HEATHROW'S AIRSPACE DESIGN PRINCIPLES FOR EXPANSION

AIRSPACE PRINCIPLES

Heathrow

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Heathrow

This report has been produced for the purpose of setting out Heathrow's airspace design principles, which will be used by our airspace designers to inform the redesign of airspace to accommodate changes associated with the introduction of a third runway at London Heathrow Airport ("expansion"). This document forms our submission to the CAA for the Define Gateway of the CAP1616 Airspace Change Process, and provides evidence of our adherence to the CAA's requirements.

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1. CONTEXT

1.1 Airspace Modernisation

1.1.1 Airspace in the south-east of England is one 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.

1.1.2 In order to update the airspace and make it more efficient, major changes to flight paths 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).

1.1.3 The aim of the strategy is to make the airspace more efficient; improve punctuality; cut CO2 emissions; reduce noise from less aircraft-holding at low levels; 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. This is also part of a Europe-wide modernisation project, called the Single European Sky, to make the skies above Europe more efficient.

1.1.4 The introduction of Performance Based Navigation (PBN) is key to achieving the aims of airspace modernisation. PBN improves the accuracy of where aircraft fly and allows us to move away from airspace design based on 'conventional' navigation and the location of ground-based beacons, to airspace design based on modern satellite navigation technology. This allows for more flexible positioning of routes and enables aircraft to fly them more accurately. PBN helps improve operational performance and reduce delays, and provides new opportunities for mitigating noise impacts.

1.1.5 Over the last decade there have been improvements in aircraft navigational technology. Currently there are different types of navigation systems used by airlines and across different aircraft fleets, meaning that today there is an element of variation as to how and where aircraft fly. However, in the future, all aircraft will use PBN and this will result in narrower flight paths.

1.2 Heathrow Expansion

1.2.1 Heathrow plans to undertake the process to modernise its airspace at the same time as we expand the airport. The process to expand the physical airport

infrastructure follows a consenting process under the Planning Act 2008 to obtain a Development Consent Order (DCO) from the Secretary of State for Transport. This process is separate to the Airspace Change Process set out by the CAA.

1.2.2 Changes that are made to accommodate a third runway at Heathrow will also need to fit in with the changing airspace of the UK and Europe. Heathrow is working closely with the other airports in the south-east of England to develop an integrated approach to airspace modernisation.

1.2.3 To make changes to our airspace, we need to follow the CAA's Airspace Change Guidance.

1.3 Airspace Change Process

1.3.1 The DfT is responsible for all aviation policy in the UK, including airspace. The CAA is the organisation responsible for its regulation and for the Airspace Change Process which all airports must follow. Heathrow is responsible for the design of any changes to flight paths into and out of the airport up to approximately 7000ft.

1.3.2 Changes to flight paths are submitted to, and approved by, the CAA, following the Airspace Design Guidance set out in their document known as 'CAP1616'[1]. This guidance provides a process framework for changing airspace, and places great importance on engaging and consulting on airspace proposals with a wide range of stakeholders, including potentially affected communities.

1.3.3 In order to implement an airspace change, there are a number of steps that we need to go through within the CAA's Airspace Change Process. The first stage in this process[2] is defining the 'key principles for airspace design': this is the stage we are at now, and this document explains the steps we have taken to reach this first key stage in the Airspace Change Process.

[1] Airspace Design: Guidance on the regulatory process for changing airspace design including community engagement requirements, CAP1616, December 2017

[2] The CAA's Airspace Change Process is shown in Figure 1 on page 11

2. EXECUTIVE SUMMARY

2.1 Development of Design Principles

2.1.1 Before we can begin to design our future airspace for an expanded Heathrow, we need to develop a set of principles to use when designing new flight paths. We are starting the process of designing our new routes and the design principles will provide a framework for evaluating options to help us develop a future airspace design that finds the best balance between all stakeholder objectives.

2.1.2 The complete set of core principles include safety, environmental and operational criteria. These are in addition to the strategic policy objectives that we must achieve through our airspace change proposals if we are to meet the requirements of the Government's Airports National Policy Statement (Airports NPS)[3]. The principles also take account of relevant Government policy and local planning requirements.

2.1.3 However, beyond these core requirements, there are many options and trade-offs to choose between when designing future flight paths. The airspace design principles provide a framework for ensuring a consistent approach when making these trade-offs.

2.1.4 The consultation and engagement described in this report was undertaken to establish what these design principles should be and how they should be prioritised when considering different flight path options.

2.1.5 The final set of principles will help shape the design and structure of Heathrow's future airspace going forward.

2.2 Airspace Design Principles Consultation (January – March 2018)

2.2.1 In January – March 2018 we carried out our first airspace consultation on some of the key design principles we could use to redesign our airspace. Development of design principles falls under the first stage of the Airspace Change Process under CAP 1616. This ran alongside the consultation for changes on the ground to accommodate the airport expansion[4], and was the first of three airspace consultations that we will be undertaking for our airspace design.

2.2.2 The principles we consulted on addressed the key environmental choices or 'trade offs' that have been most frequently highlighted to us by local communities and

[3] Airports National Policy Statement: Policy framework for expansion at Heathrow Airport and primary basis for decision making on any development consent application for a new north-west runway, DfT, 5 June 2018

[4] The process to expand the physical airport infrastructure follows a consenting process under the Planning Act 2008 to obtain a Development Consent Order (DCO) from the Secretary of State for Transport

their representatives over several years as part of our ongoing stakeholder engagement activities. The consultation also included some principles that covered operational matters such as the technological requirements for airlines.

2.2.3 In this consultation we asked for feedback on these principles and how they should be prioritised. For example, should we design flight paths that look to minimise the total number of people significantly affected by noise or should we prioritise minimising the total number of new people overflown, or should we try and share flights over a wider area with the consequence of affecting more people.

2.2.4 We also asked whether there was anything else we should consider as a design principle.

2.2.5 All the feedback received was collated and analysed to enable us to produce a draft set of principles. This also took account of policy requirements such as safety, capacity and the requirements set out in the Airports NPS to help decide how the principles should be prioritised.

2.3 Post-Consultation Engagement (June - July 2018)

2.3.1 Over June and July 2018, we undertook supplementary engagement with community and industry stakeholders. This involved sharing our draft principles and asking for feedback on whether principles were missing from this list, and whether they felt the proposed prioritisation was appropriate.

2.3.2 We also commissioned a series of focus groups with members of the public within areas that had not generally engaged in the consultation. This was to ensure that we had a broad range of views from across different communities. For example, areas that are less affected by today's operations but which may potentially be affected by new routes in the future.

2.3.3 All feedback was collated and considered, and was used to produce a final prioritised set of design principles to be used when designing our future airspace for an expanded Heathrow. This will now be submitted to the CAA who will consider whether we have met the requirements of their airspace change guidance so far.

2.4 Heathrow's Design Principles

2.4.1 Table 1 sets out Heathrow's proposed prioritised list of design principles. The first five principles are core requirements of the airspace design related to policy or regulation. They all have equal priority since any airspace design option will need to deliver against each of these. These are set out as "Heathrow must…".

2.4.2 Principles 6-10 are the more strategic principles that Heathrow intends to deliver on, but inevitably some trade-offs will have to be made. These are set out as “Heathrow should…” and are shown in the table in priority order.

2.4.3 The order of priority for these principles provides a starting point for design decisions. For example, if all else is equal, a design that achieves an improvement for Principle 5 would be favoured above one that achieves a similar scale of improvement for Principle 6. However, the design decisions will rarely be that straightforward as every flight path option will have its own complex mix of benefits and impacts across the range of principles.

