no specific LoA associated with the procedures.
h	Evidence that the airspace design is compliant with ICAO Standards and Recommended Practices (SARPs) and any other UK policy or filed differences, and UK policy on the Flexible Use of Airspace (or evidence of mitigation where it is not).	3.2º RNP Approaches (SSA) were developed by an approved procedure design organisation and approved by the CAA prior to publication in AIP SUP 030/2020. The procedures are designed to meet ICAO PANS OPS Document 8168, CAP 785 and UK AIP GEN 1.7 requirements.
i	The proposed airspace classification with justification for that classification.	n/a. SSA are already in operation and contained within existing CAS. No changes to CAS classification are required as part of this ACP.
j	Demonstration of commitment to provide airspace users equitable access to the airspace as per the classification and where necessary indicate resources to be applied or a commitment to provide them in line with forecast traffic growth. 'Management by exclusion' would not be acceptable.	This SSA ACP does not propose to make any changes to CAS or any existing access arrangements. SSA does not enable the reduction in size of Heathrow's CAS structures.
k	Details and justification for any delegation of ATS.	n/a

10. SAFETY ASSESSMENT

10.1.1 A safety assessment of SSA in accordance with the CAA policy for the conduct of operational airspace trials[7] was submitted to the CAA prior to the first live flight trials held in 2015. This involved the following activities:

- Design and validation of the 3.2º RNAV Approaches; undertaken by an approved procedure design organisation and approved by the CAA.
- NATS investigation into the impact on the functionality of their Time-Based Spacing Tool (TBS) which concluded that there would be no impact.
- A successful Hazard Identification workshop held by Heathrow in January 2015 and attended by experts from HAL, CAA, NATS (Tower and London Terminal Control), British Airways, Virgin Atlantic and Lufthansa.
- An additional safety assessment was undertaken by NATS to ensure that the trial was acceptably safe to introduce into the operation and there would be no change to the way that ATC would vector the aircraft for a 3.2° RNAV approach compared to the current 3° RNAV approach.
- Evidence was supplied to the CAA from Frankfurt Airport's 3.2° approach trial and also NATS' Research and Development department, and the CAA accepted that there would be no change to the ICAO Wake Vortex[8] separations between consecutive arrivals on final approach during the trial.

10.1.2 A successful outcome of the flight trials was defined by Heathrow as to have 'gathered sufficient data with no adverse impact to safety or operational performance', considering continuous descent approach performance, speed adherence on final approach, landing rates, runway occupancy time, numbers of go-arounds, landing gear deployment, aircraft tracks over the ground and to quantify the re-distribution of noise.

10.1.3 Feedback was gathered from Air Traffic Control (ATC) and Airlines, including safety observations. Two safety observations were raised during the first trial, neither attributable to the 3.2° RNAV approach, and none during the second trial. The flight trials conducted between 2015 and 2017 concluded that the trial 'met all objectives with no adverse impact on the daily operation', thus meeting the objective of 'no adverse impact to safety'.

10.1.4 Following the trials, 3.2° RNAV SSA have continued to operate on a temporary basis and, to date (May 2021), NATS have confirmed no safety reports have been made regarding SSA.

10.1.5 During the consultation, several individual responses raised safety as a concern. Overall, it appeared that these concerns were raised by pilots and their comments surrounded speed control, the potential for increased go-arounds, unstable approaches and increased

[7] This policy has since been overtaken by the process for airspace trials within CAP1616.
[8] This is the turbulence that forms behind an aircraft as it passes through the air, which can be extremely hazardous to the following aircraft on final approach. An adequate minimum distance must be provided to ensure this turbulence has dissipated before the next aircraft reaches that position. The minimum distance varies from 3-8nm depending on the types of aircraft in each pair.

workload for pilots and Air Traffic Control. These were similar concerns that had been raised by pilots *prior* to the 2015-2017 trials.

10.1.6 In the documents available as part of the consultation material, details were provided on safety aspects of the approach and how aircraft performance was monitored during the trials. There were no increases in missed approaches, there was evidence to support greater adherence to speed control, and no safety observations have been raised as of May 2021. As an outcome of the trials, Heathrow are aware of the increased ATC and pilot workload due to the RNAV approaches and this was highlighted throughout the consultation and engagement material.

10.1.7 One response noted that in tail wind conditions pilots would reduce speed earlier in the approach, which corelates with ATC reports during the trials; that there was a reduction in the number of requests to operate SSA when there was a tailwind.

10.1.8 The responses received by airlines as part of the consultation supported that SSA are safe and did not raise any safety concerns. As part of the British Airways response, they stated that “British Airways has no evidence to raise safety concerns with the SSA at Heathrow”.

10.1.9 It is important to note that SSA are elective, not mandatory, and ILS approaches will continue to be available for pilots wishing to fly a 3.0^{o} approach into Heathrow.

10.1.10 Further supporting information, including the preparatory documents mentioned above, can be found in Annex A: Safety.

11. OPERATIONAL IMPACT

11.1.1 CAP1616 requires the airspace change sponsor to complete the following proforma table regarding the operational impacts.

	An analysis of the impact of the change on all airspace users, airfields and traffic levels must be provided, and include an outline concept of operations within the new airspace will be managed. Specifically, consideration should be given to:	Evidence of compliance/ proposed mitigation
a	Impact on IFR general air traffic and operational air traffic on VFR General Aviation (GA) traffic flow in or through the area.	No impact. No changes to CAS were required to facilitate the trials. SSA are already in operation on a temporary basis and are contained with Heathrow's existing CAS.
b	Impact on VFR operations (including VFR routes where applicable).	No impact. SSA are already in operation, are contained within Heathrow's existing CAS, and are applicable to Instrument Flight Rules (IFR) flights.
c	Consequential effects on procedures and capacity, i.e. on SIDs, STARs, and/or holding patterns. Details of existing or planned routes and holds.	No impact. No changes to SIDs, STARs or holding patterns or capacity. SSA has been demonstrated to not affect capacity or result in any changes to lateral tracks over the ground. SSA are already in operation on a temporary basis and procedures exist for their use. The 3.2° RNAV approach procedures are already operated as an elective procedure alongside the existing 3.0° ILS procedures. SSA will continue to be elective. Aircraft will continue to be vectored from the STAR Holding/Initial Approach Fixes before joining final approach.
d	Impact on aerodromes and other specific activities within or adjacent to the proposed airspace.	No impact to aerodromes or adjacent activities were required for the trials or have been identified since.
e	Any flight planning restrictions and/or route requirements.	N/A

