HEATHROW CONSULTATION ON PROPOSALS TO PERMANENTLY ADOPT SLIGHTLY STEEPER APPROACHES

Heathrow is holding a consultation on its proposal to permanently adopt the procedures some aircraft use when arriving at the airport, known as Slightly Steeper Approaches.

This document contains information about the proposal and how you can provide feedback.

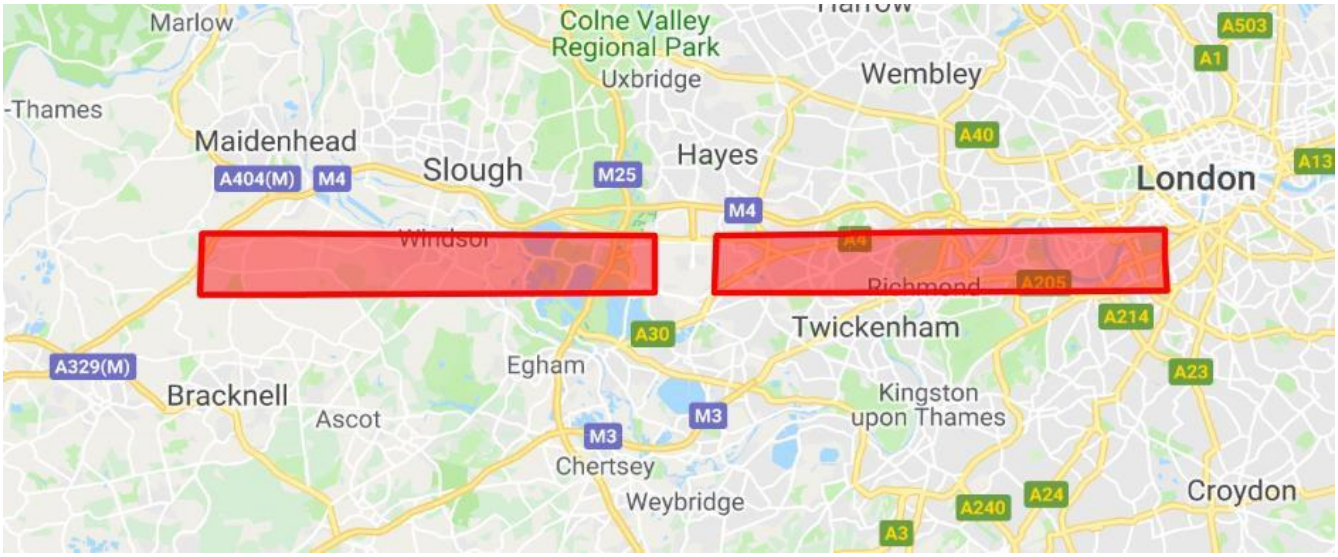
The consultation is open between **5 March – 2 April 2021.**
We look forward to hearing from you.

Consultation zone for this Airspace Change Proposal

Heathrow is consulting on the permanent adoption of Slightly Steeper Approaches (SSA) for some of the aircraft arriving 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.

As SSA are already in operation at Heathrow, and there are no changes to the lateral flight paths as a result of the SSA procedures, it has been possible for Heathrow to define a very small geographical area that could potentially be impacted as a result of SSA.

This area potentially 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 so is the defined consultation zone.



1 nautical mile = 1.508 statute miles

Our principal stakeholders for this consultation are the aviation industry and local community groups, as well as local authorities who are within the potentially impacted area identified on the above map.

We have engaged with these groups since the commencement of this Airspace Change Proposal, and a full list of these stakeholders can be found in our Consultation Strategy.

If you have not been involved with the engagement so far, we would welcome your comments on this proposal. You can find further information in both this and accompanying documents as well as contact details if you would like to get in touch.

For background on how these proposals have been developed so far, and a short summary of the Civil Aviation Authority (CAA) Airspace Change Process, please see Section 1 of this document.

If you are interested in navigating to a specific section of this document, please see the Consultation Document Navigation page for the contents.

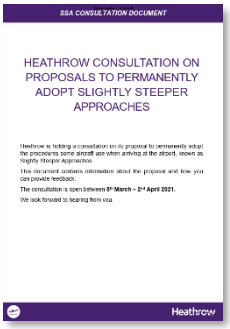
CONSULTATION DOCUMENT NAVIGATION

Alongside this Consultation document, there are two further documents which support the overall consultation for Slightly Steeper Approaches:

Summary Document

A 2-page, quick read and easy to understand document with diagrams.

Consultation Document



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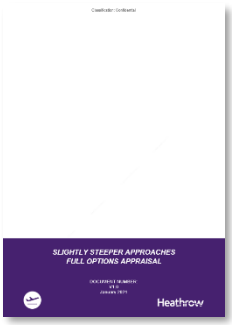
Full Option Appraisal



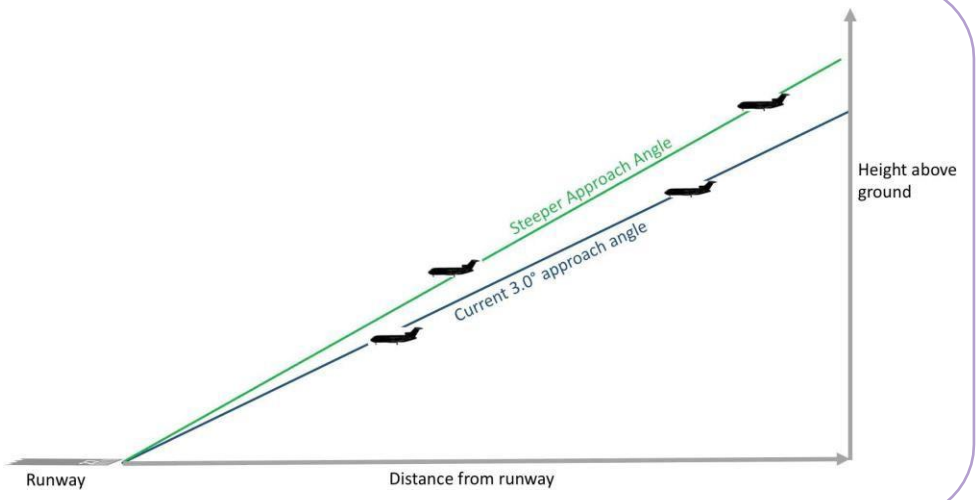
The FOA provides detailed technical and environmental analysis for consultees who wish to read the technical data.

SECTION 1 – INTRODUCTION AND CONSULTATION OVERVIEW

Aircraft flying steeper approaches help to reduce the airport's noise footprint by enabling aircraft to stay higher for longer. 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.

Slightly steeper approaches improve the airport's noise footprint by enabling aircraft to fly higher for longer.

Slightly steeper approaches do not change the lateral flight paths of aircraft.



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.

SSA are currently in operation at Heathrow and have been since the second trial, as the CAA permitted this on a temporary basis whilst Heathrow submits an Airspace Change Proposal (ACP) for their permanent adoption. Heathrow is now seeking permission from the CAA to keep SSA as a permanent feature.

Heathrow has approximately 240,000 arrivals each year (prior to COVID-19). In 2019, the slightly steeper flight paths were only used by 0.6% of Heathrow's arrivals. During the trials, an average of 2% of aircraft operated SSA. The number of aircraft able to fly SSA is limited due to the RNAV procedure type and ATC workload, more information around this is available here. SSA does not change the lateral flight paths of aircraft.