2.4.4 Furthermore, although these principles reflect the feedback received from our engagement up to this point, a further two airspace consultations will be held as we continue to develop our proposals. These consultations will provide a greater focus on local issues, for example it may highlight particular noise sensitive buildings that we should consider. Local considerations (including from the feedback from these consultations) will be considered in addition to our design principles as we move into the later stages of development, which will include full environmental assessment in accordance with CAP1616.

2.4.5 Whilst our principles do not provide a simple formula to develop our airspace design, they are a valuable first step in the airspace design process, and we will refer to them whenever we make design decisions. This will ensure transparency by showing our stakeholders how these principles have been taken into account in our emerging future designs.

2.4.6 The rationale for why these principles have been chosen, and for the proposed order of these principles, can be found in Chapter 4 of this document. A table of all suggested design principles that were not included in our final list, including those suggested by stakeholders at consultation and through other engagement forums, is also provided in Appendix 8.

Table 1: Heathrow's Airspace Design Principles for Expansion

	Heathrow's Airspace Design Principles for Expansion
1.	Must be safe
2.	Must meet Airports NPS requirements[5], including capacity
3.	Must meet 3 Airports NPS noise policy tests[6]
4.	Must meet local air quality requirements
5.	Must meet commitments to the UK's Future Airspace Strategy
6.	Should limit, and where possible reduce, local noise effects from flights by:
	a. Using more noise efficient operational practices
	b. Minimising number of people newly overflown
	c. Maximising sharing through predictable respite
	d. Avoiding overflying communities with multiple routes
	e. Maximising sharing through managed dispersal
	f. Minimising total population overflown
	g. Designing flight paths over commercial and industrial areas
	h. Where appropriate, prioritising routing flight paths over parks and open spaces (rather than over residential areas), but avoiding overflight of Areas of Outstanding Natural Beauty (AONB))
7.	Minimise fuel/CO2/greenhouse gases per flight
8.	Ensure operational efficiency and resilience to maximise benefits to all stakeholders
9.	Base our airspace design on the latest navigation technology widely available
10.	Minimise impact on other airspace users

2.5 Submission to CAA

2.5.1 These design principles for Heathrow Expansion will be submitted to the CAA for the Stage 1: Define Gateway in September 2018. If the CAA accepts that Heathrow has met the necessary requirements at this Gateway, then these Principles will form the basis for the next stage of the CAP1616 process (Develop and Assess Options). We will continue to engage our stakeholders throughout the airspace design process and will undertake our second airspace consultation for an expanded Heathrow in 2019.

[5] Table 3 summarises the relevant Airports NPS requirements
[6] Table 3 summarises the Airports NPS noise policy tests

3. HEATHROW'S AIRSPACE DESIGN PRINCIPLES SUBMISSION

3.1 Purpose of this document

3.1.1 The purpose of this document is to set out Heathrow's airspace design principles, which will be used to inform the redesign of airspace, to accommodate changes associated with the introduction of a third runway ("expansion") at London Heathrow Airport. This document is our submission to the CAA for the Define Gateway of the CAP1616 Airspace Change Process and provides evidence of our compliance with the CAA's requirements.

3.1.2 The CAA sets out the regulatory approval process for airspace changes (see Figure 1). In January 2018, Heathrow completed Step 1A ("Assess Requirement") of the CAP1616 process, where we submitted our requirements for airspace change for expansion to the CAA at an Assessment Meeting[7].

Figure 1: Overview of CAA's CAP1616 Airspace Change Process

3.1.3 Step 1B of the CAP1616 process ("Design Principles") requires us to submit our design principles for airspace change. These will be reviewed by the CAA at the Define Gateway meeting, scheduled for 28 September 2018.

[7] https://www.caa.co.uk/uk/Commerical-industry/Airspace/Airspace-change/Decisions-from-2018/london-Heathrow-airspace-departure-and-arrival-prodecures/

3.2 What is a Design Principle?

3.2.1 CAP1616 defines design principles as encompassing "the safety, environmental and operational criteria and strategic policy objectives that the change sponsor aims for in developing the airspace change proposal". The design principles must take account of all relevant Government policies and any local criteria.

3.2.2 Design principles will include fundamentals such as safety, throughput of air traffic, and environmental impacts. But they must also be developed in a local context to take account of local priorities within the area affected by Heathrow's airspace. A key requirement in the development of design principles is therefore stakeholder engagement to help identify airport-specific and proposal-specific principles. CAP1616 states that design principles must "be drawn up through discussion between the change sponsor and affected stakeholders at this early stage in the process". Chapter 6 sets out how Heathrow has developed our airspace design principles through engagement with our stakeholders.

3.3 How will we use our Design Principles?

3.3.1 Design principles will be used in two ways:

1. To inform the development of airspace design options; and,
2. To form a framework against which airspace design options can be evaluated.

3.3.2 In some cases, design principles may be contradictory; for example, where avoiding one kind of impact is likely to increase another. Our proposed design principles have therefore been given a priority order based on a combination of criteria, as set out in Table 2.

Table 2: Approach to Prioritisation of Design Principles

Heathrow's Approach to Prioritisation of Airspace Design Principles	
Policy and regulatory requirements	These set out the safety, environmental and operational criteria that Heathrow's airspace change will need to meet to achieve the required approvals for both the airspace change and the expansion programme on which this airspace change depends. These are our 'core requirements' and any airspace design option will need to deliver against these design principles. These principles are therefore given the highest priority.
Stakeholder feedback	The other design principles are based on Stakeholder feedback, and are essentially our strategic policy objectives. These design principles clarify how we will approach the various trade-offs and options which we expect to encounter during the airspace design phase (Stage 2 of CAP1616) by identifying which of these design principles will take highest priority when evaluating different airspace design options.
Practical design considerations	The prioritisation takes account of practical airspace design considerations to ensure the design principles are fit for purpose.

3.3.3 The prioritised design principles will be used in the development of airspace design options. We will have a set of airspace principles in priority order to help us design our options, however the order will be used as a guide rather than as a rule. We do not intend the design principles to impose a constraint on innovation, since consideration of a wide range of options is the best way to find an overall optimal solution.

3.3.4 The prioritised list of design principles will be used in our appraisal of airspace design options (supported by other factors, including WebTAG[8] appraisal results). This allows for qualitative assessment and judgement to enable informed decisions to be made.

3.3.5 The order of priority of these principles provides a starting point for design decisions. For example, if all else is equal, a design that achieves an improvement for Principle 6 would be favoured above one that achieves a similar scale of improvement for Principle 7. However, the design decisions will rarely be that straightforward as every option will have its own complex mix of benefits and impacts across the range of principles.

3.3.6 Whilst our principles do not provide a simple formula to develop our airspace design, they are a valuable first step in the CAA's airspace design process and we will refer to them whenever we make design decisions. This will ensure

[8] https://www.gov.uk/guidance/transport-analysis-guidance-webtag

transparency by showing our stakeholders how these principles have been taken into account in our emerging future designs.

3.3.7 CAP1616 recognises that there are technical constraints that will inform the development of airspace designs, and our design principles can only be used to consider design options that meet these constraints. Constraints include:

- Safety;
- Operational;
- Technical;
- Economic; and
- The policy and regulatory framework with which the proposal must comply.

3.3.8 These sit alongside the design principles as factors to consider in the design process, for example our designs must fit with the available technology and within cost constraints.