12. SUPPORTING INFRASTRUCTURE/RESOURCES

12.1.1 CAP1616 requires the airspace change sponsor to complete the following proforma table regarding the supporting infrastructure and resources:

	General Requirements	Evidence of compliance/ proposed mitigation
a	Evidence to support RNAV and conventional navigation as appropriate with details of planned availability and contingency procedures.	SSA will remain an elective procedure; the majority of aircraft will continue to fly an ILS approach when arriving at Heathrow. In the event of an GNSS outage, which would lead to the RNAV approaches being unavailable, conventional approaches (ILS and LOC only) will continue to be available for aircraft.
b	Evidence to support primary and secondary surveillance radar (SSR) with details of planned availability and contingency procedures.	Aircraft arriving at Heathrow are subject to tactical ATC radar control (vectoring) within existing CAS within existing radar coverage. SSA are already in operation on a temporary basis and no ATS changes are required in order to permanently adopt SSA. SSA will remain an elective procedure; the majority of aircraft will continue to fly an ILS approach when arriving at Heathrow. In the event of an GNSS outage, which would lead to the RNAV approaches being unavailable, conventional approaches (ILS and LOC only) will continue to be available for aircraft.
c	Evidence of communications infrastructure including R/T coverage, with availability and contingency procedures.	SSA are already in operation on a temporary basis within existing CAS therefore existing communications infrastructure is established and sufficient. Existing contingency procedures for loss of comms are already in place.
d	The effects of failure of equipment, procedures and/or personnel with respect to the overall management of the airspace must be considered.	SSA are already in operation on a temporary basis. SSA will remain an elective procedure with other conventional procedures (ILS and LOC only) available for arriving aircraft.

		The permanent adoption of SSA will not result in any changes to ATS and the current contingency arrangements in place.
e	Effective responses to the failure modes that will enable the functions associated with airspace to be carried out including details of navigation aid coverage, unit personnel levels, separation standards and the design of the airspace in respect of existing international standards or guidance material.	SSA are already in operation on a temporary basis and no ATS changes are required in order to permanently adopt SSA.
f	A clear statement on SSR code assignment requirements.	No impact. This ACP does not propose to make any changes to SSR code assignments.
g	Evidence of sufficient numbers of suitably qualified staff required to provide air traffic services following the implementation of a change.	SSA are already in operation on a temporary basis and no ATS changes are required in order to permanently adopt SSA.

13. AIRSPACE AND INFRASTRUCTURE REQUIREMENTS

13.1.1 The change sponsor must complete the following proforma to demonstrate that the airspace change complies with the airspace infrastructure requirement set out in UK/European law and policy, ICAO standards and recommended practices, and Eurocontrol standards.

	General Requirements	Evidence of compliance/ proposed mitigation
a	The airspace structure must be of sufficient dimensions with regard to expected aircraft navigation performance and manoeuvrability to fully contain horizontal and vertical flight activity in both radar and non-radar environments.	The 3.2° RNAV SSA procedures are already designed, validated, approved by the CAA, and operated. The procedures are contained within Heathrow's existing CAS.
b	Where an additional airspace structure is required for radar control purposes, the dimensions shall be such that radar control manoeuvres can be contained within the structure, allowing a safety buffer. This safety buffer shall be in accordance with agreed parameters as set down in CAA policy statement 'Safety Buffer Policy for Airspace Design Purposes Segregated Airspace'. Describe how the safety buffer is applied, show how the safety buffer is portrayed to the relevant parties, and provide the required agreements between the relevant ANSPs/ airspace users detailing procedures on how the airspace will be used. This may be in the form of Letters of Agreement with the appropriate level of diagrammatic explanatory detail.	n/a. No additional airspace structure is required because of this ACP.
c	The Air Traffic Management system must be adequate to ensure that prescribed separation can be maintained between aircraft within the airspace structure and safe management of interfaces with other airspace structures.	SSA are already safely in operation at Heathrow. To date (May 21) no safety observations have been raised by ATC regarding the procedures. No ATS changes are required in order to permanently adopt SSA.
d	Air traffic control procedures are to ensure required separation between traffic inside a new airspace structure and traffic within existing adjacent or other new airspace structures.	n/a. No new airspace structures are proposed as part of this ACP. SSA are already in operation and no ATS changes are required in order to permanently adopt SSA.
e	Within the constraints of safety and efficiency, the airspace classification should permit access to as many classes of user as practicable.	n/a. This ACP does not propose to make any changes to CAS or its classification.
f	There must be assurance, as far as practicable, against unauthorised incursions. This is usually done through the classification and promulgation.	SSA are contained within existing CAS and no change to CAS or its classification are proposed as part of this ACP. The permanent adoption of SSA will not impact the existing assurance measures against unauthorised incursions.
g	Pilots shall be notified of any failure of navigational facilities and of any suitable alternative facilities available and the method of identifying failure and notification should be specified.	In the event of loss of GNSS, the onboard equipment on the aircraft will notify the pilot. Alternative approach procedures such as the ILS or LOC only approaches

