



# ***AIRSPACE MODERNISATION AIRSPACE CHANGE PROPOSAL***

## ***STEP 2B INITIAL OPTIONS APPRAISAL***

### ***APPENDIX A***

#### ***PERFORMANCE BASED NAVIGATION (PBN) STANDARD INSTRUMENT DEPARTURES (SIDs)***

***Version 2  
PART 3***

**Heathrow**



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### Revision History

Version	Date	Amendment	Author
1.0	28 <sup>th</sup> July 2023	Initial issue	Heathrow Airport Ltd
2.0	07 <sup>th</sup> June 2024	All option outcome statements amended following the revision of the shortlisting methodology to remove reference to AONB's and Richmond Park.	Heathrow Airport Ltd

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

# Initial Options Appraisal

## PBN Standard Instrument Departures (SIDs)

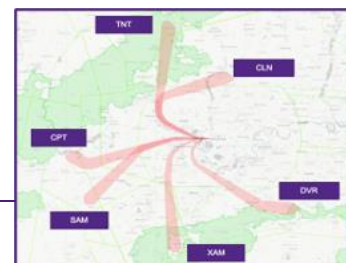
### Runway 27L



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

Version 2.0 (June 2024)

## PBN SIDs – RWY 27L Option H



### Option Description

This option was developed to address a blend of DPs 2, 4, 9 & 10.

### Communities – Noise impact on health & quality of life

Metric	Option Value	Difference to Baseline
Population above Partial LOAEL (daytime, LA <sub>eq</sub> , 16h)	126,400	-48,400
Population above Partial LOAEL (night-time, LA <sub>eq</sub> , 8h)	28,200	+1,900
Population experiencing at least one event of N65 (daytime)	548,600	-140,400
Population experiencing at least one event of N60 (night-time)	227,700	-53,000

### Communities - Air Quality

Introduction of PBN SIDs at Heathrow could affect track distribution below 1000ft within an AQMA. This may or may not have an effect on Air Quality. This is the same for all departure options and is not a differentiating factor at this stage. Any Air Quality impacts will be investigated at Full Options Appraisal (FOA).

### Wider Society – Greenhouse Gas Impact

Metric	Option Value	Difference to Baseline
Overall Track Miles of the option (nm)	451	-1

### Wider Society – Tranquillity & Biodiversity

Metric	Option Value	Difference to Baseline
Total Area of AONBs/National Parks (NPs) overflown between 0-7000ft once a day on average (daytime)	79km <sup>2</sup>	-214km <sup>2</sup>
Total Area of AONBs/NPs overflown experiencing at least one event of N65 on average (daytime)	35km <sup>2</sup>	-15km <sup>2</sup>
Total Area of Richmond Park overflown between 0-7000ft at least once a day on average (daytime)	0km <sup>2</sup>	No change
Number of sites (RAMSAR, SAC, SPA, SSSI) overflown between 0-1640ft which observe a potential change in location overflown	0	No change
Number of sites (RAMSAR, SAC, SPA, SSSI) overflown between 0-3000ft which observe a potential change in location overflown	3	+3

### Wider Society – Capacity/Resilience

Expected to perform the same as the 'Do Nothing' scenario.

Heathrow's capacity for this ACP is limited by the existing 480,000 movement cap.

### General Aviation – Access

No additional CAS envisaged.

Systemised SIDs requiring less tactical intervention and with improved CCO could facilitate release of portions of CAS.

Option not expected to impact existing helicopter routes.

## General Aviation / Commercial Airlines – Economic impact from increased effective capacity

If this option did enable sponsors to release some portions of CAS there could be a small, positive economic effect on GA operations outside CAS but this is not quantifiable at this stage.

There is no change to expected economic impact on commercial airlines from a reduction in ground delay in comparison to the Baseline.

## General Aviation / Commercial Airlines – Fuel Burn

Change in Fuel Burn (compared to the Baseline - annual - tonnes)	0
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## Commercial Airlines – Training costs

None identified.

## Commercial Airlines – Other costs

None identified.

## Airport/ANSP – Infrastructure costs

Option may require re-location and/or addition of Noise Monitoring Terminals.

## Airport/ANSP – Operational costs

This option is not anticipated to change airport or ANSP operational costs. The implementation of PBN SIDs removes Heathrow's dependency on conventional ground-based navigation equipment (VORs), which contributes to a reduction in Heathrow and NERL's operational costs as it enables VOR rationalisation.

## Airport/ANSP – Deployment costs

There will be significant costs associated with deployment in terms of operational training and system upgrades which will be quantified in Stage 3. However, no differences are expected in these costs between the different options.