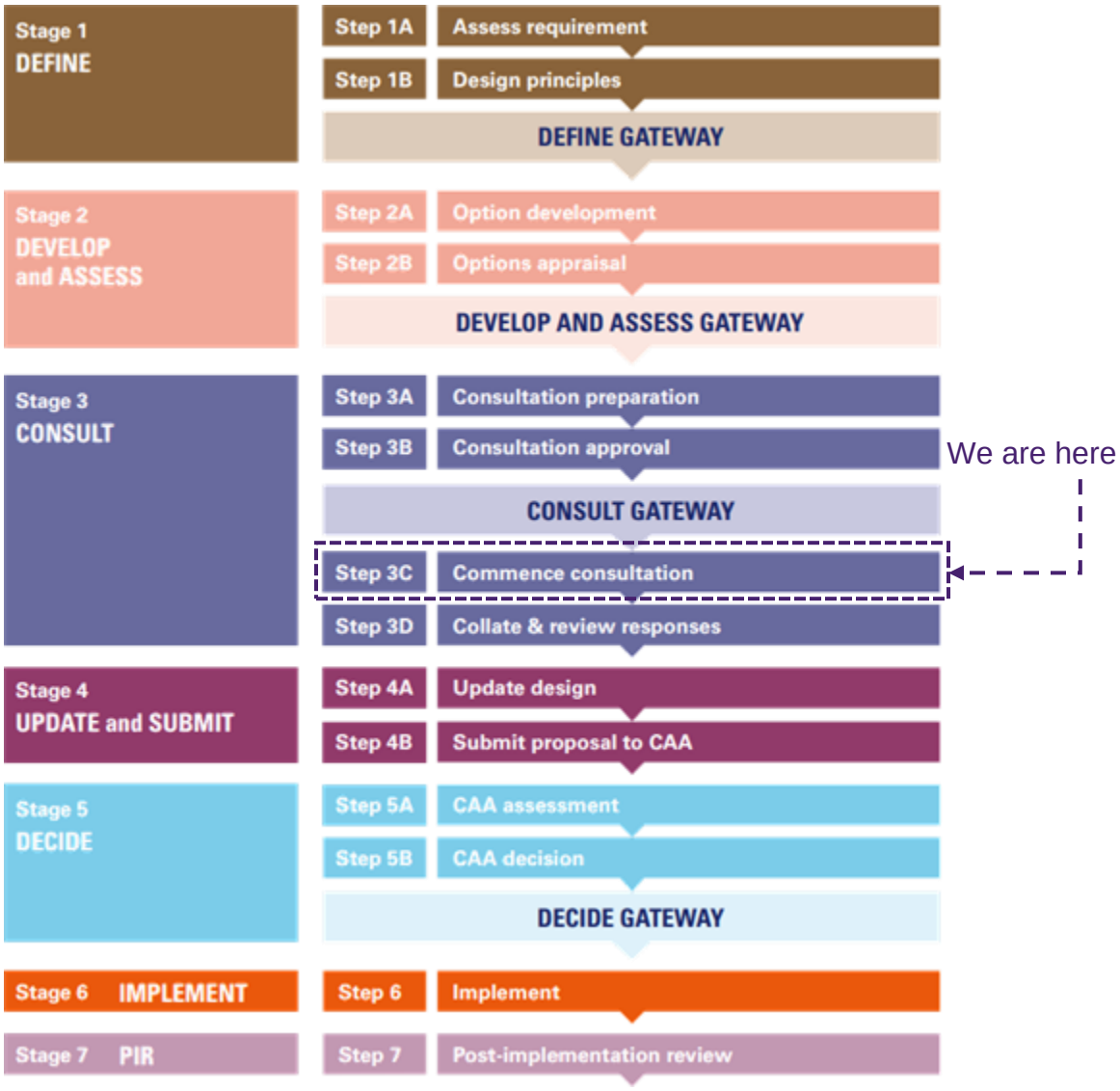
This consultation is to ask if you agree with the proposal that Slightly Steeper Approaches should be made a permanent feature at Heathrow airport. We are asking the question:

"Do you support the permanent adoption of Slightly Steeper Approaches at Heathrow airport?"

Airspace Change Process

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. It places great importance on engaging and consulting on airspace proposals throughout the process.

The figure below displays the full ACP process as defined in CAP1616. We have completed Stages 1 and 2 of the process and we are now at Stage 3: Consult:



Summary of Stage 1

Stage 1 of CAP1616 requires change sponsors to first develop a statement of need. The statement of need for SSA explained how Heathrow would like to introduce SSA as part of its ongoing commitment to reducing its noise footprint. The full statement of need is available here.

Following the statement of need, 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.

During Stage 1 Heathrow utilised existing forums to carry out the design principle engagement.

More information on these stakeholder groups and the full Stage 1 submission can be found on the CAA portal here.

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

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

	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

Summary of Stage 2

Stage 2 of CAP1616 is split into two parts, Stage 2A and Stage 2B. During Stage 2A, Heathrow was required to develop a "comprehensive list of options" which address the statement of need and which align with the design principles from Stage 1B. This comprehensive list of options is then required to be tested with the same stakeholders as engaged with in Stage 1B, to ensure they are satisfied that the design options are aligned with the design principles.

To ensure the community stakeholders fully understood the proposals, Heathrow engaged those stakeholders via briefings using a power-point presentation. For the industry groups, Heathrow emailed the presentation and requested feedback. Stakeholders were informed of the comprehensive list of options and Heathrow explained the process of how these options were developed.

During Stage 2B Heathrow carried out the initial options appraisal. A full copy of the Stage 2 submission to the CAA is available on the CAA Portal here. There is more detail on the options explored in Section 3 of this document.

Stage 3 – Where we are now

Stage 3 of the process requires Heathrow to carry out a formal consultation with interested parties on proposals, including potentially affected communities. This is where we are now.

We will use the feedback we receive from this consultation to inform our SSA ACP submission to the CAA at Stage 4, which is required to permanently adopt 3.2° RNAV approaches at Heathrow.

If our proposal is successful, we will keep the SSA we currently have on trial in place permanently. Without a successful proposal, the CAA will require us to withdraw SSA procedures and revert back to 3.0° approaches for the subset of arrivals that currently use the procedures. Our SSA were flown by 0.6% of arrivals into Heathrow in 2019. The reasons for these low figures are set out in more detail in Section 2.

These proposed changes do not change the number of aircraft arriving at Heathrow. Heathrow will continue to operate within its legal operating cap of 480,000 aircraft movements a year (arrivals and departures) with or without SSA. Any future plans to increase the numbers of aircraft operating at Heathrow beyond this cap would have to be subject to a separate Government planning process, including further public consultation on any supporting airspace changes.

The purpose of this consultation document is to explain:

- What considerations Heathrow took when determining the type and angle of SSA;
- The final option proposed as part of this airspace change;
- The benefits and impacts of permanently adopting slightly steeper approaches;
- The impacts of reverting back to all aircraft operating 3.0° approaches.

SECTION 2 – HOW AIRCRAFT LAND AT HEATHROW

The following section sets out how aircraft currently land at Heathrow, including how wind affects the direction aircraft fly, holding stacks and how aircraft arrive on the final approach.

Wind Direction

Flights in and out of Heathrow airport use our two runways known as the northern and southern runways which run parallel east to west.