		are available in the event of an unplanned outage. An assessment of RAIM outages is undertaken by crews as part of the pre-flight planning requirements.
h	The notification of the implementation of new airspace structures or withdrawal of redundant airspace structures shall be adequate to allow interested parties sufficient time to comply with user requirements. This is normally done through the AIRAC cycle.	No changes to airspace structures are proposed. Changes to the RNAV Instrument Approaches and associated AIP updates will be promulgated through the normal AIRAC cycle (Planned 12/2021) Please see the technical information section of this document for further information about AIP changes and appendix A for draft charts.
i	There must be sufficient R/T coverage to support the Air Traffic Management system within the totality of proposed controlled airspace.	n/a. No changes to CAS are proposed. SSA are contained within existing CAS where there is known R/T coverage. SSA are already safely in operation at Heathrow. No ATS changes are required in order to permanently adopt SSA.
j	If the new structure lies close to another airspace structure or overlaps an associated airspace structure, the need for operating agreements shall be considered.	n/a. SSA are already in operation and there is no requirement for operating agreements with any adjacent airspace structure.
k	Should there be any other aviation activity (low flying, gliding, parachuting, microlight site, etc) in the vicinity of the new airspace structure and no suitable operating agreements or air traffic control procedures can be devised, the change sponsor shall act to resolve any conflicting interests.	n/a. No changes to airspace are proposed.

	ATS route requirements	**Evidence of compliance/ proposed mitigation**
a	There must be sufficient accurate navigational guidance based on in-line VOR/DME or NDB or by approved RNAV derived sources, to contain the aircraft within the route to the published RNP value in accordance with ICAO/Eurocontrol standards.	n/a. SSA are Instrument Approach Procedures that require no change to the existing ATS route structures.
b	Where ATS routes adjoin terminal airspace there shall be suitable link routes as necessary for the ATM task.	n/a. SSA are Instrument Approach Procedures that require no change to the existing ATS route structures.
c	All new routes should be designed to accommodate P-RNAV navigational requirements.	SSA are Instrument Approach Procedures that require no change to the existing ATS route structures.

	Terminal airspace requirements	Evidence of compliance/ proposed mitigation
a	The airspace structure shall be of sufficient dimensions to contain appropriate procedures, holding patterns and their associated protected areas.	n/a. SSA are contained within existing CAS and therefore no changes to airspace are proposed as part of this ACP.
b	There shall be effective integration of departure and arrival routes associated with the airspace structure and linking to designated runways and published instrument approach procedures (IAPs).	SSA procedures are already in operation. Aircraft arriving at Heathrow will continue to be vectored by ATC from the STAR Holding/Initial Approach Fixes before joining the final approach.
c	Where possible, there shall be suitable linking routes between the proposed terminal airspace and existing en-route airspace structure.	n/a. SSA only impact the final approach phase of the flight. No other changes to CAS are required in order to permanently adopt SSA.
d	The airspace structure shall be designed to ensure that adequate and appropriate terrain clearance can be readily applied within and adjacent to the proposed airspace.	The SSA procedures have been designed and validated by an approved procedure design organisation and reviewed using Heathrow's CAP232 survey data. The procedures are designed in accordance with ICAO PANS OPS 8168 and UK regulatory guidelines. The procedures have been assessed against Heathrow's latest CAP232 aerodrome survey.
e	Suitable arrangements for the control of all classes of aircraft (including transits) operating within or adjacent to the airspace in question, in all meteorological conditions and under all flight rules, shall be in place or will be put into effect by the change sponsor upon implementation of the change in question (if these do not already exist).	SSA procedures are already in operation and are contained within existing controlled airspace. No changes to Controlled Airspace or ATS are required in order to permanently adopt SSA.
f	The change sponsor shall ensure that sufficient visual reference points are established within or adjacent to the subject airspace to facilitate the effective integration of VFR arrivals, departures and transits of the airspace with IFR traffic.	n/a. This ACP does not propose to make any changes to the existing CAS or Heathrow's VRPs.
g	There shall be suitable availability of radar control facilities.	n/a. No changes to CAS or ATS are proposed as part of this ACP.
h	The change sponsor shall, upon implementation of any airspace change, devise the means of gathering (if these do not already exist) and of maintaining statistics on the number of aircraft transiting the airspace in question. Similarly, the change sponsor shall maintain records on the numbers of aircraft refused permission to transit the airspace in question, and the reasons why. The change sponsor should note that such records would enable ATS managers to plan staffing requirements necessary to effectively manage the airspace under their control.	The SSA ACP does not propose to make any changes to CAS volume or classification or to the provision of ATS services.
i	All new procedures should, wherever possible, incorporate Continuous Descent Approach (CDA) profiles after aircraft leave the holding facility associated with that procedure.	The trials found that although the procedures are designed to meet the PANS-OPS requirements for a level segment prior to the Final Approach Fix, the vast majority of aircraft do not actually

		fly the level segment and instead perform a CDA. Data gathered during the trials showed that SSA CDA compliance was very slightly lower compared to overall CDA compliance at Heathrow (on average 0.2% lower when flying RNAV compared to ILS across the two trials).

	Off-route airspace requirements	Evidence of compliance/ proposed mitigation
a	If the new structure lies close to another airspace structure or overlaps an associated airspace structure, the need for operating agreements shall be considered.	n/a. SSA are Instrument Approach Procedures that require no change to off-route airspace
b	Should there be any other aviation activity (military low flying, gliding, parachuting, microlight site etc) in the vicinity of the new airspace structure and no suitable operating agreements or air traffic control procedures can be devised, the change sponsor shall act to resolve any conflicting interests.	n/a. SSA are already in operation on a temporary basis. SSA are Instrument Approach Procedures that require no change to off-route airspace