Option may lead to a change in the number of properties eligible for the noise insulation scheme which could lead to a change in operational costs for the airport.

## Safety

No IFP Design issues identified.

Although new or revised safety assurances may be needed, an acceptable safety argument is envisaged to be achievable.

## Adherence to AMS

Supports the AMS through increased systemisation and meeting the Government's key environmental objectives by utilising PBN. Used in combination with suitable arrival options, the option supports CCO/CDA operations enabling quicker & cleaner journeys. PBN Departures provide opportunity to potentially reduce CAS & enable integration of UAM in the future. Efficiency benefits to the LTMA are not yet known.

## Interdependencies, Conflicts & Trade-Offs

Option is expected to result in conflicts/interdependencies with RAF Northolt, Luton, Biggin Hill, Stansted, London City, Farnborough and Gatwick.

## Outcome of PBN SID RWY27L Option H

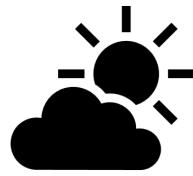
Option H significantly reduces the population above the Partial LOAEL (daytime). It reduces the population experiencing at least one N65 (day) or N60 (night) noise event. There is a negligible improvement to track miles and an indication of similar airport resilience performance compared to the Baseline.

There are increases in the population above the Partial LOAEL (night) and a significant number of biodiversity sites between 0-3000ft that may experience a change in location overflow. This option will be explored further in Stage 3.

**OPTION CARRIED FORWARD TO STAGE 3**



# CAP1616 - INITIAL OPTIONS APPRAISAL – SUPPLEMENTARY METRICS



07:00 - 23:00

## PBN Departures – RWY27L Option H (Day)

### Overflight

Rate	Population Overflow		Overflight (0-7000 ft) contour map
	Baseline	Option H	
≥ 1	1,483,800	484,100	
≥ 5	716,100	379,700	
≥ 10	442,000	351,000	
≥ 20	280,000	283,400	
≥ 50	105,600	112,400	
≥ 100	28,300	16,800	
≥ 200	400	1,100	

### Aircraft Noise Events

Rate	Population experiencing noise events above N65 each day		N65 events contour map
	Baseline	Option H	
≥ 1	688,900	548,600	
≥ 5	317,600	313,800	
≥ 10	245,200	197,000	
≥ 20	176,100	132,200	
≥ 50	67,800	65,500	
≥ 100	18,500	26,200	
≥ 200	8,000	9,200	

### Noise Exposures

Population count	Baseline	Option H	Partial LOAEL contour map
Estimated total population above WHO Threshold (>45 dB L <sub>den</sub> )	602,400	647,600	
Total population within Partial LOAEL (>51 dB L <sub>Aeq,16h</sub> )	174,800	126,400	

### Noise Exposure Change

Change in Noise Exposure	Population experiencing at least 1 dB reduction within partial LOAEL or brought out of partial LOAEL	Population experiencing no change in noise exposure within partial LOAEL	Population experiencing at least 1 dB increase within partial LOAEL or brought into partial LOAEL	Change in noise exposure map
Partial LOAEL	98,600 (of which 77,400 brought out of Partial LOAEL by Option)	45,000	60,200 (of which 29,000 brought into Partial LOAEL by Option)	



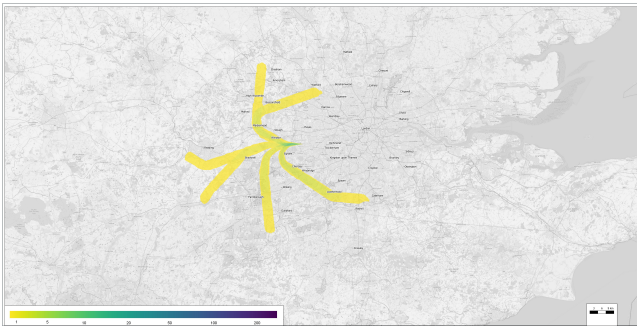
# CAP1616 - INITIAL OPTIONS APPRAISAL – SUPPLEMENTARY METRICS