In the UK, the prevailing winds are mostly south-westerly (from the southwest) and aircraft generally land and take off into the wind. As a result, the majority of aircraft (approximately 70%) make their final approach over London and take off towards the west. This is known as 'westerly operations':

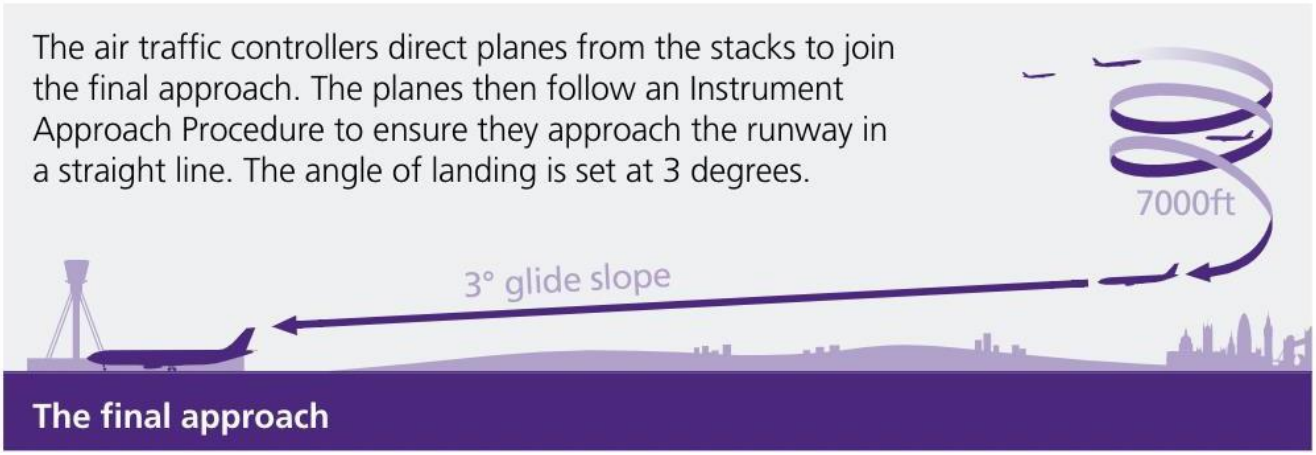
When the wind blows from the east (and over five knots (nautical miles per hour)), the direction of operation is switched and aircraft land from the west over Berkshire and take off towards the east. This is known as 'easterly operations' and occurs approximately 30% of the time.

Heathrow's slightly steeper approaches apply to both easterly and westerly operations for a subset of arrivals.

Holding stacks and final approach

Because Heathrow is so busy, aircraft coming into land at Heathrow are frequently held in 'holding stacks' where they circle above 7000ft until there is space in the queue to land at the airport. There are four holding stacks at Heathrow – known as 'Bovingdon', 'Lambourne', 'Ockham' and 'Biggin'. The locations of the stacks have been in the same position since the 1960s.

Aircraft enter the stack, circle and descend as shown in the diagram below. When they leave the stack, they are directed by air traffic controllers onto the final approach to land at Heathrow. The controllers manage the order of the aircraft from all four stacks and guide them safely onto one of Heathrow's two runways.



There are no set routes for aircraft between the holding stacks and final approach to land. While the overall patterns are similar, the precise position of aircraft in the skies varies from flight to flight and day to day. Aircraft are tactically positioned by Air Traffic Control onto final approach.

ILS Approaches

Once on the final descent when lined up with the runway (final approach), aircraft typically follow a system of radio beams known as the Instrument Landing System (ILS). There is one beam aligned with the centreline of each runway (northern and southern) to ensure aircraft are guided accurately to the runway when they come into land. There is an ILS available for arrivals from the east and west on each runway.

What is an ILS?

Instrument Landing System

The ILS is a radio navigation system which provides aircraft with horizontal and vertical guidance just before and during landing.

The ILS relies on physical infrastructure on the ground at the airport and enables aircraft to land in even the poorest of visibility conditions.

In line with global rule sets, Heathrow's ILS is calibrated to ensure arrivals descend on a standard 3.0° glide path.

Although the ILS is the type of approach procedure used by most arrivals into Heathrow, pilots can elect a different type of approach, known as an RNAV Approach. We provide more detail on RNAV approaches on the next page.

RNAV Approaches

What is RNAV?

Satellite based Area Navigation

Heathrow implemented the original 3.0° RNAV approaches to add resilience to the operation as it provides another commonly used approach procedure which could be used in the event of an ILS failure or unavailability.

As opposed to the physical infrastructure required on the airfield for the ILS, RNAV approaches use satellite technology to provide the navigational accuracy required to enable aircraft to be guided to the runway for landing. Once established on the final approach, there is no difference to the lateral track over the ground between Heathrow's ILS and RNAV approaches.

RNAV approaches require certain technology to be available on aircraft compared to that required for ILS landings. RNAV approaches are not quite as precise as ILS approaches which means in poor visibility, RNAV approaches become redundant and ILS approaches are required in order to continue to land safely.

Technical Note

This document refers to 'RNAV (Global Navigation Satellite System (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 industry standard term for these procedures is now '**RNP Approach**'.

When we refer to RNAV approaches we are specifically referring to Lateral Navigation (LNAV) and LNAV/Vertical Navigation (VNAV). Localiser Performance with Vertical Guidance (LPV200) approaches are **not** part of this ACP.

Pilots are responsible for determining which final approach procedure they use for landing. Where available, the ILS has been the landing system of choice for pilots for the last 50+ years across the world. In recent years, more modern approach procedures based on satellite navigation have been introduced, such as RNAV approaches.

Both the RNAV and ILS final approaches follow the same lateral path over the ground.

Performance Based Navigation

Our Slightly Steeper RNAV Approaches use Global Navigation Satellite Systems (GNSS) which is a form of Performance Based Navigation (PBN).

PBN improves the accuracy of where aircraft fly by moving away from outdated and conventional navigation using ground-based beacons, to modern satellite navigation. This is similar to the sat navs that most people have in their cars today.

It is important to note that SSA do not change the lateral tracks of aircraft over the ground. The procedures follow the same lateral profile as the ILS but rely on on-board equipment and satellite navigation as opposed to physical infrastructure on the airport.

Current SSA usage

In 2019, around 1400 out of just under 240,000 arrivals flew the Slightly Steeper RNAV Approaches. This was around 0.6% of arrivals. During the trials in 2015 – 2017 an average of 2% of arrivals operated SSA.

The main reasons for the lower number of RNAV arrivals compared to arrivals using our ILS are as follows:

0.6% SSA

99.4%

ILS

- ILS approaches have been the standard for over 50 years and flight crews are much more familiar with them compared to RNAV approaches, which are relatively new on a global level.
- With Heathrow's large and diverse range of airline customers, many flight crews operate long-haul (over 6 hours) flights meaning that they may only fly into Heathrow once every few months and at the end of a long flight crews will opt for the approach (ILS) with which they feel most comfortable. (69% of all the RNAV approaches flown during our first trial were performed by the A320 family, a short to medium-haul aircraft).
- RNAV approaches are only available in certain weather conditions, meaning that during poorer visibility they cannot be used.
- RNAV approaches result in a higher Air Traffic Control (ATC) and pilot workload.
- Not all the aircraft operating at Heathrow have the capability to fly RNAV approaches.

Heathrow's SSA Trials

In 2008 Heathrow implemented 3.0° RNAV approaches to add resilience to the operation as it provides another commonly used approach procedure which could be used in the event of an ILS failure or unavailability.

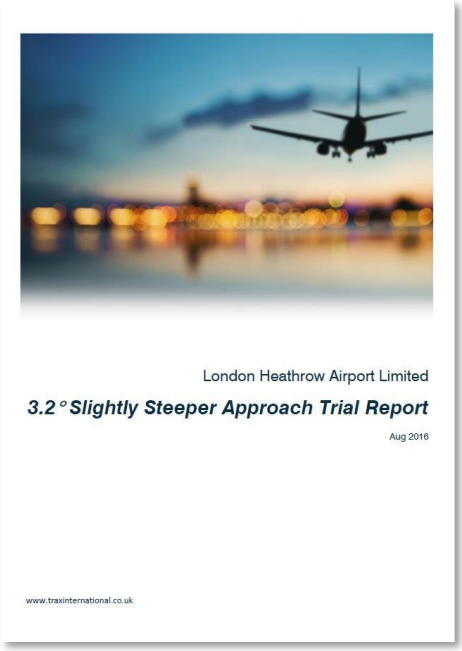
Between 17 September 2015 and 16 March 2016 and between 25 May 2017 and 11 October 2017, Heathrow ran two live trials to investigate the effect of a slightly steeper 3.2° RNAV approach on several factors including safety, the Heathrow operation and the environment.