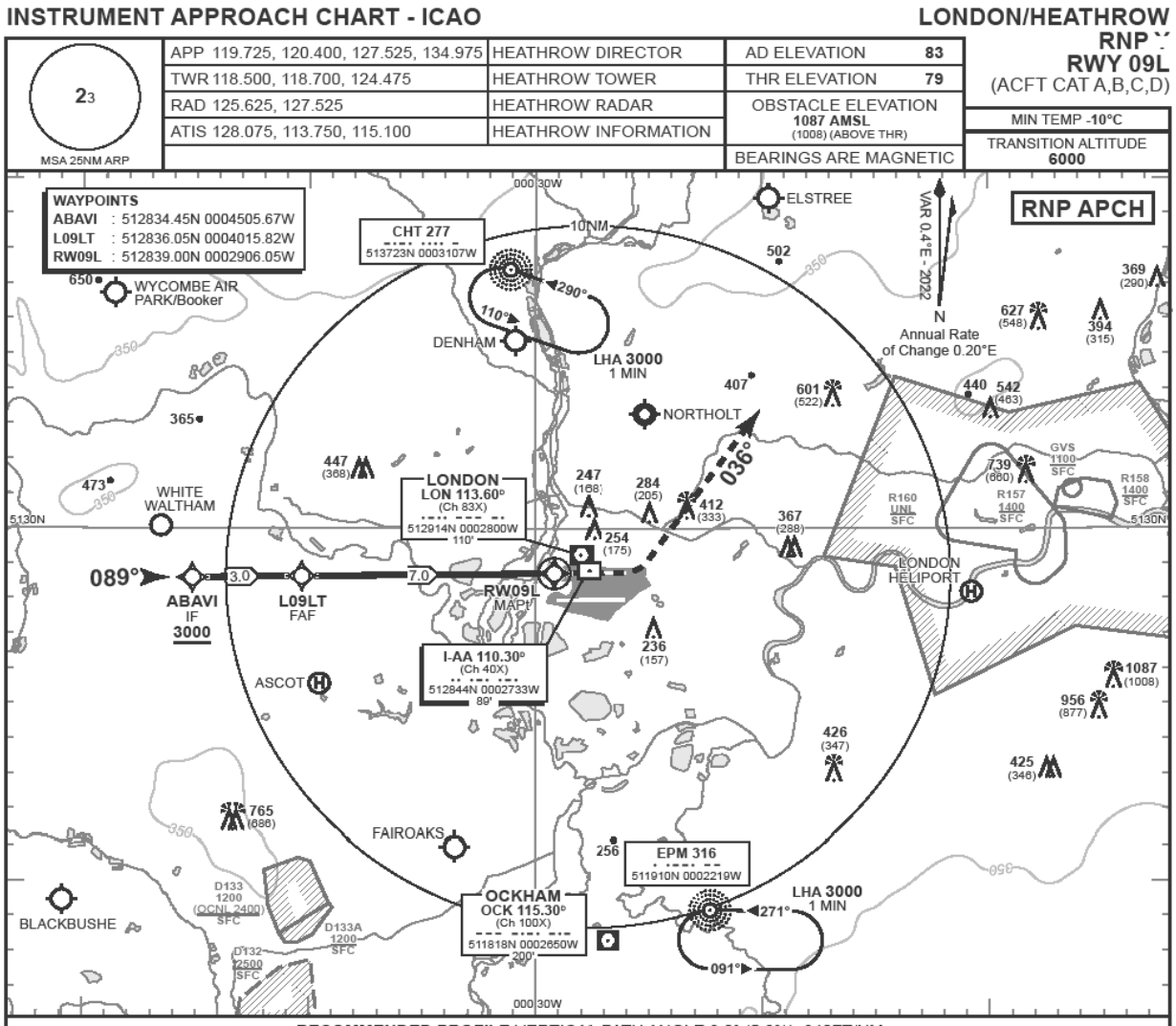
14. ENVIRONMENTAL ASSESSMENT

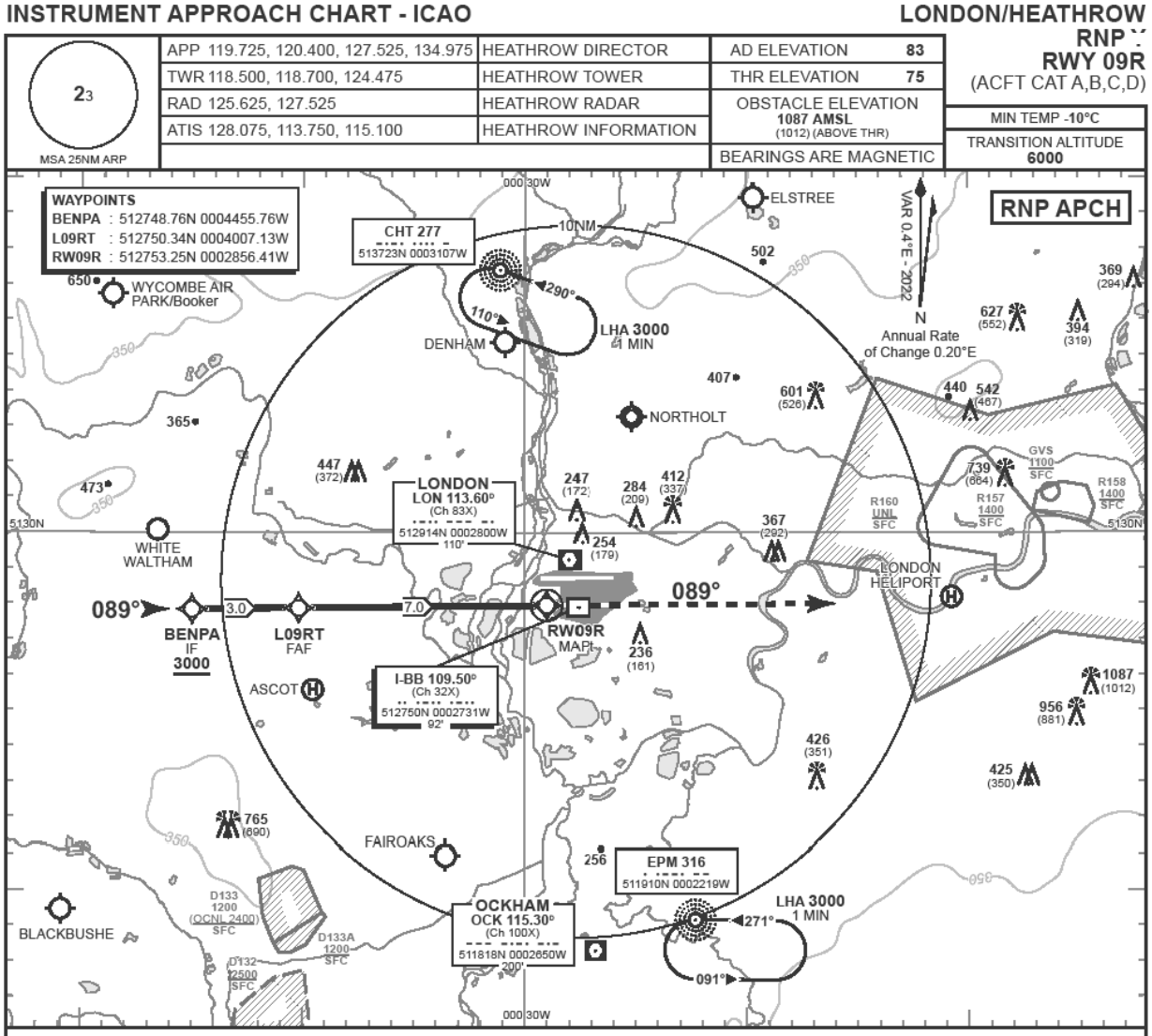
14.1.1 CAP1616 requires the change sponsor to complete the following proforma. The following table provides a summary of the conclusions made within our Consultation Document and our Final/Full Options Appraisal.