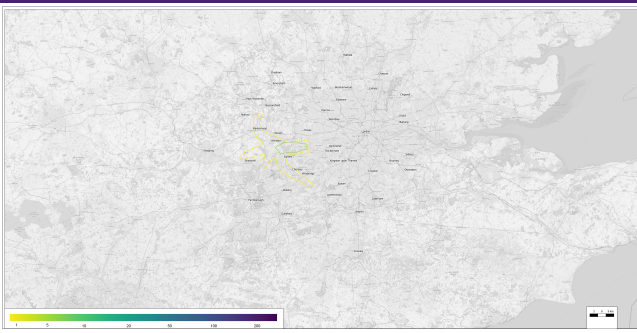
23:00 - 07:00

## PBN Departures – RWY27L Option H (Night)

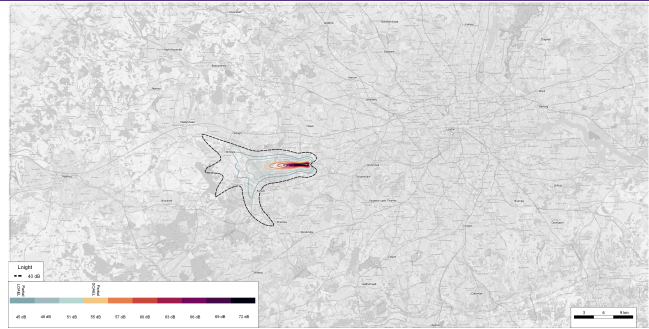
### Overflight

Rate	Population Overflow		Overflight (0-7000 ft) contour map
	Baseline	Option H	
≥ 1	164,000	246,600	
≥ 5	1,000	1,300	
≥ 10	0	0	
≥ 20	0	0	
≥ 50	0	0	
≥ 100	0	0	
≥ 200	0	0	

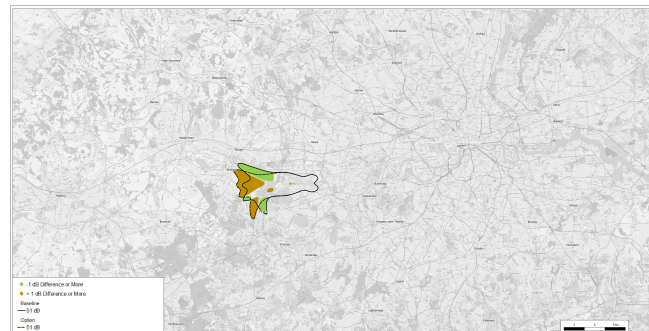
### Aircraft Noise Events

Rate	Population experiencing noise events above N60 each day		N60 events contour map
	Baseline	Option H	
≥ 1	280,600	227,700	
≥ 5	20,000	24,600	
≥ 10	0	0	
≥ 20	0	0	
≥ 50	0	0	
≥ 100	0	0	
≥ 200	0	0	

### Noise Exposures

Population count	Baseline	Option H	Partial LOAEL contour map
Estimated total population above WHO Threshold (>40 dB L <sub>night</sub> )	105,200	93,300	
Total population within Partial LOAEL (>45 dB L <sub>Aeq,8h</sub> )	26,300	28,200	

### Noise Exposure Change

Change in Noise Exposure	Population experiencing at least 1 dB reduction within partial LOAEL or brought out of partial LOAEL	Population experiencing no change in noise exposure within partial LOAEL	Population experiencing at least 1 dB increase within partial LOAEL or brought into partial LOAEL	Change in noise exposure map
Partial LOAEL	8,800 (of which 7,800 brought out of Partial LOAEL by Option)	15,000	12,200 (of which 9,600 brought into Partial LOAEL by Option)	



# Initial Options Appraisal

## PBN Standard Instrument Departures (SIDs)

Runway 27R



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

Version 2.0 (July 2024)



**Standard Instrument Departures (SIDs) – Runway (RWY) 27R Baseline ‘Do Nothing’**



**Option Description**

This represents the baseline for ‘Doing Nothing’ with 27R departures. The image represents the areas overflowed at least once per day on average by 27R departures in 2019.

**Communities – Noise Impact on Health & Quality of Life**

Metric	Option Value	Difference to Baseline
Population above Partial LOAEL (daytime, LA <sub>eq</sub> , 16h)	159,700	N/A
Population above Partial LOAEL (night-time, LA <sub>eq</sub> , 8h)	35,700	N/A
Population experiencing at least one event of N65 (daytime)	612,800	N/A
Population experiencing at least one event of N60 (night-time)	292,900	N/A

**Communities - Air Quality**

As this is the Baseline ‘Do Nothing’ there is no change to Air Quality.