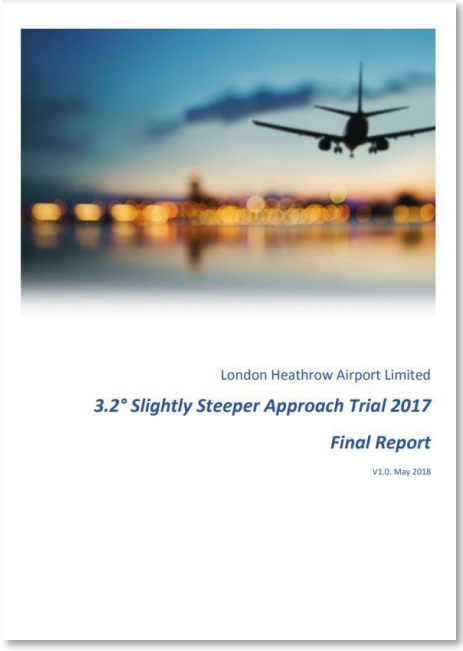
These SSA are still in operation at Heathrow as the CAA permitted this on a temporary basis whilst Heathrow follows the Airspace Change Process for their permanent adoption.

The trials demonstrated that our SSA were safe, had no detrimental impacts on the airport's operation, and provided a small noise benefit without negatively impacting community and aviation stakeholders.

As an outcome of the live trials and due to SSA continuing to operate on a temporary basis beyond the latest trial, we have actual data and information above and beyond the requirements of the guidance for the airspace change process (CAP1616) in certain areas regarding noise, environmental and operational impacts.

The information from the live trials and the ongoing operation of SSA has been used to inform all stages of this ACP to date and in particular the noise and environmental analysis undertaken as part of the Full Options Appraisal. The full trial reports are available here and here.



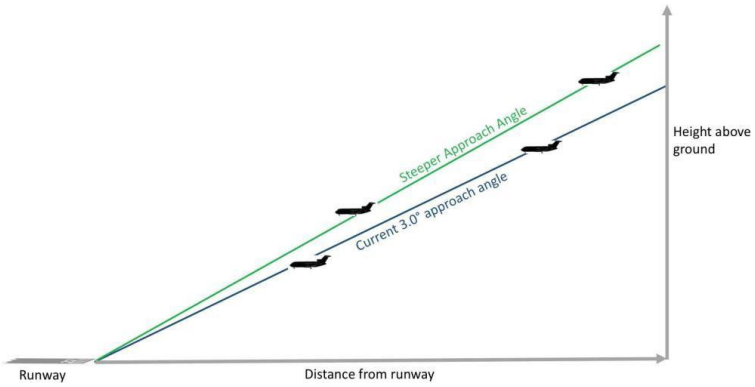


SECTION 3 – SLIGHTLY STEEPER APPROACHES

What are Slightly Steeper Approaches (SSA)?

A steeper approach involves increasing the angle of aircraft on the final approach (from around 10 nautical miles before the landing threshold) resulting in aircraft being higher over the ground for longer.

Prior to the SSA trials, all aircraft arriving at Heathrow operated a final approach using a 3.0° angle of approach. Following the continuation of the latest trial on a temporary basis, in 2019, 0.6% of Heathrow arrivals operated a 3.2° approach.

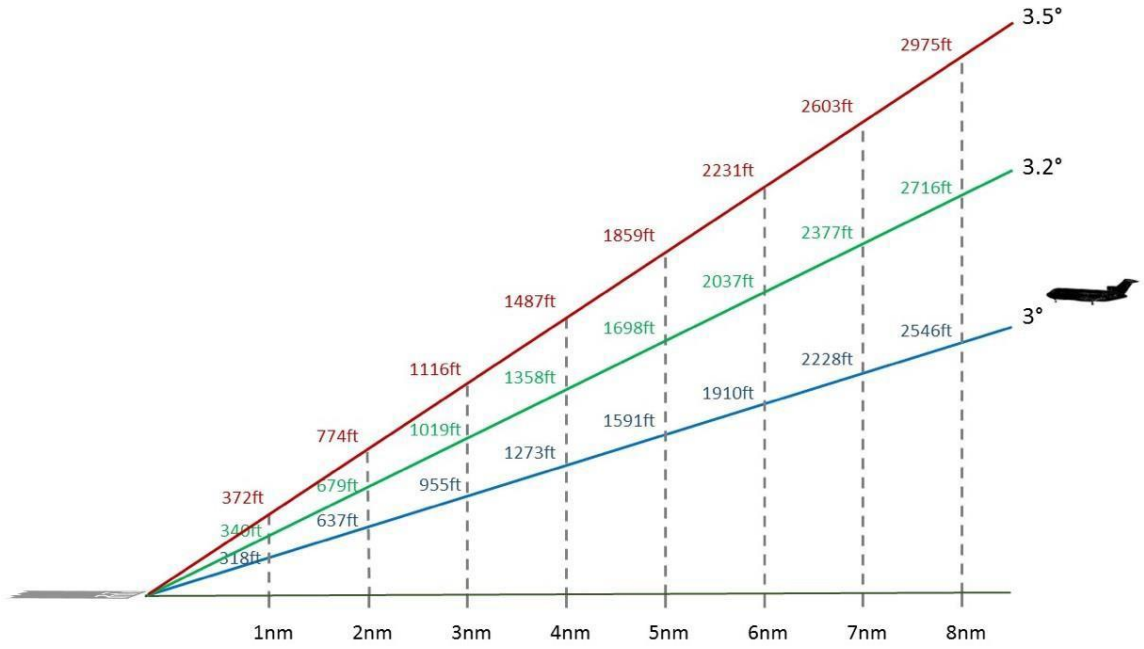


What are the benefits of SSA?

Increasing an aircraft's glide path (angle of approach) reduces noise in two ways:

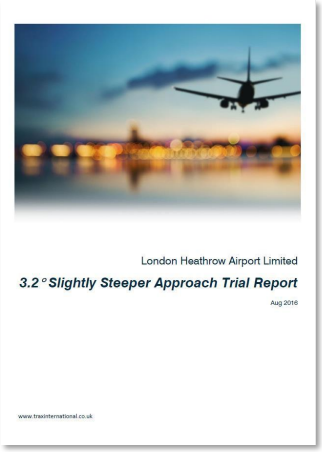
- It increases the height of the aircraft over the ground, increasing the distance over which sound travels before it reaches a population.
- It increases an aircraft's rate of descent, reducing the amount of engine power required and helping to reduce the amount of noise emitted.

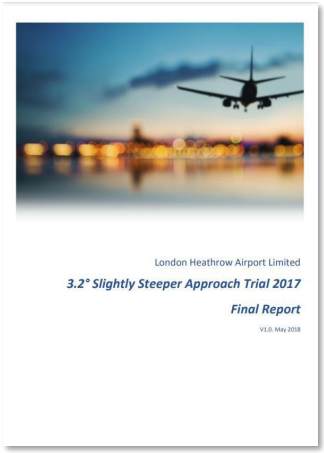
The illustration below shows the increase in height of an aircraft flying a steeper approach compared to a 3.0° approach.