3.3.9 The principles reflect the feedback received from our engagement to date: a further two airspace consultations will be held as we continue to develop our proposals and get a better understanding of which localities are potentially impacted and which are not. These consultations will provide a greater focus on local issues, for example it may highlight particular noise sensitive buildings that we should consider. The feedback from these consultations will be considered alongside our design principles as we move into the later stages of development, which will also include an environmental assessment in accordance with CAP 1616.

3.3.10 We will refer to the framework of the design principles when we present our shortlisted and preferred flight path options later in the design process. Where we have favoured an option that does not deliver against the principles in the prioritised order, we will clearly articulate our rationale for the decision in accordance with CAP1616 requirements. Results of our options evaluation and assessment will be published on the Heathrow website at each consultation, and on the Heathrow website and CAA Portal at each gateway, to ensure full transparency to our stakeholders.

4. AIRSPACE DESIGN PRINCIPLES FOR EXPANSION

4.1 Heathrow's Airspace Design Principles for Expansion

4.1.1 Our list of airspace design principles for expansion is presented below, in Table 3. This table is the result of our findings from stakeholder engagement activities (as set out in Chapter 6).

4.1.2 The first 5 principles are core requirements of the airspace design related to policy or regulation. They all have equal priority since any airspace design option will need to deliver against each of these. These are set out as "Heathrow must…".

4.1.3 The following principles (6-10) are the more strategic principles that Heathrow intends to deliver on. These are set out as "Heathrow should…" and are shown in the table in priority order.

4.1.4 The table includes:

- The rationale for inclusion of the principle and for its' priority ranking, including policy and regulation where relevant;
- A summary of stakeholder feedback on the principle; and,
- The degree of consensus reached during stakeholder engagement, graded as "Strong agreement", "General agreement", "Disagreement" or "Strong disagreement".

Table 3: Heathrow's Airspace Design Principles for Expansion

	Design Principle	Rationale	Stakeholder Feedback	Degree of Consensus
1.	Must be safe	Safety is paramount. The design must meet or exceed all relevant national and international safety standards.	Feedback on draft design principles showed support for this as highest priority	Strong agreement.
2.	Must meet Airports NPS requirements, including capacity	The airspace design will need to allow Heathrow to meet all requirements set out in the Airports NPS[9]. This includes a requirement to provide resilient capacity for at least 260,000 additional movements per year, to meet the needs of future passengers and the UK economy.	Airlines support this as a core requirement, to enable future resilience and operational efficiency.	General agreement.

[9] Airports National Policy Statement, 2018 (https:assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/714106/airports-nps-new-runway-capacity-and-infrastructure-at-airports-in-the-south-east-of-england-web-version-pdf)

3.	Must be compliant with the 3 Airports NPS noise policy tests	We recognise that additional capacity has to be delivered in a sustainable way and are fully supportive of the Airports NPS three key noise tests[10], within the context of government's policy on sustainable development: - Avoid significant adverse impacts on health and quality of life from noise; - Mitigate and minimise adverse impacts on health and quality of life from noise; and - Where possible, contribute to improvements to health and quality of life. Each design option will be assessed using WebTAG methodology which includes quantification of health effects related to noise.	Some community stakeholders would prefer these tests to be more clearly defined.	Strong agreement. All stakeholders recognise the value of these tests.
4.	Must meet local air quality requirements	We will meet local air quality requirements. We will prioritise air quality in the design of airspace up to 1000ft[11] in accordance with Government guidance[12].	Questions from industry and community over how this will be achieved, and whether it will lead to increased noise.	General agreement.
5.	Must meet commitments to the Government's airspace modernisation strategy.	Heathrow, along with all UK airports, has committed to deliver airspace modernisation by 2030 and is working with NATS and other airports in the south east to deliver to an agreed timeline. We have taken the logical decision to undertake airspace modernisation as part of the expansion programme since both programmes require substantial redesign of our airspace.	Industry stakeholders see modernisation as the key to unlocking many benefits, including to passengers and local communities. Some community stakeholders have concerns about concentration of aircraft on a route caused by PBN[13].	Disagreement. Some stakeholders expressed concerns about airspace modernisation leading to concentration of aircraft on a route: this is a matter of government policy and beyond the scope of airspace design principles
6.	Should limit, and where possible reduce, local noise effects from flights	We will seek to minimise noise effects where possible, and we will consider local circumstances when	Historic feedback and consultation feedback showed a clear preference for the prioritisation of	Strong agreement. Some stakeholders stated that environmental impacts (fuel/CO2/greenhouse

[10] These same 3 tests are set out as objectives in the Government's UK Airspace Policy, 2017. (https://assets.publishing service.gov.uk/government/uploads/system/uploads/attachment_data/file/714106/airports-nps-new-runway-capacity-and-infrastructure-at-airports-in-the-south-east-of-england-web-version.pdf)

[11] Air Navigation Guidance, 2017, states that 'emissions from aircraft above 1000ft are unlikely to have a significant impact on local air quality'.

[12] Flight tracks up to 1000ft are largely dictated by runway position and opera ing procedures rather than airspace design. Air Navigation Guidance, 2017, recognises that airspace design above 1000ft is unlikely to have a significant effect on local air quality due to mixing and dispersion but states that the CAA should include considera ion of whether local air quality could be impacted when assessing airspace change proposals.

[13] Performance Based Navigation

		evaluating the noise impact. Government guidance states that minimising noise should be the priority (over environmental considerations) for the design below 7000ft[14]. We recognise that there are many potential applications of this principle which are sometimes contradictory. This principle is therefore broken down into prioritised sub-principles (a-h) based on stakeholder feedback.	minimising noise above all other potential principles. Noise impact was also considered a high priority by stakeholders at focus groups and by airlines.	gases) should be prioritised above noise.
	a. Use more noise efficient operational practices	More noise efficient operations such as optimal climb/descent rates, climbing/descending continuously, avoiding low level holding, and noise reduction through speed management have obvious benefits with limited, or no, dis-benefits to trade off against. The Airports NPS recognises that Heathrow has already introduced more noise efficient operational practices over recent years[15] and states that further opportunities should be investigated. New technology should enable further advancements. Routes will therefore be designed to incorporate noise efficient operational practices both vertically and horizontally, wherever practical.	Historic engagement has shown that quieter operating procedures (such as keeping aircraft high for as long as possible) are important to our local communities, particularly those living closest to the airport[16].	Strong agreement. No evidence that any stakeholders disagree with this principle, or with its' position in the list.
	b. Minimise number of people newly overflown.	It is sometimes impossible to avoid overflight of new areas, but we will seek to avoid overflying new	Principles b and c are both desirable methods of reducing the noise impact for communities, and stakeholder	General agreement. Those who consider themselves currently overflown would generally prefer

[14] Air Navigation Guidance states that 'in airspace from the ground to below 4000ft the government's environmental priority is to limit and, where possible, reduce the total adverse effects on people' and 'at or above 4000ft to below 7000ft, the environmental priority should continue to be minimising he impact of aviation noise in a manner consistent with the governments overall policy on aviation noise, unless the CAA is satisfied that the evidence presented by the sponsor demonstrates this would disproportionally increase CO2 emissions'.