**Wider Society – Greenhouse Gas Impact**

Metric	Option Value	Difference to Baseline
Overall Track miles (nm)	455	N/A

**Wider Society – Tranquillity & Biodiversity**

Metric	Option Value	Difference to Baseline
Total Area of AONBs/National Parks (NPs) overflowed between 0-7000ft once a day on average (daytime)	295km <sup>2</sup>	N/A
Total Area of AONBs/NPs overflowed experiencing at least one event of N65 on average (daytime)	44km <sup>2</sup>	N/A
Total Area of Richmond Park overflowed between 0-7000ft at least once a day on average (daytime)	0km <sup>2</sup>	N/A
Number of sites (RAMSAR, SAC, SPA, SSSI) overflowed between 0-1640ft which observe a potential change in location overflow	N/A	N/A
Number of sites (RAMSAR, SAC, SPA, SSSI) overflowed between 0-3000ft which observe a potential change in location overflow	N/A	N/A

**Wider Society – Capacity/Resilience**

As this is the Baseline ‘Do Nothing’, there is no impact on Capacity/Resilience.

Heathrow's capacity for this ACP is limited by the existing 480,000 movement cap.

**General Aviation (GA) – Access**

No additional Controlled Airspace (CAS) required.

Option does not facilitate the release of CAS. Furthermore, doing nothing could inhibit adjacent aerodromes from operating Continuous Climb Operations (CCO) and release of any of their CAS volumes.

Option not expected to impact existing helicopter routes.

## General Aviation / Commercial Airlines – Economic impact from increased effective capacity

As this is the Baseline ‘Do Nothing’ there is no economic impact from increased effective capacity on General Aviation or Commercial Airlines.

## General Aviation / Commercial Airlines – Fuel Burn

Change in Fuel Burn (annual - tonnes)	No change
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## Commercial Airlines – Training costs

Option does not require any re-equipage or upgrade costs for airlines. No training costs required for airlines.

## Commercial Airlines – Other costs

None identified.

## Airport/Air Navigation Service Provider (ANSP) – Infrastructure costs

Doing nothing means no changes to infrastructure costs.

## Airport/ANSP – Operational costs

Heathrow’s current SIDs are dependent on conventional ground-based navigation equipment (VORs) which are currently undergoing a rationalisation programme by NATS NERL. Heathrow is currently progressing RNAV substitution to mitigate VOR rationalisation however this is an interim measure that can only be used to bridge the gap ahead of Future Airspace Strategy Implementation (FASI).

## Airport/ANSP – Deployment costs

Doing nothing means no deployment costs.

Failure to mitigate the impacts of VOR rationalisation in the long term could result in critical operational issues and significant loss of revenue, as well as not meeting the requirements of the AMS, should a long-term reliance on RNAV substitution not be permitted by the Civil Aviation Authority (CAA).

## Safety

Doing nothing means no Instrument Flight Procedure (IFP) design considerations.

At current traffic levels, there are no safety concerns with the current arrangements at Heathrow. Future traffic growth could however result in increased complexity and workload for Air Traffic Control (ATC) and pilots, which may lead to traffic levels within the London Terminal Manoeuvring Area (LTMA) being capped, or increased aircraft holding on the ground to maintain safety.

## Adherence to Airspace Modernisation Strategy (AMS)

Doing nothing with Westerly departures will not align with the AMS. It will not enable any environmental benefits, increase airspace capacity, reduce noise impacts, introduce PBN or maximise benefits from NERL’s re-design of the LTMA. No change and therefore no ACP submission will not enable enhancements to safety, enhanced integration or reductions in the volume of controlled airspace.

## Interdependencies, Conflicts & Trade-Offs

Doing nothing would not be in support of the AMS. There are many interdependencies with routes to/from other airports in the LTMA and without changes to Heathrow’s routes, enhancements to the wider LTMA would be severely constrained.

## Outcome of SID RWY27R Baseline ‘Do Nothing’

The Baseline (Do Nothing) Option was discontinued during the Design Principles Evaluation (DPE) phase of Stage 2, owing to the option not meeting the objectives set by the Airspace Modernisation Strategy (AMS).

**OPTION DISCONTINUED (During DPE)**

# CAP1616 - INITIAL OPTIONS APPRAISAL – SUPPLEMENTARY METRICS



07:00 - 23:00

## PBN Departures – RWY27R Do Nothing (Day)

### Overflight

Rate	Population Overflown		Overflight (0-7000 ft) contour map
	Baseline	Do Nothing	
≥ 1	1,492,600	1,492,600	
≥ 5	671,500	671,500	
≥ 10	444,700	444,700	
≥ 20	285,200	285,200	
≥ 50	108,900	108,900	
≥ 100	25,100	25,100	
≥ 200	1,000	1,000	

### Aircraft Noise Events

Rate	Population experiencing noise events above N65 each day		N65 events contour map
	Baseline	Do Nothing	
≥ 1	612,800	612,800	
≥ 5	288,800	288,800	
≥ 10	209,700	209,700	
≥ 20	155,700	155,700	
≥ 50	66,800	66,800	
≥ 100	22,300	22,300	
≥ 200	11,800	11,800	