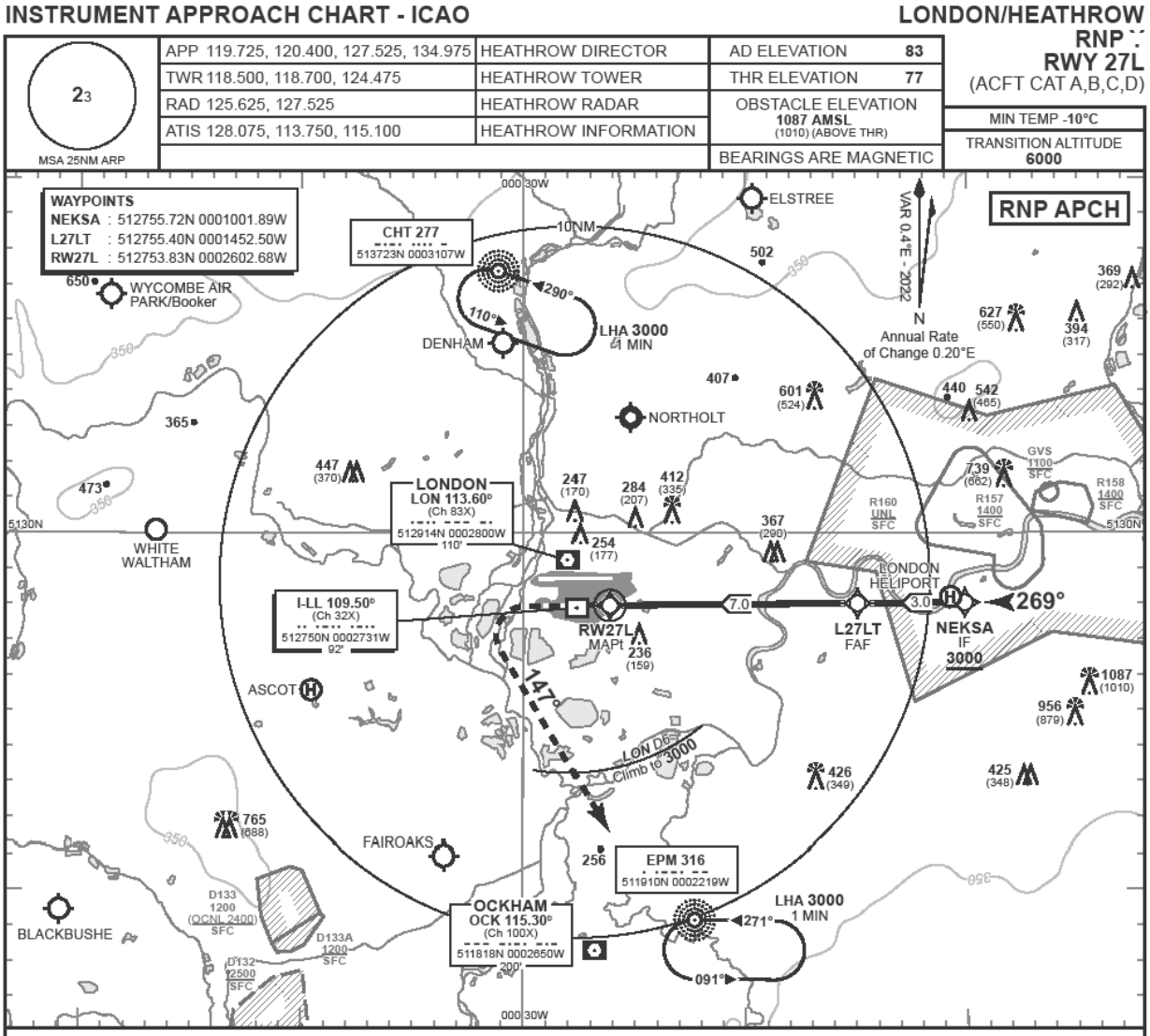
	Theme	Content	Evidence of compliance/ proposed mitigation
a	WebTAG analysis	Output and conclusions of the analysis (if not already provided elsewhere in the proposal)	The webTAG assessment of noise associates a net benefit of £27,630,267 (with a sensitivity test outcome of £10,543,304) across the 60-year appraisal period, with the permanent adoption of 3.2° RNAV SSA. For more information, please see the Final Options Appraisal.
b	Assessment of noise impacts (Level 1/M1 proposals only)	Consideration of noise impacts, and where appropriate the related qualitative and/or quantitative analysis, including whether the anticipated noise impact meets the criteria for a proposal to be called-in by the Secretary of State (paragraph 5(c) of Direction 6 of the Air Navigation Directions 2017) If the change sponsor expects that there will be no noise impacts, the rationale must be explained	The permanent adoption of SSA would mean that the average noise reduction of 0.51dBA would remain for the 0.6% of flights that operate 3.2° RNAV approaches. An average reduction of 0.51 dBA results in a change in SEL that is difficult to perceive from the ground; however, the permanent adoption of 3.2° RNAV approaches is an incremental step to reducing the impact of Heathrow airport's noise footprint on health and quality of life. This noise reduction is reflected in the noise exposure data which shows a small reduction in the overall number of people exposed above the daytime and night-time lowest Observable Adverse Effect Levels (LOAELs). It is also reflected in the WebTAG assessment which associates a net benefit of £27,630,267 (with a sensitivity test outcome of £10,543,304) with the permanent adoption of 3.2° RNAV SSA. For more information regarding the noise assessments please see the Final Options Appraisal document. As overall there are only noise benefits associated with SSA, this does not meet the criteria to be called-in by the Secretary of State.
c	Assessment of CO_2 emissions	Consideration of the impacts on CO_2 emissions, and where appropriate the related qualitative and/or quantitative analysis If the change sponsor expects that there will be no impact on CO_2 emissions impacts, the rationale must be explained	The live trials demonstrated that there will be no change to existing lateral flight paths, no change to track length, no increase in the number of air traffic movements, and no increase in aircraft holding as a result of either option. Aircraft operating on a 3.2° approach will fly higher for longer which our FOA analysis has shown will lead to a reduction in carbon emissions compared to a 3.0° approach: however, due to the small percentage of aircraft use (0.6% in 2019), the impact in terms of CO2 emissions are considered negligible. Please see the Final Options Appraisal for further information about the CO_2 analysis undertaken and the benefits.
d	Assessment of local air quality (Level	Consideration of the impacts on local air quality, and where appropriate the related	There are overall air quality benefits associated with Option B2 3.2° RNAV SSA due to the reduction in thrust and fuel flow required for the 3.2° approach. However, the small