[15] "It is recognised that Hea hrow Airport already supports a number of initiatives to mitigate aircraft noise, such as developing quieter operating procedures (like steeper descent approaches) and keeping landing gear up as long as possible. The applicant is expected to continue to do so, and to explore all opportunities to mi igate opera ional noise in line with best practice. The implementation of such measures may require working with partners to support their delivery" (Airports NPS, June 2018)

[16] Heathrow is currently undertaking a trial of steeper departures, and will consider the results of this trial before determining the noise impact of steeper climbs.

		communities where possible. This is consistent with Government guidance which states that where options are similar in terms of the number of people affected, preference should be given to the option which is closest to existing published airspace arrangements[17].	engagement supported the inclusion of both of these. Those who consider themselves currently overflown tended to favour sharing noise, and those who consider themselves not currently overflown tended to favour minimise new. The practical application of this is to generally seek to avoid new people first (principle b) and then share noise across the areas already overflown (principle c). This provides the best opportunity for meeting both principles. If we were to prioritise "maximise sharing" over "minimise new", we would seek to spread flight paths as widely as possible. It would not then be realistically feasible to "minimise new".	"maximise sharing" to be prioritised over this principle. Feedback from our community forums indicated that some of them would prefer the noise impact to be reduced for communities currently overflown and increased for new communities: this was not consistent with Government guidance or with many stakeholders' perceptions of 'fairness'. Note that the above rationale considers two principles in isolation. In reality this trade off will be made in the context of the other design principles (in particular the need to connect to a completely new runway) which will inevitably result in some people newly overflown.
	c. Maximise sharing through predictable respite	We will seek to offer predictable respite[18] to those overflown, this maybe by one of two methods: - using multiple routes from a single runway to share impacts across different areas with different routes being active at different times - through runway alternation so that routes relating to each runway are only active when that runway is in use. The Government recognises that predictable periods of relief from aircraft noise (known as respite) are important for communities affected[19].	Consultation feedback and historic stakeholder engagement have shown that those currently overflown are generally in favour of sharing flight paths over a wider area, and there was a small preference amongst stakeholder focus groups for predictable respite over general dispersal[20].	General agreement. Some stakeholders would prefer this principle to be prioritised above principle b. Airlines accept the principle, but commented that the number of flight path options would need to be assessed for feas bility.

[17] Air Navigation Guidance, 2017, states "where options for route design from he ground to below 4,000 feet are similar in terms of the number of people affected by total adverse noise effects, preference should be given to that option which is most consistent with existing published airspace arrangements".

[18] Air Navigation Guidance, 2017, states "The principle of noise respite is to provide planned and defined periods of perceptible noise relief to people living directly under a flight path".

[19] Airports National Policy Statement 2018 states that "The Government also recognises that predictable periods of relief from aircraft noise (known as respite) are important for communi ies affected". Air Navigation Guidance, 2017, states that "The Government also expects the CAA to encourage the use of new and innovative approaches to managing aviation noise through airspace design such as the provision of respite for communities already significan ly affected by aircraft noise where possible".

[20] The consultation did not distinguish between the different approaches to sharing (i.e. respite and dispersal) since this would have added a layer of complexity hat may have reduced the response rate.

	d. Avoid overflying communities with multiple routes	This further application of the sharing principle, where possible we will seek to avoid the following below 7000ft: - arrivals and departures overflying the same communities; - converging routes over the same communities; - Heathrow's routes and those from neighbouring airports overflying the same communities. This principle was suggested by respondents to the consultation, and is supported by our own experience from recent trials and historic engagement with community forums. It is also broadly complementary to providing respite because switching off one route will not provide effective respite if there is another route impacting that area.	Feedback from stakeholders, both formally and in discussions at consultation events and community forums, indicated that this principle could help deliver against the broader principle to "share noise". This principle could benefit those under arrival routes where we have less flex bility around designing multiple routes for respite.	Strong agreement. Principle suggested by stakeholders. No evidence that any stakeholders disagree with this principle, or with its' position in the list.
	e. Maximise sharing through managed dispersal	An alternative approach to maximising sharing is to spread routes over a wider area to share the impact of noise. This would mean each flight path was flown less frequently but a wider area would be affected by noise[21]. We have prioritised the principle of predictable respite (principle c) over this one but there may be instances where: a. The other sharing principles do not deliver in respect to the higher principles (e.g. meeting the 3 Airports NPS noise policy tests), or b. Our ongoing stakeholder engagement indicates that this use of alternating routes may offer a better solution for specific local communities.	Feedback from stakeholders has shown that those currently overflown are generally in favour of sharing flight paths over a wider area.	General agreement. No evidence that any stakeholders disagree with this principle. Some stakeholders have suggested a principle of managed dispersal, to mitigate the impacts of concentration caused by PBN[22]. Airlines accept the principle, but commented that the number of flight path options would need to be assessed for feas bility.

[21] Air Navigation 2017 defines relief as "when multiple routes are designed and operated far enough apart to offer a perceptible reduction in noise for communities. Respite is one form of relief, but multiple flight paths could also be operated at the same time but with an alternating pattern of operation".

[22] Performance-Based Naviga ion. As part of Heathrow's commitment to the Future Airspace Strategy, we will introduce performance-based navigation, which allows more flexible positioning of routes and enables aircraft to fly them more accurately. However, "the increased concentration of aircraft concentrates the aircraft noise over a smaller area which can negatively affect those communities in the close vicinity of the PBN flight path" (CAP1378, CAA, 2016)

	f. Minimise total population overflown	This principle has been positioned below "minimise new" and "share noise" based on stakeholder feedback that showed it was the lowest priority of these 3 options. However, it remains an important consideration when assessing different airspace options, and is referenced in Government policy[23]. We recognise that the prioritisation of sharing principles (c, d and e) means that a larger number of people will be overflown, but with fewer aircraft overflying each community than there would have been if this "minimise total" had taken priority. However, we will seek to minimise the number of people overflown by aircraft using Heathrow, since it is still desirable to do so, within the constraints of delivering against higher priority principles.	Stakeholder engagement indicated that minimising newly overflown and sharing flight paths over a wider area were of greater priority to our community stakeholders than minimise total. This principle is therefore of lower priority.	General agreement. No evidence that any stakeholders disagree with this principle. However, a minority of stakeholders would have preferred this principle to be prioritised over "minimise new" and "share noise".
	g. Design flight paths over commercial and industrial areas	Where poss ble, we will seek to design flight paths to go over commercial and industrial areas to reduce the noise effects over residential areas. This principle was suggested by stakeholders on the basis that these areas generally have higher background noise and fewer residents. This approach would be appropriate in some cases; however, we recognise that overflying these areas would impact adjacent areas and may involve overflying new communities or limiting the sharing poss bilities. This principle would only be delivered if we could achieve acceptable results for the higher priority principles at the same time.	This principle was suggested by consultation respondents and was accepted by Heathrow as having benefits for reducing noise over residents, with little, or no, dis-benefits to trade off against. This is consistent with minimising total population overflown (principle f), since commercial and industrial areas tend to be areas of low population.	Strong agreement. No evidence that any stakeholders disagree with this principle, or with its' position in the list.