### Noise Exposures

Population count	Baseline	Do Nothing	Partial LOAEL contour map
Estimated total population above WHO Threshold (>45 dB L <sub>den</sub> )	597,500	597,500	
Total population within Partial LOAEL (>51 dB L <sub>Aeq,16h</sub> )	159,700	159,700	

### Noise Exposure Change

Change in Noise Exposure	Population experiencing at least 1 dB reduction within partial LOAEL or brought out of partial LOAEL	Population experiencing no change in noise exposure within partial LOAEL	Population experiencing at least 1 dB increase within partial LOAEL or brought into partial LOAEL	Change in noise exposure map
<b>Partial LOAEL</b>	<b>0</b> (0 brought out of Partial LOAEL by Option)	<b>0</b>	<b>0</b> (0 brought into Partial LOAEL by Option)	



# CAP1616 - INITIAL OPTIONS APPRAISAL – SUPPLEMENTARY METRICS



23:00 - 07:00

## PBN Departures – RWY 27R Do Nothing (Night)

### Overflight

Rate	Population Overflown		Overflight (0-7000 ft) contour map
	Baseline	Do Nothing	
≥ 1	190,500	190,500	
≥ 5	2,000	2,000	
≥ 10	1,000	1,000	
≥ 20	0	0	
≥ 50	0	0	
≥ 100	0	0	
≥ 200	0	0	

### Aircraft Noise Events

Rate	Population experiencing noise events above N60 each day		N60 events contour map
	Baseline	Do Nothing	
≥ 1	292,900	292,900	
≥ 5	42,800	42,800	
≥ 10	19,700	19,700	
≥ 20	0	0	
≥ 50	0	0	
≥ 100	0	0	
≥ 200	0	0	

### Noise Exposures

Population count	Baseline	Do Nothing	Partial LOAEL contour map
Estimated total population above WHO Threshold (>40 dB L <sub>night</sub> )	166,600	166,600	
Total population within Partial LOAEL (>45 dB L <sub>Aeq,8h</sub> )	35,700	35,700	

### Noise Exposure Change

Change in Noise Exposure	Population experiencing at least 1 dB reduction within partial LOAEL or brought out of partial LOAEL	Population experiencing no change in noise exposure within partial LOAEL	Population experiencing at least 1 dB increase within partial LOAEL or brought into partial LOAEL	Change in noise exposure map
Partial LOAEL	0 (0 brought out of Partial LOAEL by Option)	0	0 (0 brought into Partial LOAEL by Option)	



# PBN SIDs – RWY 27R Option A



## Option Description

This option was developed to address DP2.

## Communities – Noise impact on health & quality of life

Metric	Option Value	Difference to Baseline
Population above Partial LOAEL (daytime, LA <sub>eq</sub> , 16h)	91,200	-68,500
Population above Partial LOAEL (night-time, LA <sub>eq</sub> , 8h)	40,200	+4,500
Population experiencing at least one event of N65 (daytime)	454,200	-158,600
Population experiencing at least one event of N60 (night-time)	221,000	-71,900

## Communities - Air Quality

Introduction of PBN SIDs at Heathrow could affect track distribution below 1000ft within an AQMA. This may or may not have an effect on Air Quality. This is the same for all departure options and is not a differentiating factor at this stage. Any Air Quality impacts will be investigated at Full Options Appraisal (FOA).

## Wider Society – Greenhouse Gas Impact

Metric	Option Value	Difference to Baseline
Overall Track Miles of the option (nm)	457	+2

## Wider Society – Tranquillity & Biodiversity

Metric	Option Value	Difference to Baseline
Total Area of AONBs/National Parks (NPs) overflown between 0-7000ft once a day on average (daytime)	145km <sup>2</sup>	-150km <sup>2</sup>
Total Area of AONBs/NPs overflown experiencing at least one event of N65 on average (daytime)	88km <sup>2</sup>	+44km <sup>2</sup>
Total Area of Richmond Park overflown between 0-7000ft at least once a day on average (daytime)	0km <sup>2</sup>	No change
Number of sites (RAMSAR, SAC, SPA, SSSI) overflown between 0-1640ft which observe a potential change in location overflown	0	No change
Number of sites (RAMSAR, SAC, SPA, SSSI) overflown between 0-3000ft which observe a potential change in location overflown	7	+7

## Wider Society – Capacity/Resilience

Expected to perform better than the 'Do Nothing' scenario owing to anticipated improved departure separations.

Heathrow's capacity for this ACP is limited by the existing 480,000 movement cap.

## General Aviation – Access

No additional CAS envisaged.