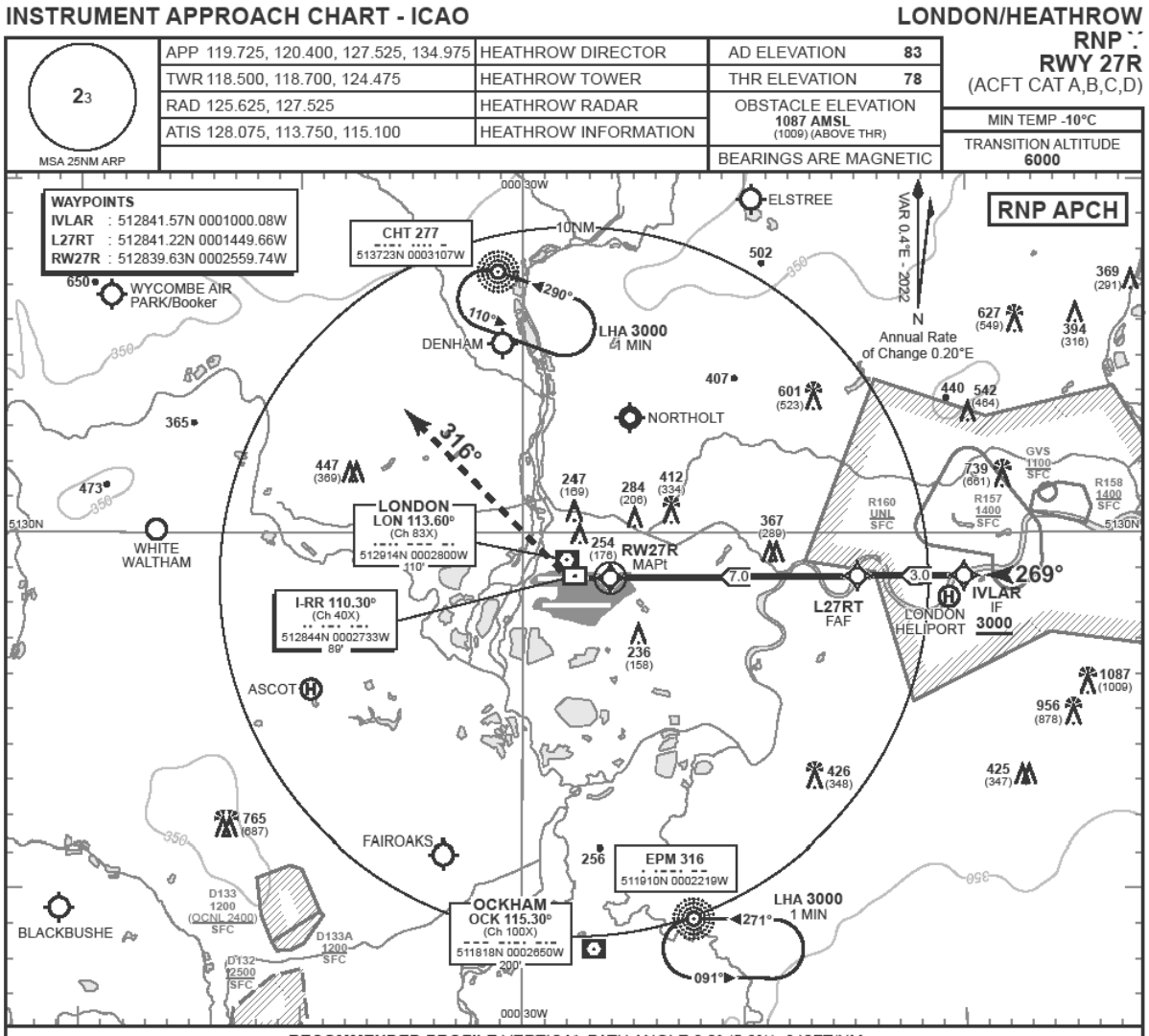
	1/M1 proposals only)	qualitative and/or quantitative analysis If the change sponsor expects that there will be no impact on local air quality, the rationale must be explained	percentage of aircraft use (0.6% in 2019), combined with no change to lateral flight paths, means that the overall benefits are marginal. Please see the Final Options Appraisal for further information about the Air Quality analysis undertaken and the benefits.
e	Assessment of impacts upon tranquillity (Level 1/M1 proposals only)	Consideration of any impact upon tranquillity, notably on Areas of Outstanding Natural Beauty or National Parks, and where appropriate the related qualitative and/or quantitative analysis If the change sponsor expects that there will be no tranquillity impacts, the rationale must be explained	As there will be no change to existing lateral flight paths and no increase in the number of air traffic movements as a result of either option, the nationally protected landscapes of National Parks and Areas of Outstanding Natural Beauty (AONBs) as sensitive receptors will not be affected by the SSA airspace change. The noise assessment has shown that when an aircraft operates SSA noise levels do decrease, albeit only very slightly, and at a level which is imperceptible on the ground having regard to the total operation. Therefore, it is considered that any effects on sensitive biodiversity or tranquillity receptors, as a result of either permanently adopting SSA or reverting, would be negligible. Please see the Final Options Appraisal for further information about the assessment of tranquillity.
f	Operational diagrams	Any operational diagrams that have been used in the consultation to illustrate and aid understanding of environmental impacts must be provided	Please see Appendix A of the Full Options Appraisal and our Consultation Document.
g	Traffic forecasts	10-year traffic forecasts, from the anticipated date of implementation, must be provided (if not already provided elsewhere in the proposal)	Please see our Final Options Appraisal document.
h	Summary of environmental impacts and conclusions	A summary of all the environmental impacts detailed above plus the change sponsor's conclusions on those impacts	Please see our Final Options Appraisal document.