[23] Air Navigation Guidance, 2017, sets out the Government's environmental objectives with respect to air naviga ion, including: "limit and, where possible, reduce the number of people in the UK significantly affected by adverse impacts from aircraft noise".

	h. Where appropriate, prioritise routing flight paths over parks and open spaces (rather than over residential areas), but avoid overflight of Areas of Outstanding Natural Beauty (AONB) where possible.	Where we are able, we will seek to route flight paths over parks and open spaces, rather than over the residential areas surrounding them. However, we recognise Government guidance on avoiding overflight of national parks and AONBs[24], and that overflying these areas could impact adjacent areas and may involve overflying new communities or limiting the sharing possibilities. This principle is therefore low priority and will only be considered where design options already achieve acceptable results for the higher priority principles, and following consideration of other effects of this principle. We will seek to avoid overflight of AONBs and National Parks, where poss ble, and will consider each park/open space on a case-by-case basis.	Stakeholder feedback (particularly in consultation responses) showed a preference for overflying parks and open spaces, and protecting peoples' homes from noise where possible. However, some stakeholders stressed the importance of protecting AONBs from noise, and we amended this principle based on this feedback.	General agreement. The majority of stakeholders supported this principle. However, no evidence that any stakeholders disagree with its' position (as a low priority) in the list.
7.	Minimise fuel/CO2/greenhouse gases per flight	Government guidance states that minimising noise should be the priority (over CO2 considerations) for the design below 7000ft, and we have prioritised that accordingly. However, this principle is given the next highest priority after noise. Government guidance recognises the importance of minimising the environmental impact of aviation[25] and the Airports NPS includes a requirement to deliver airspace change for expansion within national targets on greenhouse gas emissions[26].	Stakeholder engagement showed a preference for prioritising noise over emissions. However, the financial impact of fuel burn was raised by airlines, and the focus groups highlighted this principle as being of significant concern to the wider population.	General agreement. No evidence that any stakeholders disagree with this principle. A minority of stakeholders would have preferred this principle to be prioritised over "minimise noise".

[24] Air Navigation Guidance, 2017, states that "where practicable, it is desirable that airspace routes below 7,000 feet should seek to avoid flying over Areas of Outstanding Natural Beauty (AONB) and National Parks"

[25] Air Navigation Guidance, 2017, sets out the Government's environmental objectives with respect to air naviga ion, including: "ensure that the aviation sector makes a significant and cost-effective contribution towards reducing global emissions".

[26] "The Government also acknowledges the local and national environmental impacts of airports and aviation, for example noise and emissions, and believes that capacity expansion should take place in a way that satisfactorily mitigates these impacts wherever possible. Expansion must be deliverable within national targets on greenhouse gas emissions and in accordance with legal obligations on air quality" (Airports NPS, June 2018)

		In addition, airline operations should not be penalised to the extent that they become uneconomical because of fuel.		
8.	Ensure operational efficiency and resilience to maximise benefits to all stakeholders	We will seek to design airspace to minimise pilot and air traffic control workload. This will enhance safety, provide capacity and resilience, and reduce delay for airlines and their passengers.	Feedback from stakeholder focus groups and industry stakeholders indicated the importance of operational efficiency for the benefit of all. However, most stakeholders considered this principle to be of lower priority than minimising local noise effects or minimising environmental effects.	Strong agreement. No evidence that any stakeholders disagree with this principle, or with its' position in the list.
9.	Base our airspace design on the latest navigation technology widely available	We will seek to use modern navigation technology to future proof our airspace design. Modern navigation technology will reduce pilot and air traffic control workload, which will lead to enhanced safety, with more capacity and less delay. We will seek to ensure that airlines that have invested in technology get direct operational benefit from doing so. In accordance with the Airports NPS, we will also ensure the benefits of future technological improvements are shared with local communities[27].	Based on stakeholder feedback, we know this principle is important to airlines and other aviation industry stakeholders. Focus groups also perceived a link between this principle and quieter and more efficient aircraft, and were therefore supportive of this principle.	Strong agreement. No evidence that any stakeholders disagree with this principle, or with its' position in the list.
10.	Minimise impact on other airspace users	We are mindful of other airspace users[28] who share the airspace around Heathrow, and seek to be a good neighbour. We will only seek additional controlled airspace where justifiable, and we will look to identify opportunities to release controlled airspace that is not essential for our future operation. We will seek to employ airspace sharing arrangements where possible.	Based on stakeholder feedback, we know this principle is important to other airports and the general aviation community. However, none of these stakeholders expressed a desire for this principle to be prioritised over other principles, and focus groups stated that this should only be a principle once noise and environmental principles have been considered.	Strong agreement. No evidence that any stakeholders disagree with this principle, or with its' position in the list.

[27] "The benefits of future technological improvements should be shared between the applicant and its local communities, hence helping to achieve a balance between growth and noise reduction" (Airports NPS, June 2018)

[28] Neighbouring airports & aerodromes, Ministry of Defence (MOD), and General Aviation (GA) including recreational flyers, helicopters, gliders etc.

4.1.5 A table of all suggested design principles that were not included in our final list, including those suggested by stakeholders at consultation and through other engagement forums, is provided in Appendix 8. The table provides an explanation for why each of these principles was excluded from the 10 final design principles.

4.1.6 Many of the suggested principles that are not being taken forward relate to issues that are beyond the scope of airspace design principles, in particular:

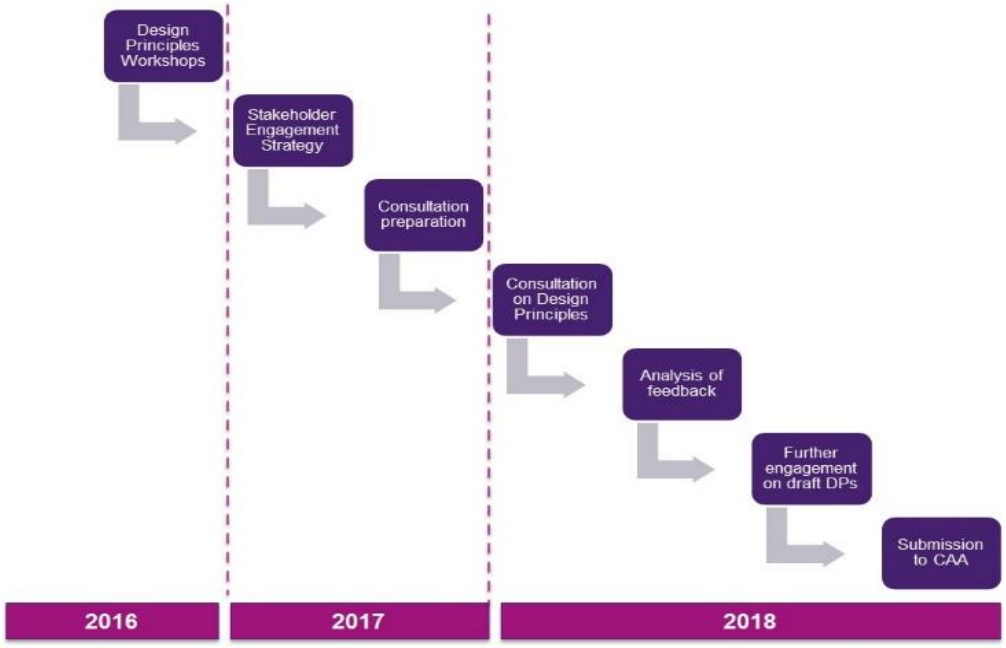
- Process (i.e. the CAA's CAP1616 process and the airspace design process Heathrow is following within that); or,
- Issues that will be covered by the Development Consent Order[29] (including runway alternation, night flight regimes and property compensation). This feedback does not impact our airspace design principles but will be considered as part of the Planning Act 2008 process for expansion of the airport on the ground.

[29] The process to expand the physical airport infrastructure follows a consenting process under the Planning Act 2008 to obtain a Development Consent Order (DCO) from the Secretary of State for Transport.

5. OUR APPROACH TO DEVELOPING DESIGN PRINCIPLES

5.1 Identification of Airspace Design Principles

Figure 2: Heathrow's Process for Identification of Airspace Design Principles



5.1.1 Heathrow undertakes continuing and ongoing stakeholder engagement on airspace matters with our local authorities and community stakeholders. These groups include the Heathrow Community Engagement Board[30] (HCEB) (formally Heathrow Airport Consultative Committee (HACC)), the Heathrow Community Noise Forum (HCNF), Flight Operations Performance Committee (FLOPC) and Heathrow Strategic Noise Advisory Group (HSNAG). Over the years these groups have provided us with an insight into the key community and industry issues relating to airspace.