Systemised SIDs requiring less tactical intervention and with improved CCO could facilitate release of portions of CAS.

Option not expected to impact existing helicopter routes.



## General Aviation / Commercial Airlines – Economic impact from increased effective capacity

If this option did enable sponsors to release some portions of CAS there could be a small, positive economic effect on GA operations outside CAS but this is not quantifiable at this stage.

The economic impact on commercial airlines from a reduction in ground delay is expected to provide an overall benefit in comparison to the Baseline.

## General Aviation / Commercial Airlines – Fuel Burn

Change in Fuel Burn (compared to the Baseline - annual - tonnes)	+860
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## Commercial Airlines – Training costs

None identified.

## Commercial Airlines – Other costs

None identified.

## Airport/ANSP – Infrastructure costs

Option may require re-location and/or addition of Noise Monitoring Terminals.

## Airport/ANSP – Operational costs

This option is not anticipated to change airport or ANSP operational costs. The implementation of PBN SIDs removes Heathrow’s dependency on conventional ground-based navigation equipment (VORs), which contributes to a reduction in Heathrow and NERL’s operational costs as it enables VOR rationalisation.

## Airport/ANSP – Deployment costs

There will be significant costs associated with deployment in terms of operational training and system upgrades which will be quantified in Stage 3. However, no differences are expected in these costs between the different options.

Option may lead to a change in the number of properties eligible for the noise insulation scheme which could lead to a change in operational costs for the airport.

## Safety

No IFP Design issues identified.

Although new or revised safety assurances may be needed, an acceptable safety argument is envisaged to be achievable.

## Adherence to AMS

Supports the AMS through increased systemisation and meeting the Government’s key environmental objectives by utilising PBN. Used in combination with suitable arrival options, the option supports CCO/CDA operations enabling quicker & cleaner journeys. PBN Departures provide opportunity to potentially reduce CAS & enable integration of UAM in the future. Efficiency benefits to the LTMA are not yet known.

## Interdependencies, Conflicts & Trade-Offs

Option is expected to result in conflicts/interdependencies with RAF Northolt, Luton, Biggin Hill, Stansted, London City, Farnborough and Gatwick.

## Outcome of PBN SID RWY27R Option A

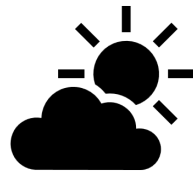
Option A performs well against the majority of noise metrics and reduces the size of the population above the Partial LOAEL (daytime) by almost half. It indicates an improvement in airport resilience when compared to the Baseline.

There is an increase in the population above the Partial LOAEL (night) and a significant number of biodiversity sites between 0-3000ft may experience a change in location overflight. There is a small increase in track miles. This option will be explored further in Stage 3.

**OPTION CARRIED FORWARD TO STAGE 3**



# CAP1616 - INITIAL OPTIONS APPRAISAL – SUPPLEMENTARY METRICS



07:00 - 23:00

## PBN Departures – RWY27R Option A (Day)

### Overflight

Rate	Population Overflow		Overflight (0-7000 ft) contour map
	Baseline	Option A	
≥ 1	1,492,600	380,900	
≥ 5	671,500	340,200	
≥ 10	444,700	306,500	
≥ 20	285,200	242,000	
≥ 50	108,900	105,000	
≥ 100	25,100	27,500	
≥ 200	1,000	1,400	

### Aircraft Noise Events

Rate	Population experiencing noise events above N65 each day		N65 events contour map
	Baseline	Option A	
≥ 1	612,800	454,200	
≥ 5	288,800	211,200	
≥ 10	209,700	135,600	
≥ 20	155,700	91,100	
≥ 50	66,800	52,900	
≥ 100	22,300	34,600	
≥ 200	11,800	11,400	

### Noise Exposures

Population count	Baseline	Option A	Partial LOAEL contour map
Estimated total population above WHO Threshold (>45 dB L <sub>den</sub> )	597,500	541,500	
Total population within Partial LOAEL (>51 dB L <sub>Aeq,16h</sub> )	159,700	91,200	

### Noise Exposure Change

Change in Noise Exposure	Population experiencing at least 1 dB reduction within partial LOAEL or brought out of partial LOAEL	Population experiencing no change in noise exposure within partial LOAEL	Population experiencing at least 1 dB increase within partial LOAEL or brought into partial LOAEL	Change in noise exposure map
Partial LOAEL	94,900 (of which 84,700 brought out of Partial LOAEL by Option)	43,200	37,700 (of which 16,100 brought into Partial LOAEL by Option)	