Heathrow's Slightly Steeper Approach Options

As set out in Section 2, between 17 September 2015 and 16 March 2016 and between 25 May 2017 and 11 October 2017, Heathrow ran two live trials in order to investigate the effect of a slightly steeper 3.2° approach on a number of factors covering safety, the airport's operation and the environment.





As part of the preparation for a live trial, various options were considered to achieve the objective of introducing SSA. This preparatory work was then used when developing options for this ACP.

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.

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° RNAV approaches. In addition, it explains why we would like to adopt SSA on a permanent basis.

ILS and/or RNAV Approaches

As noted in Section 2, 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.

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.

To begin with, Heathrow needed to determine whether ILS, RNAV or both approaches could be steepened. 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 on the portal here.

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.

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

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

#	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		

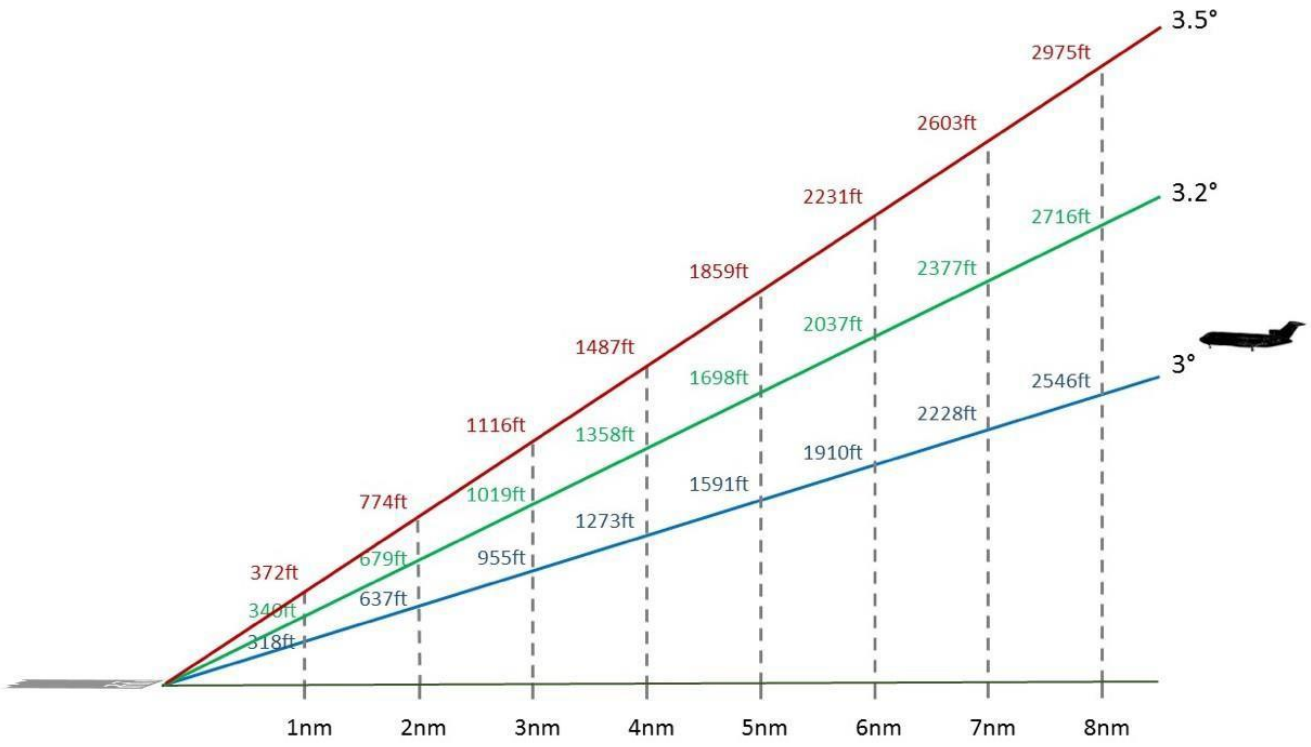
Doesn't meet the Design Principle	Partially meets the Design Principle	Meets the Design Principle

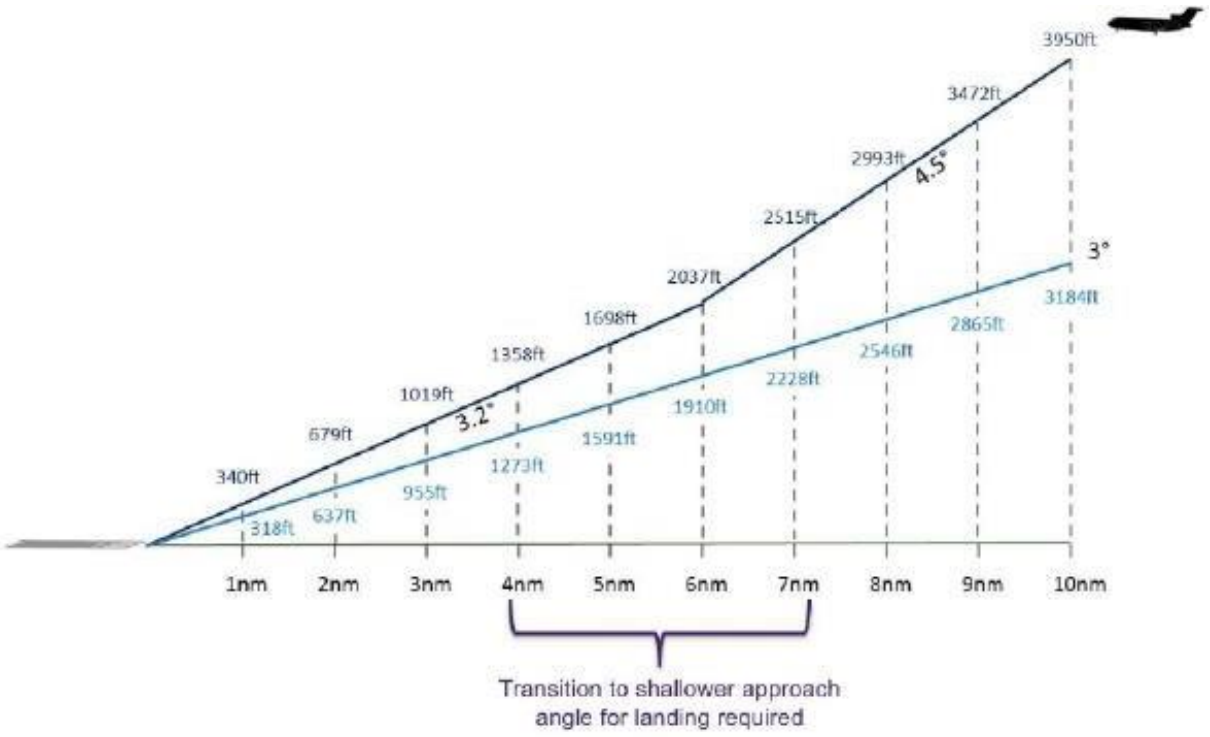
The information in Section 2 of this document explains why Option B: Steeper RNAV only partially meets design principles 7 and 8, in summary because RNAV approaches result in a higher ATC and pilot workload compared to ILS approaches, and not all the aircraft operating at Heathrow have the capability to fly RNAV approaches.

Steeper Approach Angles Considered

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°.

Illustrations of Steeper Approach Angles Considered and the extra height benefit of each





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 here.

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 on 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.

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

#	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

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 remains the baseline against which option B2 at 3.2° will be assessed.

The live trials have 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.

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

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).