5.1.2 In 2016, Heathrow held workshops with the HCNF members (including community, airline and industry representatives) to look at the key factors for inclusion when considering design principles for any future airspace change. Details of these workshops can be found in Appendix 2.

5.1.3 Discussions held in the stakeholder forums and workshops highlighted significant differences between stakeholder groups on some key issues and trade-offs. The

[30] The HCEB was set up to meet Government guidance (Department for Transport Guidance: Heathrow Airport consultation: community and compensation, Feb 2017) and the requirements of the Draft NPS, which required that an independent community engagement board is set up at Heathrow 'to help ensure that local communities are able to contribute effectively to the delivery of expansion, including to consultations and evidence gathering during the planning process'.

conclusion was that we should engage more widely on some of these issues to develop a better understanding from our broader stakeholder group. Consequently, we conducted a voluntary consultation as part of our engagement, to seek feedback on our key airspace design principles and to generally raise awareness of Heathrow's proposals and airspace change to a larger audience. This voluntary consultation formed part of the statutory requirement under CAP1616 for stakeholder engagement.

5.1.4 Heathrow drew on the output of stakeholder forums to develop a set of questions on design principles for consultation. We also drew upon research undertaken on environmental and noise impacts of aviation, as well as conceptual approaches to airspace design developed as part of our submission to the Airports Commission in 2014.

5.1.5 To ensure meaningful stakeholder engagement, we sought to make our consultation accessible and easy to understand. We were mindful that presenting complex and lengthy information may reduce the likelihood of people responding. We therefore identified 6 key questions related to aspects of airspace design which our stakeholders have consistently raised as important, and which have the potential to be contradictory. The consultation material is at Appendix 5.

5.1.6 Our consultation also asked, "Please provide any other comments you would like to make about our approach to airspace change, and let us know if there are any other design principles we should consider". This question sought to identify a broad range of further design principles for our consideration.

5.1.7 For each of the suggested principles, we have either:

- Accepted it and added it to our final list of design principles (see Table 3); or,
- Included it in our list of Considered Principles and provided a rationale for why it has not been appropriate to include it (see Appendix 8).

5.1.8 Based on responses to the consultation questions, and on the suggested principles received, we compiled a list of proposed and prioritised design principles. These were shared with stakeholder groups and we asked for feedback.

5.1.9 A full list of stakeholders engaged on our identification of airspace design principles is included at Appendix 1 and includes community groups, resident associations, airlines, Government and Local Authorities, General Aviation groups and other airports.

5.2 How were Design Principles prioritised?

5.2.1 Heathrow began prioritising the design principles following the analysis of consultation feedback. Chapter 6 describes our stakeholder engagement in detail and summarises stakeholder feedback.

5.2.2 There is no formula for combining all stakeholder feedback; therefore, there is an element of judgement that has been applied in determining relative prioritisation of principles.

5.2.3 The criteria for prioritising design principles are set out in Table 4 below.

Table 4: Criteria for Prioritisation of Design Principles

Heathrow's Criteria for Prioritisation of Airspace Design Principles	
Policy and regulatory requirements	These set out the safety, environmental and operational criteria that Heathrow's airspace change will need to meet to achieve the required approvals for both the airspace change and the expansion programme on which this airspace change depends. These are our 'core requirements' and any airspace design option will need to deliver against these design principles. These principles are therefore given the highest priority. Policy and regulatory requirements and guidance include, but are not limited, to: • CAP1616 Airspace Design: Guidance on the regulatory process for changing airspace design including community engagement requirements, CAA, 2017 • Airports National Policy Statement, DfT, 2018 • Air Navigation Guidance, DfT, 2017 • Noise Policy Statement for England, DEFRA, 2010 • National Planning Policy Framework, MHCLG, 2018 • Aviation Policy Framework (APF), DfT, 2013 • UK Airspace Policy: A framework for balanced decisions on the design and use of airspace. Consultation Response on UK Airspace Policy, DfT, 2017 • CAP1616a Airspace Design: Environmental Requirements Technical Annex, CAA, 2017 • CAP1378: Airspace Design Guidance: Noise Mitigation Considerations when Designing PBN Departure and Arrival Procedures, CAA, 2016 • ICAO Balanced Approach to Aircraft Noise Management, ICAO, revised 2007
Stakeholder feedback	The other design principles are based on Stakeholder feedback, and are essentially our strategic policy objectives. These design principles clarify how we will approach the various trade-offs and options which we expect to encounter during the airspace design phase (Stage 2 of CAP1616) by identifying which of these design principles should generally be given highest priority when evaluating different airspace design options. Stakeholder feedback includes: • Feedback from Heathrow's Airspace Public Consultation (Jan–Mar 2018) • Feedback from Stakeholder Focus Groups (June - July 2018) • Feedback from Industry Stakeholder Groups (June - July 2018)
Practical design considerations	The prioritisation takes account of practical airspace design considerations to ensure the design principles are technically and financially feasible and operationally fit for purpose.

5.2.4 The questions set out in the consultation were designed to help us prioritise the design principles, by asking respondents to state their own preferences between various design principle options. All the design principles included in the consultation feedback form are considered by Heathrow to be 'good' principles, however it would not be feasible for any airspace design to deliver against all these principles equally. Therefore, we asked respondents to state their preference and we looked for patterns in the responses to identify which of the principles would best meet the preferences of all our stakeholders. We did not simply prioritise the design principle options chosen by the greatest number of consultation respondents, since the consultation was not a referendum. We recognised that consultation respondents were unlikely to represent the broad range of stakeholders who may be affected by the proposed airspace change, since not all community members would choose to engage with, or respond to, a public consultation.

5.2.5 Consequently, when prioritising the design principles, we further engaged people who might not be currently overflown by aircraft using Heathrow but could be overflown by future airspace changes. The goal was to present information on the design principles to an audience who is yet to engage in debates on airspace design or airport expansion, and seek to understand which of the design principles they would prioritise, and why. We did this through a series of focus groups conducted by Stonehaven, an independent communications consultancy. The report is at Annex B.

5.2.6 We shared an initial proposed prioritised list of design principles with key stakeholders from industry and community forums, to give an opportunity for feedback on the proposed prioritisation.

5.2.7 For a more detailed evolution of our airspace design principles, see Appendix 7.

6. STAKEHOLDER ENGAGEMENT

6.1 Our ongoing approach to stakeholder engagement

6.1.1 Heathrow has a long-established engagement programme with local communities, recognising the impact Heathrow's operations have on the area in which it operates. Heathrow's stakeholders include local authorities, community groups, airlines and other airspace users who operate from, or adjacent to, the airport. We also engage with neighbouring airports, local and national interest groups, regulatory and Government bodies. A full list of stakeholders can be found in Appendix 1.