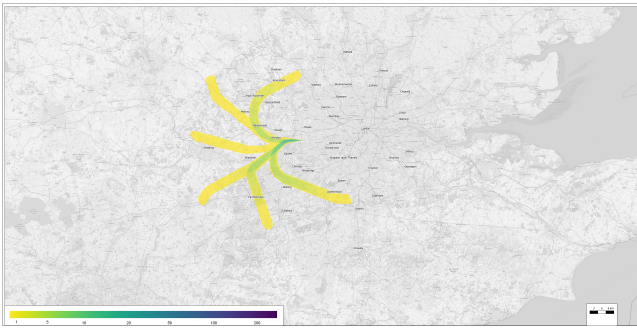
# CAP1616 - INITIAL OPTIONS APPRAISAL – SUPPLEMENTARY METRICS



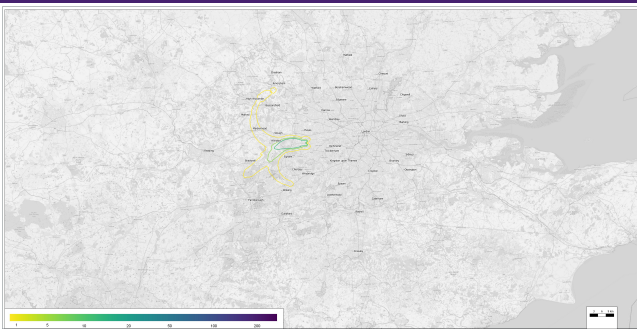
23:00 - 07:00

## PBN Departures – RWY27R Option A (Night)

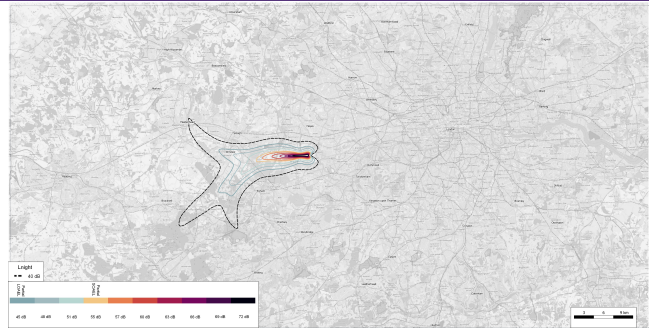
### Overflight

Rate	Population Overflown		Overflight (0-7000 ft) contour map
	Baseline	Option A	
≥ 1	190,500	228,700	
≥ 5	2,000	8,400	
≥ 10	1,000	1,400	
≥ 20	0	0	
≥ 50	0	0	
≥ 100	0	0	
≥ 200	0	0	


### Aircraft Noise Events

Rate	Population experiencing noise events above N60 each day		N60 events contour map
	Baseline	Option A	
≥ 1	292,900	221,100	
≥ 5	42,800	35,800	
≥ 10	19,700	21,500	
≥ 20	0	0	
≥ 50	0	0	
≥ 100	0	0	
≥ 200	0	0	

### Noise Exposures

Population count	Baseline	Option A	Partial LOAEL contour map
Estimated total population above WHO Threshold (>40 dB L <sub>night</sub> )	166,600	95,800	
Total population within Partial LOAEL (>45 dB L <sub>Aeq,8h</sub> )	35,700	40,200	

### Noise Exposure Change

Change in Noise Exposure	Population experiencing at least 1 dB reduction within partial LOAEL or brought out of partial LOAEL	Population experiencing no change in noise exposure within partial LOAEL	Population experiencing at least 1 dB increase within partial LOAEL or brought into partial LOAEL	Change in noise exposure map
Partial LOAEL	10,300 (of which 7,000 brought out of Partial LOAEL by Option)	21,200	15,800 (of which 11,500 brought into Partial LOAEL by Option)	





## PBN SIDs – RWY 27R Option B



### Option Description

This option was developed to prioritise noise to 4000ft and give more weight to CO<sub>2</sub> from 4000ft to 7000ft.

### Communities – Noise impact on health & quality of life

Metric	Option Value	Difference to Baseline
Population above Partial LOAEL (daytime, LA <sub>eq</sub> , 16h)	143,300	-16,400
Population above Partial LOAEL (night-time, LA <sub>eq</sub> , 8h)	73,700	+38,000
Population experiencing at least one event of N65 (daytime)	778,100	+165,300
Population experiencing at least one event of N60 (night-time)	308,600	+15,700

### Communities - Air Quality

Introduction of PBN SIDs at Heathrow could affect track distribution below 1000ft within an AQMA. This may or may not have an effect on Air Quality. This is the same for all departure options and is not a differentiating factor at this stage. Any Air Quality impacts will be investigated at Full Options Appraisal (FOA).