Category	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

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 to be performed in Stage 3);
4) No identified stakeholder groups are adversely impacted by the adoption of Option B2.

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

Sound Exposure Level. The level generated by a single aircraft noise event at the monitoring point. This is normalised to a one second burst of sound and takes account of the duration of the sound as well as its intensity.

SECTION 4 – FULL OPTIONS APPRAISAL OF SLIGHTLY STEEPER APPROACHES

At Stage 3 in the CAP1616 process, an organisation requesting an airspace change is required to undertake a Full Options Appraisal for the options that progress from Stage 2B and then provide this information as part of a consultation on the proposal. We are now at Stage 3 with the Slightly Steeper Approaches ACP.

As part of this consultation, we are asking stakeholders whether we should keep Option B2 3.2° RNAV approaches on a permanent basis or revert back to all aircraft operating 3.0° approaches:

"Do you support the permanent adoption of slightly steeper approaches at Heathrow airport?"

To provide our stakeholders with the information needed for an informed response to this consultation, and as part of the CAP1616 process, we have undertaken detailed analysis of the impacts of keeping 3.2° SSA for some aircraft arriving at Heathrow or reverting back to all aircraft operating 3.0° RNAV approaches.

The below sections provide a high-level summary of the information contained within our Full Options Appraisal (FOA) document, which provides full details of the impacts and the methodology used to assess the impacts. The methodology used for our FOA is drawn on the Independent Commission on Civil Aviation Noise (ICCAN) best practice. The FOA document can be found on the CAA portal here.

About Option B2 Slightly Steeper 3.2° Approaches

Permanently adopting Option B2 Slightly Steeper 3.2° Approaches	Revert back to option B1 All aircraft operate 3.0° approaches
Option B2 Slightly Steeper 3.2° RNAV approaches are currently operated by 0.6% of aircraft arriving at Heathrow. (On average 2% of aircraft operated SSA during the trials in 2015-2017). When operating on a 3.2° approach, aircraft are higher over the ground than operating a 3.0° approach. This results in noise benefits which were demonstrated as part of the trials. Permanently adopting SSA would not result in any changes to lateral flight tracks. Slightly Steeper 3.2° RNAV Approaches apply to both easterly and westerly operations. If permanently adopted, it is anticipated that a similar number of aircraft will continue to operate SSA to what we have seen since their introduction in 2015.	Option B1 is the Baseline option which is used to demonstrate the impact of introducing 3.2° approaches for 0.6% of aircraft. If the ACP decision is made to revert, then all aircraft would operate 3.0° approaches using either RNAV or the ILS. Reverting to 3.0° RNAV approaches would not result in any changes to lateral flight tracks. Reverting to 3.0° RNAV approaches would result in a slightly worse noise footprint than has been in place since the second trial began in May 2017. Reverting to 3.0° RNAV approaches would apply to both easterly and westerly operations.

Full Options Appraisal Overview

Using the analysis and outcomes from the Full Options Appraisal, and using the same groupings as required by CAP1616, we have summarised the overall outcome of the analysis of SSA in the table below.

Click on each section below to see further detail from the Full Options Appraisal

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

Heathrow's preferred option

As part of the CAP1616 process, Heathrow is required to state its preferred option for this ACP. Our conclusion is that Option B2, to permanently introduce 3.2° RNAV slightly steeper approaches, is our preferred option for the following reasons:

- Keeping SSA reduces the average Sound Exposure Level (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 keeping SSA results in a small reduction in the number of people exposed to certain levels of noise. When we review these benefits in webTAG (the Department for Transport's guidance for appraising and monetising the impacts of noise on health and quality of life) the result is an overall monetised net benefit. For more information, please see our FOA document.
- Our environmental analysis of Air Quality, Greenhouse Gas (Carbon Emissions) and fuel burn shows a marginal net benefit of SSA. There is no adverse environmental impact of permanently implementing slightly steeper approaches.
- No identified stakeholder groups are adversely affected as a result of keeping SSA.
- There are no other construction or other works required in order 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 and would also require the published procedures to be reviewed by a UK Approved Procedure Design Organisation which is an additional small cost to Heathrow.

If you would like to find out more information about the above, please see our FOA document.

Our conclusion is that Option B2, to permanently introduce 3.2° RNAV slightly steeper approaches, is our preferred option.

We therefore support the permanent adoption of SSA at Heathrow airport.

SECTION 5 – HAVE YOUR SAY

Get involved

The consultation on slightly steeper approaches runs for 4 weeks from **5 March – 2 April 2021**.

All responses to the consultation should be submitted online via the CAA's Citizen Space Portal. The portal is available via the link below, via the Heathrow website, or at the following web address: https://airspacechange.caa.co.uk/PublicProposalArea?pID=17

If you are unable to respond online, you can respond in writing using the feedback form in appendix B. Any written responses will be manually uploaded onto Citizen Space and published.

All responses will be redacted and published on the Citizen Space portal as the consultation progresses and we will be reviewing the responses and keeping a frequently asked questions document up to date during the process. **The deadline for responding to this consultation is 2 April 2021.** Feedback received after this date will not be taken into consideration.

Slightly Steeper Approaches Consultation Portal

The consultation information can be accessed via the Citizen Space Portal and the Heathrow website. This is an online consultation only so we are not holding public events however you can contact the Heathrow team using the following email address if you have any questions (airspace@heathrow.com). Please note this email address is for questions only; we are unable to accept emails as a response to this consultation and all consultation responses must be submitted through the website linked above.

If you are unable to view the material on-line you can request a hard copy of the consultation documents by phoning the Heathrow Community Helpdesk (0800 344 844) or emailing Heathrow. Please note we are unable to accept emails as a response to this consultation, please use the link to the consultation site.

The Consultation Question

The question we are asking as part of the consultation is:

"Do you support the permanent adoption of slightly steeper approaches at Heathrow airport?"

There is also a free-writing section in the feedback form for any further feedback you wish to give on this airspace change proposal.

Have a question?

Email airspace@heathrow.com
Phone 0800 344 844

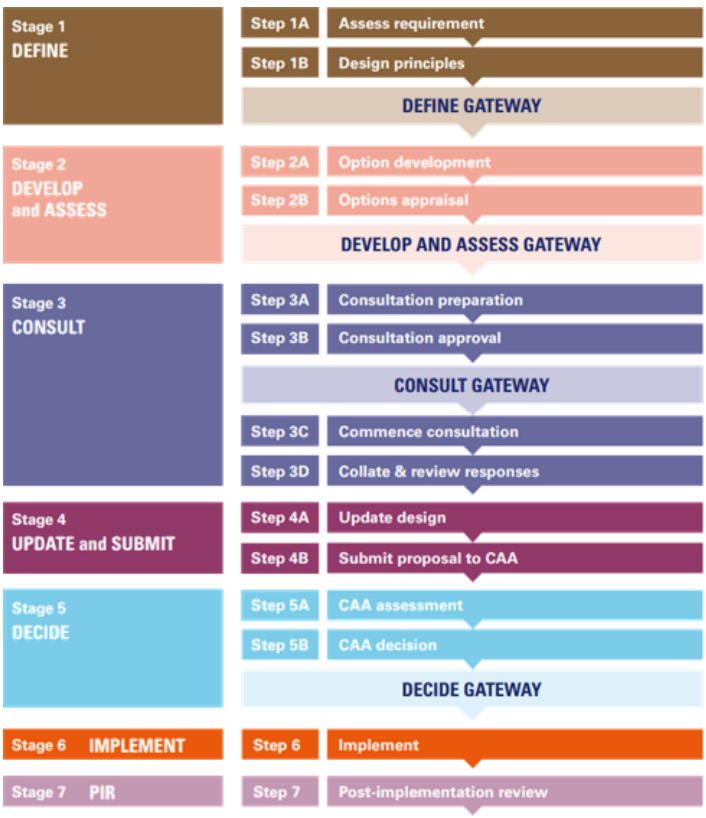
Please note we cannot accept email consultation responses.
Please use the link above for the SSA Consultation Site.