15. APPENDIX A: DRAFT AIP INFORMATION




INSTRUMENT APPROACH CHART - ICAO
LONDON/HEATHROW
RNP
RWY 09R
(ACFT CAT A,B,C,D)
2 3
MSA 25NM ARP
APP 119.725, 120.400, 127.525, 134.975
HEATHROW DIRECTOR
TWR 118.500, 118.700, 124.475
HEATHROW TOWER
RAD 125.625, 127.525
HEATHROW RADAR
ATIS 128.075, 113.750, 115.100
HEATHROW INFORMATION
AD ELEVATION 83
THR ELEVATION 75
OBSTACLE ELEVATION
1087 AMSL
(1012) (ABOVE THR)
BEARINGS ARE MAGNETIC
MIN TEMP -10°C
TRANSITION ALTITUDE
6000
WAYPOINTS
BENPA : 512748.76N 0004455.76W
L09RT : 512750.34N 0004007.13W
RW09R : 512753.25N 0002856.41W
CHT 277
513723N 0003107W
10NM
RNP APCH
VAR 0.4°E - 2022
Annual Rate of Change 0.20°E
WYCOMBE AIR PARK/Booker
DENHAM
LHA 3000
1 MIN
ELSTREE
NORTHOLT
LONDON
LON 113.60°
(Ch 83X)
512914N 0002800W
WHITE WALTHAM
LONDON HELIPORT
BENPA
IF
3000
L09RT
FAF
RW09R
MAPt
089°
3.0
7.0
I-BB 109.50°
(Ch 32X)
512750N 0002731W
ASCOT
FAIROAKS
EPM 316
511910N 0002219W
OCKHAM
OCK 115.30°
(Ch 100X)
511818N 0002650W
BLACKBUSHE
LHA 3000
1 MIN
271°
091°
R160 UNL SFC
R157 1400 SFC
R158 1400 SFC
GVS 1100 SFC
D133 1200 (OCNL 2400) SFC
D133A 1200 SFC
D132 12500 SFC
000 30W
5130N
RECOMMENDED PROFILE VERTICAL PATH ANGLE 3.2° (5.6%), 340FT/NM
RANGE (NM) 6 5 4 3 2
ALT(HGT) 2160(2085) 1820(1745) 1480(1405) 1140(1065) 800(725)
TCH 50
BENPA 3000(2925)
L09RT 2500(2425)
089°
RW09R
800(725)
10
7.0
THR (NM)
MAPt (LNAV): RW09R
Climb straight ahead to 3000. After passing 3000 revert to conventional navigation. Continue as directed.
RCF: On passing LON DME 10 turn right to NDB EPM at 3000.
Aircraft Category A B C D
OCA (OCH) LNAV/VNAV 400(325) 410(335) 430(355) 540(465)
LNAV 620(545) 620(545) 620(545) 620(545)
VM(C)OCA (OCH AAL) Total Area 670(587) 720(637) 820(737) 830(747)
Rate of descent
G/S KT 160 140 120 100 80
FT/MIN 910 790 680 570 450
NOTES 1 Pilots should 'Request RNP . Approach' on first contact with Heathrow Director.
2 Aircraft will normally be radar vectored from the STAR Holding/Initial Approach Fixes.
3 Missed Approach Procedure and RCF use conventional navigation aids and are not available without DME LON and NDB EPM.
4 PAPI angle is 3.0°.
2020/39 LONDON HEATHROW RNP . RWY 09R 08 JUN 20