6.1.2 We recognise the need to maintain relationships with all our stakeholders, and seek their input, listen to, and respond to, their concerns. This insight helps to inform our day to day operations. This dialogue is carried out through a variety of meetings, including but not limited to:

- Heathrow Community Engagement Board (HCEB). An independent body which represents those who live, work and travel through Heathrow. This new group has superseded the Heathrow Airport Consultative Committee (HACC). The HCEB, and the previous HACC, seeks to find a balance between the wide and often conflicting interests of Heathrow's community stakeholders.
- The Heathrow Community Noise Forum (HCNF). Comprised of local councillors and community groups from 12 boroughs around Heathrow, as well as representatives from NATS, British Airways, Virgin Atlantic, the Department for Transport (DfT) and the Civil Aviation Authority (CAA). It was set up in 2015 to establish a common level of understanding of Heathrow's operations amongst community representatives and stakeholders. Its main objectives are to involve Forum members in the planning and delivery of Heathrow's future airspace changes, along with the steps we are taking to reduce the noise impacts of our operations today.
- Airline Working Group (AWG). A working group designed to support airport-airline engagement over Heathrow's expansion plans. Representatives include airlines and airline bodies.
- Joint Expansion Board (JEB). A senior monthly meeting between HAL and the airline community, observed by CAA, DfT and IFS.
- London Airports Working Group (LAWG). A meeting of the airspace development leads for airports serving London and the South East.
- Future Airspace Strategy Industry Implementation Group (FASIIG). An industry body set up to coordinate and deliver airspace modernisation, including

representatives from Airlines, Air Navigation, Service Providers (ANSPs), Business Aviation, Large and Small Airports, the Ministry of Defence, General Aviation, industry trade bodies and UK CAA.

6.2 Stakeholder Engagement on our Design Principles

6.2.1 Heathrow has undertaken comprehensive two-way stakeholder engagement. We have interpreted "two-way engagement" to mean actively listening to, and acting on, the views of our stakeholders and providing a number of opportunities to provide feedback. We have re-engaged with stakeholders to explain what changes we have made to our proposals as a result of this feedback: in summary: "we showed you; you responded; we adapted".

6.2.2 Through our stakeholder engagement, we have identified six broad stakeholder groups:

1. Those who are 'engaged' and overflown or otherwise affected by Heathrow operations (engagement being demonstrated by the fact that they were motivated to respond to the consultation and/or those engaged through HNCF for example). These stakeholders strongly prioritise noise reduction and generally favour sharing of noise in some form.

2. Those who are 'engaged' and not overflown (engaged being demonstrated by the fact that they were motivated to respond to the consultation) who have an interest in noise and generally favour minimising the number of people newly overflown.

3. Those who have not previously engaged (i.e. focus groups). These groups were generally more accepting of some background noise from aircraft and had greater appreciation for the wider benefits provided by the airport. These stakeholders placed a greater emphasis on climate change and protecting the environment for future generations, and on a desire for the airspace solution to be "fair".

4. Airlines, whose primary objectives from airspace change are modernisation, greater capacity and minimising fuel requirements. Some airlines also recognise the noise impact on local communities and would like Heathrow to minimise noise impacts where possible.

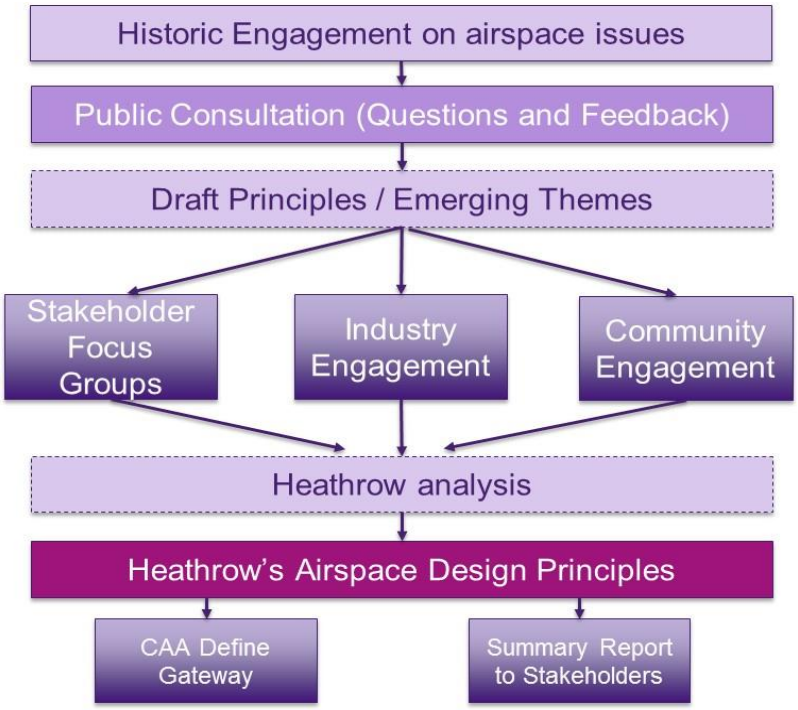
5. Other airports, whose primary objectives from airspace change are modernisation and the protection of their own existing (and/or planned) airspace from Heathrow's expansion plans.

6. General aviation users, whose primary objective is the protection of uncontrolled airspace for their own use.

6.2.3 Our stakeholder strategy sets out our vision for effective engagement and how we will achieve this throughout the CAP1616 process. It sets out how we have identified and engaged with our different stakeholder groups and how we ensured that the information provided to our different stakeholder groups meets their needs. It is provided in Appendix 3.

6.2.4 An overview of our engagement approach for design principles is set out below and each stage is summarised in the following sections. Information on the meetings held, any relevant presentations, and minutes from these sessions can be found in our engagement log at Appendix 12.

Figure 3: Heathrow's Process for Stakeholder Engagement on Airspace Design Principles



6.3 Historic/Legacy Engagement

6.3.1 Heathrow's insight from its ongoing engagement on airspace issues means that we had a good understanding of the key issues and challenges facing industry colleagues and our local stakeholders and how they might like to see these incorporated into our design principles.

6.3.2 While not directly related to the expansion work, we also drew on feedback gained from three workshops held in late 2016 with members of the HCNF which examined the key factors that might inform Heathrow's design principles for future airspace design. These highlighted areas where opinions differed between

different stakeholder groups, as well as potential trade-offs between different design options. Key feedback from these workshops were:

- Safety and compliance with international regulatory frameworks are the highest priorities;
- Community representatives then prioritised noise (equitable sharing; respite), air quality and health effects; and,
- Airlines tended to prioritise passenger experience, operational efficiency (including fuel use and CO2 emissions) and noise (being a good neighbour).

6.4 Public Consultation

6.4.1 Given the scale and complexity of the Heathrow expansion project, along with the many varied stakeholders' interests, we decided to go out to a full public consultation. Public consultation also enabled us to explore in more depth the areas where opinions were likely to differ, particularly for the design principle areas where there are known trade-offs.

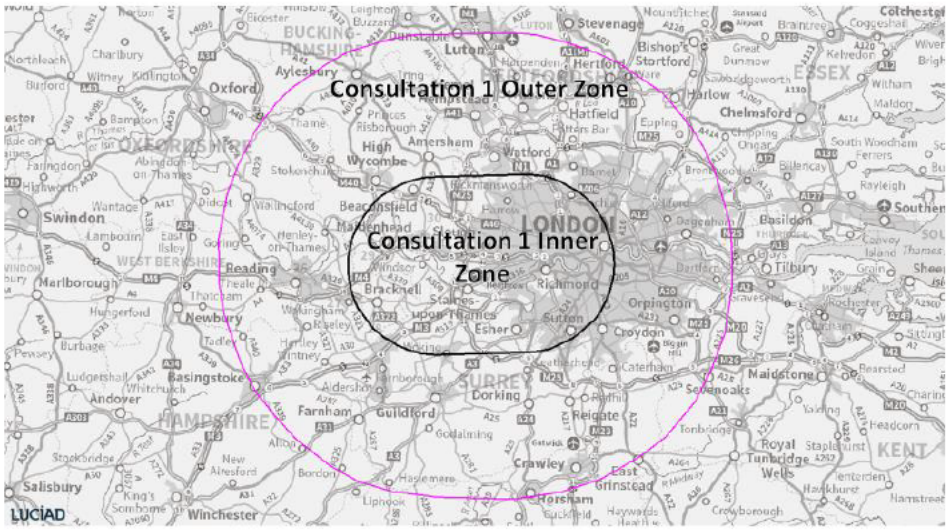
6.4.2 The public consultation on Heathrow's Airspace Design Principles ran from 17 January to 28 March 2018. This was run in parallel with the public consultation on Heathrow's airport expansion programme, set up to meet the requirements of a separate consenting process for physical infrastructure, known as the Development Consent Order (DCO).