SECTION 6 – WHAT HAPPENS NEXT?

Next Steps

After the consultation has closed, we will collate, review, and categorise consultation responses on the portal. Our categorisation will be reviewed by the CAA. This forms Step 3D of the Airspace Change Process.

At Stage 4, we will consider the consultation responses and finalise our options appraisal. This will be published on the CAA airspace change portal.



APPENDIX A – FULL OPTIONS APPRAISAL SUMMARY

The tables below summarise the outcomes of the Full Options Appraisal (FOA). Full details of the methodology and the analysis can be found in the Full Options Appraisal document published on the CAA portal here; this forms part of the suite of consultation materials.

FOA Calculations

Owing to the significant decline in traffic in 2020 due to COVID-19, we have used 2019 as the baseline assessment year for the SSA FOA. CAP1616 requires change sponsors to also provide forecast data 10 years in future from the planned implementation date of the ACP. In the case of this ACP, this involves creating a future forecast for 2031.

In 2019, 0.6% of arrivals operated SSA therefore this percentage has been used throughout the FOA calculations. During the 2015-2017 trials, an average of 2% of aircraft operated SSA. Therefore the benefits, outlined in the following sections and based on the 2019 frequencies, may be improved if greater than 0.6% of flights fly SSA in future. It is important to note that the number of aircraft able to fly SSA is limited due to the RNAV procedure type and ATC workload, more information around this is available here.

For further information regarding the FOA methodology, please see the FOA document.

Communities

Impact	Summary of Assessment Outcome	
	Permanently adopt Option B2 **Slightly Steeper 3.2° RNAV Approaches**	**Revert to Option B1** **All aircraft operate 3.0° approaches**
Noise impact on health and quality of life	As part of the trials undertaken prior to this Airspace change proposal, Heathrow deployed additional noise monitoring equipment underneath the final approach to runway 27L. Data captured during the trials compared the noise levels from 3.0° ILS approaches and 3.2° RNAV approaches. The outcome of the SSA trials demonstrated that the average noise reduction across the monitors during both trials was 0.51dBA. 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 Sound Exposure Level (SEL) that is small and may be 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 (Appendix A of the FOA) which shows a small reduction in the number of people exposed to certain levels of noise. It is also reflected in the webTAG assessment which associates a net benefit of £27,632,143 (with a sensitivity test outcome of £10,544,020) across the 60-year appraisal period, with the permanent adoption of 3.2° RNAV SSA. There is further information regarding this, including full details of the noise contours, in the Full Options Appraisal document.	As 3.2° RNAV SSA (Option B2) are already in operation at Heathrow, reverting to Option B1, where all aircraft operate 3.0° approaches, will result in a small noise disbenefit. The reversion to all aircraft operating 3.0° approaches would mean that the average noise reduction of 0.51dBA for the 0.6% of flights that operate SSA would be lost. Whilst a change of 0.51dBA SEL is small, removing SSA would have a small negative impact on the current noise footprint. The noise exposure data shows that there would be a small increase in the number of people exposed to certain levels of noise; this is reflected in the webTAG assessments which shows a net disbenefit of £27,632,143 (with a sensitivity test outcome of £10,544,020) across the 60-year appraisal period, as a result of the removal of SSA. There is further information regarding this, including full details of the noise contours, in the Full Options Appraisal document.

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Communities

Impact	Summary of Assessment Outcome	
	Permanently adopt Option B2 **Slightly Steeper 3.2° RNAV Approaches**	**Revert to Option B1** **All aircraft operate 3.0° approaches**
Air quality	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 percentage of aircraft use (0.6% in 2019), combined with no change to lateral flight paths, means that the overall benefits are marginal.	There are overall air quality benefits associated with SSA due to the reduction in thrust and fuel flow required for the 3.2° approach therefore reverting to all aircraft operating 3.0° approaches would result in a very small disbenefit in air quality, however due to the small percentage of aircraft that operate SSA (0.6% in 2019), the overall disbenefits are marginal.

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Wider Society

Impact	Summary of Assessment Outcome	
	Permanently adopt Option B2 **Slightly Steeper 3.2° RNAV Approaches**	**Revert to Option B1** **All aircraft operate 3.0° approaches**
Greenhouse gas impact	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 CO_2 emissions is considered negligible.	
Capacity /resilience	The permanent adoption of 3.2° approaches will not impact the present movement cap at Heathrow Airport and there are no impacts on existing controlled airspace boundaries or airspace classifications. As such the permanent adoption of 3.2° approaches or reverting to all aircraft operating 3.0° arrivals, is expected to have a neutral impact on system capacity/resilience with the levels of uptake observed in the trials and current operations.	
Social Impact	There are eight social impacts considered as part of WebTAG however, none are applicable to airspace change as these are relevant to ground transportation and would not be affected by airspace change of any kind.	
Distributional Impact	For the SSA airspace change proposal, the distributional impact of noise has been considered within the respective noise and air quality assessment.	
Tranquillity	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.	

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Wider Society

Impact	Summary of Assessment Outcome	
	Permanently adopt Option B2 Slightly Steeper 3.2° RNAV Approaches	Revert to Option B1 All aircraft operate 3.0° approaches
Biodiversity	As the SSA airspace change proposal does not change the current lateral flight paths arriving aircraft fly on approach to Heathrow, and there would be no increase in the number of aircraft arriving at Heathrow, there is not potential for disturbance of biodiversity to increase. In terms of air quality, analysis shows that when aircraft operate SSA fuel burn and emissions are marginally reduced. In addition, aircraft remain at a greater height above ground and as such the contribution of aircraft engine emissions to ground-based biodiversity receptors will be lower when aircraft operate SSA. Overall, these changes will result in reductions in emissions at biodiversity receptors as a result of SSA, however the decrease in concentrations will be imperceptible and therefore the effects will be negligible. 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 there is no potential for any negative effect to arise as a result of the proposals on sensitive biodiversity receptors. Furthermore, as the decrease in noise levels are considered to be imperceptible, it is considered that any positive effects arising as a result of the proposals on the same sensitive biodiversity receptors, would on the whole be negligible.	
Historic Environment	It is considered that the SSA noise improvements will not affect noise thresholds enough to significantly alter the contribution of setting to the significance of heritage assets. Furthermore, there will be no change to the existing lateral flight paths and no increase in the number of air traffic movements as a result of either option. The Historic Environment assessment is therefore scoped out of the appraisal for SSA.	

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Wider Society

Impact	Summary of Assessment Outcome	
	Permanently adopt Option B2 **Slightly Steeper 3.2° RNAV Approaches**	**Revert to Option B1** **All aircraft operate 3.0° approaches**
Landscape / Townscape	WebTAG guidance for landscape (which is consistent with that for townscape, where relevant to airspace change) is applied to a tranquillity assessment. 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 being implemented, the nationally protected landscapes of National Parks and AONBs as sensitive receptors will not be affected by the SSA airspace change.	
Safety	During the two trials conducted between 2015 and 2017, feedback was gathered from Air Traffic Control (ATC) and Airlines, including a request for any safety observations. There were no safety observations submitted. The flight trials concluded that the trial 'met all objectives with no adverse impact on the daily operation'. Following the trial, slightly steeper 3.2° approaches have been allowed to continue on a temporary basis, and to date, no safety observations from ATC have been received.	Heathrow has safely operated 3.0° ILS and 3.0° RNAV approaches for many years. There will therefore be no impact on safety as a result of reverting to all aircraft operating 3.0° approaches.
Water Environment	An assessment of the impact on the water environment is not considered relevant for the SSA ACP as the airspace change will not result in any measurable effects on water receptors. This is because the SSA ACP would not require any changes to the current lateral flight paths arriving aircraft fly on approach to Heathrow, nor would it seek to increase the number of aircraft arriving at Heathrow. The Water environment assessment is scoped out for all Stages of the CAP1616 process for SSA.	