INSTRUMENT APPROACH CHART - ICAO
LONDON/HEATHROW
RNP ``
RWY 27L
(ACFT CAT A,B,C,D)
2 3
MSA 25NM ARP
APP 119.725, 120.400, 127.525, 134.975 HEATHROW DIRECTOR
TWR 118.500, 118.700, 124.475 HEATHROW TOWER
RAD 125.625, 127.525 HEATHROW RADAR
ATIS 128.075, 113.750, 115.100 HEATHROW INFORMATION
AD ELEVATION 83
THR ELEVATION 77
OBSTACLE ELEVATION
1087 AMSL
(1010) (ABOVE THR)
BEARINGS ARE MAGNETIC
MIN TEMP -10°C
TRANSITION ALTITUDE
6000
WAYPOINTS
NEKSA : 512755.72N 0001001.89W
L27LT : 512755.40N 0001452.50W
RW27L : 512753.83N 0002602.68W
CHT 277
513723N 0003107W
10NM
RNP APCH
VAR 0.4°E - 2022
Annual Rate of Change 0.20°E
WYCOMBE AIR PARK/Booker
DENHAM
LHA 3000
1 MIN
ELSTREE
NORTHOLT
LONDON
LON 113.60°
(Ch 83X)
512914N 0002800W
WHITE WALTHAM
I-LL 109.50°
(Ch 32X)
512750N 0002731W
RW27L
MAPt
L27LT
FAF
LONDON HELIPORT
NEKSA
IF
3000
269°
147°
LON DME
Climb to 3000
ASCOT
FAIROAKS
EPM 316
511910N 0002219W
OCKHAM
OCK 115.30°
(Ch 100X)
511818N 0002650W
LHA 3000
1 MIN
271°
091°
BLACKBUSHE
R160 UNL SFC
R157 1400 SFC
R158 1400 SFC
GVS 1100 SFC
D133 1200 (OCNL 2400) SFC
D133A 1200 SFC
D132 2500 SFC
RECOMMENDED PROFILE VERTICAL PATH ANGLE 3.2° (5.6%), 340FT/NM
RANGE (NM) 6 5 4 3 2
ALT(HGT) 2170(2093) 1830(1753) 1490(1413) 1150(1073) 810(733)
TCH 50
MAPt (LNAV): RW27L
Climb to 2000 - straight ahead until passing 1080 or I-LL DME zero inbound whichever is later, then turn left onto track 147°. After passing 1080 revert to conventional navigation. When established and passing LON DME 6 climb to 3000 without delay. Continue as directed.
RCF: On reaching 3000 proceed to NDB EPM at 3000.
NEKSA
3000(2923)
L27LT
2500(2423)
RW27L
147°/269°
269°
900(823)
THR (NM)
7
10
Aircraft Category A B C D
OCA (OCH) LNAV/VNAV 380(303) 390(313) 400(323) 440(363)
LNAV 640(563) 640(563) 640(563) 640(563)
VM(C)OCA (OCH AAL) Total Area 670(587) 720(637) 820(737) 830(747)
Rate of descent G/S KT 160 140 120 100 80
FT/MIN 910 790 680 570 450
NOTES 1 Pilots should 'Request RNP `` Approach' on first contact with Heathrow Director.
2 Aircraft will normally be radar vectored from the STAR Holding/Initial Approach Fixes.
3 Pilots should not expect descent clearance below 4000 until 13NM from touchdown.
4 Missed Approach Procedure and RCF use conventional navigation aids and are not available without DME I-LL, DME LON and NDB EPM.
5 PAPI angle is 3.0°.
2020/39 LONDON HEATHROW RNP `` RWY 27L 08 JUN 20


INSTRUMENT APPROACH CHART - ICAO
LONDON/HEATHROW
RNP
RWY 27R
(ACFT CAT A,B,C,D)
APP 119.725, 120.400, 127.525, 134.975
HEATHROW DIRECTOR
TWR 118.500, 118.700, 124.475
HEATHROW TOWER
RAD 125.625, 127.525
HEATHROW RADAR
ATIS 128.075, 113.750, 115.100
HEATHROW INFORMATION
AD ELEVATION 83
THR ELEVATION 78
OBSTACLE ELEVATION
1087 AMSL
(1009) (ABOVE THR)
BEARINGS ARE MAGNETIC
MIN TEMP -10°C
TRANSITION ALTITUDE
6000
MSA 25NM ARP
WAYPOINTS
IVLAR : 512841.57N 0001000.08W
L27RT : 512841.22N 0001449.66W
RW27R : 512839.63N 0002559.74W
RNP APCH
CHT 277
513723N 0003107W
WYCOMBE AIR PARK/Booker
DENHAM
LHA 3000
1 MIN
ELSTREE
VAR 0.4°E - 2022
Annual Rate of Change 0.20°E
NORTHOLT
LONDON
LON 113.60°
(Ch 83X)
512914N 0002800W
I-RR 110.30°
(Ch 40X)
512844N 0002733W
WHITE WALTHAM
RW27R
MAPt
L27RT
FAF
IVLAR
IF
3000
LONDON HELIPORT
ASCOT
FAIROAKS
EPM 316
511910N 0002219W
OCKHAM
OCK 115.30°
(Ch 100X)
511818N 0002650W
BLACKBUSHE
RECOMMENDED PROFILE VERTICAL PATH ANGLE 3.2° (5.6%), 340FT/NM
RANGE (NM) 6 5 4 3 2
ALT(HGT) 2170(2092) 1830(1752) 1490(1412) 1150(1072) 810(732)
TCH 50
MAPt (LNAV): RW27R
Climb to 3000 - straight ahead until passing 1580 or I-RR DME zero inbound whichever is later, then turn right onto track 316°. After passing 1580 revert to conventional navigation. Continue as directed.
RCF: On passing LON DME 10 turn right to NDB CHT at 3000.
IVLAR
3000(2922)
L27RT
2500(2422)
RW27R
269°
316°/269°
900(822)
0NM
7
10
Aircraft Category A B C D
OCA (OCH) LNAV/VNAV 380(302) 390(312) 400(322) 440(362)
LNAV 640(562) 640(562) 640(562) 640(562)
VM(C)OCA (OCH AAL) Total Area 670(587) 720(637) 820(737) 830(747)
Rate of descent
G/S KT 160 140 120 100 80
FT/MIN 910 790 680 570 450
NOTES 1 Pilots should 'Request RNP Approach' on first contact with Heathrow Director.
2 Aircraft will normally be radar vectored from the STAR Holding/Initial Approach Fixes.
3 Pilots should not expect descent clearance below 4000 until 13NM from touchdown.
4 Missed Approach Procedure and RCF use conventional navigation aids and are not available without DME I-RR, DME LON and NDB CHT.
5 PAPI angle is 3.0°.
2020/39 LONDON HEATHROW RNP RWY 27R 08 JUN 20