6.4.3 In accordance with Air Navigation Guidance[31] and CAP1378[32], Heathrow split its consultation area into two zones, as shown in Figure 4: an outer area encompassing 7,000 feet and below, and an inner area encompassing 4,000 feet and below. These zones included local authorities, and communities that are likely to be affected by the proposed changes. See Appendix 3 for our Stakeholder Engagement Strategy.

[31] Air Navigation Guidance, Department for Transport, 2017

[32] Performance-based Navigation. Airspace Design Guidance: Noise mitigation considerations when designing PBN departure and arrival procedures, CAA, April 2016

Figure 4: Airspace Design Principles Consultation: Consultation Zone



6.4.4 To ensure successful stakeholder engagement, we sought to make our consultation accessible and easy to understand. We also wanted to ensure that the consultation followed a fair process. As such we ensured that our consultation followed the 4 Gunning Principles[33].

Table 5: Heathrow's Approach to Meeting the Gunning Principles

Gunning Principle	Heathrow's Approach
Consultation must take place when the proposal is still at a formative stage	We have consulted on design principles at the outset of the project to ensure stakeholders have the opportunity to influence the airspace design before options are developed.
Sufficient reasons must be put forward for the proposal to allow for intelligent consideration and response	Heathrow's Expansion proposal was described and consultation questions focussed on key issues. Simplified illustrations and explanations were given to help ensure that the consultation was accessible to all.
Adequate time must be given for consideration and response	A 10-week time period was provided for a response.
The product of consultation must be conscientiously taken into account	This document and associated appendices show how the responses have been taken into account.

6.4.5 We sought to identify which key trade-offs we should include in the consultation feedback form and our proposed consultation questions were reviewed and approved by our external consultation experts and NERG[34].

6.4.6 To keep the consultation targeted and accessible, it focussed on six key questions relating to aspects of airspace design which our communities have consistently raised as important, and which have the potential for being contradictory. It also

[33] R v. Brent London borough Council, ex parte Gunning (1985)

[34] Noise Expert Review Group

asked a broader question to determine whether there were any other areas which stakeholders felt should be considered as design principles.

6.4.7 The number of questions was based on advice from our consultation experts. They suggested that people would be less likely to engage in the consultation if we presented too many questions, particularly given the conceptual nature of this early stage of the airspace development process, i.e. because there is not yet any design detail (or maps) to consult on. A summary of our consultation question development and consultation feedback is provided in Appendix 4.

6.4.8 In the weeks prior to launching the consultation, Heathrow undertook a period of pre-consultation stakeholder engagement with industry and community groups. The purpose of this engagement was to:

- Explain what a design principle is;
- Explain the purpose of Heathrow's consultation on airspace design principles;
- Answer questions on the airspace design process and, specifically, the development of design principles;
- Take feedback on our approach and on the consultation questions, and amend if required;
- Invite, and encourage, stakeholders to respond to the consultation.

6.4.9 Once the consultation period had begun, Heathrow hosted events across the inner consultation zone to share material, answer questions and distribute paper feedback forms and consultation documents. We used different media to ensure that the consultation material was accessible to all types of stakeholder, including videos and handbooks, and material was written in language that was as clear and simple as possible, to aid an understanding of the airspace design process. In addition, there were specialists on hand at the events to help explain the technical issues in simple terms.

6.4.10 Over 40 public consultation events were held and 1834 Airspace consultation responses were received. These responses included online responses (1061), paper feedback forms (400), emails (359) and whitemail (14). All responses were analysed by Wood and Ipsos Mori, who provided an independent report on Airspace Consultation Findings. This can be found at Annex A. Their report informed our understanding of the consultation feedback, including the preferences and trends identified in the consultation responses.

6.5 Community Focus Groups

6.5.1 In June 2018, we undertook community focus groups to supplement, and build upon, the initial public consultation findings. The aim was to present information on a set of draft design principles to an audience which is yet to engage in debates on airspace design or airport expansion and seek to understand which of the design principles they would prioritise, and why. Stonehaven, an independent communications consultancy, was asked to undertake this work. Their methodology was developed in consultation with Heathrow, and included five focus groups.

6.5.2 The Key themes coming through the focus groups were:

- Noise is a highly important consideration and the first thing most consider when discussing airspace redesign;
- A greater emphasis on climate change and protecting the environment for future generations;
- A view that Heathrow should actively encourage the use of quieter, more environmentally efficient aircraft;
- A desire for the solution to be 'fair', with fairness represented by continuing to share the noise impact of flights across a relatively wide area and avoiding concentration, and by avoiding impacting new people on the basis that it's unfair to suddenly change peoples' circumstances; and,
- The proposed principle of routing flight paths over rural areas (rather than over urban areas) generated significant debate at the Community Focus Groups with no clear consensus.

6.5.3 A report of the Community Focus Groups and research findings is provided in Annex B.

6.6 Additional Industry and Community Engagement

6.6.1 We shared the consultation feedback and emerging themes with our industry and community forums over the period June-July 2018 to ensure that their views had been considered in our proposed list of design principles. This further engagement included:

- HCEB
- HCNF Forum
- HCNF Working Groups
- HSPG
- NATMAC

- DfT Airspace Working Group
- Airline Working Group
- Joint Expansion Board
- Internal Airport Operational Duty Managers group

6.6.2 At these sessions we:

- Provided a summary of key findings from the consultation on airspace principles;
- Set out proposed, and prioritised, design principles based on consultation findings;
- Asked for further feedback to help us confirm or amend our principles and their prioritisation.

6.6.3 We produced an information pack setting out our draft proposed design principles which was emailed to a wide list of our engaged stakeholders. Feedback was sought to ensure we had identified and prioritised our design principles in accordance with our stakeholders' preferences and suggestions, as well as to identify whether any design principles were missing from the list. The information pack, email and address list are provided in Appendix 9 where records and minutes are also available.

6.6.4 Feedback from the Community at this stage generally related to:

1. Avoidance of AONBs[35]. This was added to the design principles following this feedback.
2. Objections to "minimise new" being positioned above "share noise" in the proposed design principles list. Some argued that if Heathrow expansion was intended to benefit the whole of UK society, the burden of expansion would also be shared as equally as possible.
3. Concerns about the process of developing design principles prior to developing flight paths for community feedback.

6.6.5 The key issues raised by Industry stakeholders at this stage were consistent with historic engagement:

1. General Aviation seeking protection of existing operations outside controlled airspace, and a reduction in the size of controlled airspace.
2. Airlines' focus was on the cost of operation (fuel/delay), capacity, resilience and cost, but they were also supportive of measures to minimise local impact.

[35] Areas of Outstanding Natural Beauty

3. Neighbouring airports sought to ensure that their local operations and potential growth would not be negatively affected or limited by Heathrow's airspace change for expansion.

6.6.6 This feedback is captured in the rationales for principle and prioritisation set out in the table of Design Principles (Table 3).