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General Aviation

Impact	Summary of Assessment Outcome	
	Permanently adopt Option B2 Slightly Steeper 3.2° RNAV Approaches	Revert to Option B1 All aircraft operate 3.0° approaches
Access	There are no impacts on existing controlled airspace boundaries or airspace classifications or on traffic numbers with the introduction of 3.2° arrivals. As such the permanent adoption of 3.2° arrivals, or the reversion to all aircraft operating 3.0° arrivals, is expected to have a neutral impact on General Aviation access.	

General Aviation and Commercial Airlines

Impact	Summary of Assessment Outcome	
	Permanently adopt Option B2 Slightly Steeper 3.2° RNAV Approaches	Revert to Option B1 All aircraft operate 3.0° approaches
Economic impact from increased effective capacity	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. The flight trials conducted between 2015 and 2017 reported 'no adverse impact on the daily operation' and 'no impact' on Heathrow airport's landing rate. The permanent adoption of 3.2° arrivals, or the reversion to all aircraft operating 3.0° arrivals, is expected to have a neutral impact on economic impact / capacity.	
Fuel burn	The flight trials conducted between 2015 and 2017 demonstrated 'no noticeable difference in tracks over the ground between the 3.0° and 3.2° arrivals or between the 1st and 2nd trial'. It was further reported that 3.2° arrivals 'no adverse impact on the daily operation' and 'no impact' on Heathrow airport's landing rate. This indicated that no increase in aircraft holding will arise from the permanent implementation of 3.2° approaches. During a 3.2° approach, the level of thrust required by an aircraft on final approach is slightly lower, which in turn leads to reduced fuel burn and reduced carbon emissions. Overall, the use of a 3.2° RNAV SSA will lead to a reduction in fuel burn for commercial aircraft compared to use of a 3.0° VPA. However, given the use of the of the 3.2° slope (0.6% of all arrivals in 2019) the influence of SSA on fuel burn will overall be negligible.	

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Commercial Airlines

Impact	Summary of Assessment Outcome	
	Permanently adopt Option B2 **Slightly Steeper 3.2° RNAV Approaches**	**Revert to Option B1** **All aircraft operate 3.0° approaches**
Training costs	3.2° approaches are currently operated at Heathrow and therefore there would be no training cost associated with the permanent adoption of option B2.	3.0° ILS approaches are currently operated at Heathrow and 3.0° RNAV procedures are published but not allocated, therefore there would be no training cost associated with option B1.
Other costs	3.2° approaches are currently operated at Heathrow. Furthermore, the use of RNAV approaches remains optional with the permanent adoption of 3.2° RNAV approaches. Therefore, operators of unequipped aircraft face no mandatory equipage costs.	There would be no other costs to airlines associated with option B1.

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Airport / Air navigation service provider

Impact	Summary of Assessment Outcome	
	Permanently adopt Option B2	**Revert to Option B1**
	Slightly Steeper 3.2° RNAV Approaches	**All aircraft operate 3.0° approaches**
Infrastructure costs	RNAV approaches do not rely on ground-based equipment to determine the final approach vertical and lateral path. 3.2° RNAV approaches are currently operated at Heathrow and therefore there would be no infrastructure costs associated with option B2. No change in infrastructure is required for either option.	3.0° ILS approaches are currently operated at Heathrow and 3.0° RNAV procedures are published but not allocated and therefore there would be no infrastructure costs associated with option B1. No change in infrastructure is required for either option.
Operational costs	Instrument Flight Procedures (IFP) design, validation, Aeronautical Information Publication (AIP) promulgation and ATC operational instructions and training have already been completed as part of the flight trials conducted in 2015 and 2017. The flight trials conducted between 2015 and 2017 reported 'No detrimental impact due to 3.2° approach' to ATC and 'no impact' on Airport landing rate. No further operational costs are applicable to Heathrow airport or ANSP for the permanent adoption of 3.2° RNAV approaches.	The 3.0° RNAV Approach procedures would require a review by a UK Approved Procedure Design Organisation to ensure there still exists a safe obstacle environment for their use.
Deployment costs	IFP design, validation, AIP promulgation and ATC operational instructions and training have already completed as part of the trials. As 3.2° RNAV approaches are currently operated at Heathrow, there are no further deployment costs applicable to Airport or ANSP for the permanent adoption of 3.2° RNAV approaches.	There would be no Airport/ANSP deployment costs associated with option B1.

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APPENDIX B – SSA CONSULTATION FEEDBACK FORM

The consultation on Slightly Steeper Approaches runs for 4 weeks from 5 March – 2 April 2021. To respond to this consultation, please use our Slightly Steeper Approaches Consultation Portal. If you're unable to respond online, please use the below form to answer the questions and return it to:

SSA Airspace Change Consultation
The Compass Centre
Nelson Road
Hounslow
TW6 2GW

All responses will be moderated by the CAA and published online. If you wish your response to be published anonymously, your personal details (name, postcode, email) will be redacted and only be seen by Heathrow and the CAA. Please select below:

☐ YES - Publish my response with my details

☐ NO – Publish my response anonymously

Name: _____

Representing (Self/Organisation): _____

Post code: _____

Email (if available): _____

Questions

Do you support the permanent adoption of slightly steeper approaches at Heathrow airport? (Please tick one box)

☐ Yes ☐No

Do you have any further feedback about this airspace change proposal?

_____

_____

_____

_____

Please continue overleaf if required.

If you have any questions about this ACP, please see the consultation website or contact us via airspace@heathrow.com or 0800 344 844. Please note that we cannot accept consultation responses via email or telephone.

APPENDIX C – ABBREVIATIONS

ACP	Airspace Change Proposal
AIP	Aeronautical Information Publication
ANSP	Air Navigation Service Provider
ANOMS	Airport Noise Monitoring and Management
ATC	Air Traffic Control
AQMA	Air Quality Management Area
CAA	Civil Aviation Authority
CAP	Civil Aviation Publication
CDA	Continuous Descent Arrival
dB	Decibels – unit to measure sound level
FOA	Full Options Appraisal
GA	General Aviation
GNSS	Global Navigation Satellite System
ICCAN	Independent Commission on Civil Aviation Noise
IFP	Instrument Flight Procedures
ILS	Instrument Landing System
IOA	Initial Options Appraisal
LNAV	Lateral Navigation
LPV	Localiser Performance with Vertical Guidance
MoD	Ministry of Defence
NATS	Primary UK Air Navigation Service Provider
NMR	National Monuments Record
Nx Contours	Nx contours show the locations where the number of events (i.e. flights) exceeds a pre-determined noise level, expressed in dB LAmax.
PBN	Performance Based Navigation
RMT	Remote Monitoring Terminal (Noise)
RNAV Area Navigation:	A method of instrument flight rules navigation that allows an aircraft to choose any course within a network of navigation beacons.
RNP	Required Navigation Performance
SEL	Sound Exposure Level: numerically equivalent to the total sound energy.

SSA	Slightly Steeper Approaches
VNAV	Vertical Navigation
VPA	Vertical Path Angle
WebTAG	UK Government Online Transport Analysis Guidance Tool