### Wider Society – Greenhouse Gas Impact

Metric	Option Value	Difference to Baseline
Overall Track Miles of the option (nm)	445	-10

### Wider Society – Tranquillity & Biodiversity

Metric	Option Value	Difference to Baseline
Total Area of AONBs/National Parks (NPs) overflown between 0-7000ft once a day on average (daytime)	113km <sup>2</sup>	-182km <sup>2</sup>
Total Area of AONBs/NPs overflown experiencing at least one event of N65 on average (daytime)	84km <sup>2</sup>	+40km <sup>2</sup>
Total Area of Richmond Park overflown between 0-7000ft at least once a day on average (daytime)	0km <sup>2</sup>	No change
Number of sites (RAMSAR, SAC, SPA, SSSI) overflown between 0-1640ft which observe a potential change in location overflown	3	+3
Number of sites (RAMSAR, SAC, SPA, SSSI) overflown between 0-3000ft which observe a potential change in location overflown	14	+14

### Wider Society – Capacity/Resilience

Expected to perform better than the 'Do Nothing' scenario owing to anticipated improved departure separations.

Heathrow's capacity for this ACP is limited by the existing 480,000 movement cap.

### General Aviation – Access

No additional CAS envisaged.

Systemised SIDs requiring less tactical intervention and with improved CCO could facilitate release of portions of CAS.

SIDs could impact helicopter route H10.

## General Aviation / Commercial Airlines – Economic impact from increased effective capacity

If this option did enable sponsors to release some portions of CAS there could be a small, positive economic effect on GA operations outside CAS but this is not quantifiable at this stage.

The economic impact on commercial airlines from a reduction in ground delay is expected to provide an overall benefit in comparison to the Baseline.

## General Aviation / Commercial Airlines – Fuel Burn

Change in Fuel Burn (compared to the Baseline - annual - tonnes)	-1,580
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## Commercial Airlines – Training costs

None identified.

## Commercial Airlines – Other costs

None identified.

## Airport/ANSP – Infrastructure costs

Option may require re-location and/or addition of Noise Monitoring Terminals.

## Airport/ANSP – Operational costs

This option is not anticipated to change airport or ANSP operational costs. The implementation of PBN SIDs removes Heathrow's dependency on conventional ground-based navigation equipment (VORs), which contributes to a reduction in Heathrow and NERL's operational costs as it enables VOR rationalisation.

## Airport/ANSP – Deployment costs

There will be significant costs associated with deployment in terms of operational training and system upgrades which will be quantified in Stage 3. However, no differences are expected in these costs between the different options.

Option may lead to a change in the number of properties eligible for the noise insulation scheme which could lead to a change in operational costs for the airport.

## Safety

Designing first turn within PANS OPS may be challenging.

Although new or revised safety assurances may be needed, an acceptable safety argument is envisaged to be achievable.

## Adherence to AMS

Supports the AMS through increased systemisation and meeting the Government's key environmental objectives by utilising PBN. Used in combination with suitable arrival options, the option supports CCO/CDA operations enabling quicker & cleaner journeys. PBN Departures provide opportunity to potentially reduce CAS & enable integration of UAM in the future. Efficiency benefits to the LTMA are not yet known.

## Interdependencies, Conflicts & Trade-Offs

Option is expected to result in conflicts/interdependencies with RAF Northolt, Luton, Biggin Hill, Stansted, London City, Farnborough and Gatwick.

## Outcome of PBN SID RWY27R Option B

Option B reduces the population above the Partial LOAEL (daytime). There is a small decrease in track miles and the option indicates an improvement in airport resilience.

There is a significant number of biodiversity sites between 0-3000ft that may experience a change in location overflown and it performs poorly against the majority of the noise metrics. Critically, the option failed Test 1 of the shortlisting process as it would increase population above the partial LOAEL (night) by more than twice the size of the Baseline.

**OPTION DISCONTINUED**

# CAP1616 - INITIAL OPTIONS APPRAISAL – SUPPLEMENTARY METRICS



07:00 - 23:00

## PBN Departures – RWY27R Option B (Day)

### Overflight

Rate	Population Overflow		Overflight (0-7000 ft) contour map
	Baseline	Option B	
≥ 1	1,492,600	933,900	
≥ 5	671,500	812,100	
≥ 10	444,700	697,300	
≥ 20	285,200	583,600	
≥ 50	108,900	183,400	
≥ 100	25,100	2,700	
≥ 200	1,000	1,000	

### Aircraft Noise Events

Rate	Population experiencing noise events above N65 each day		N65 events contour map
	Baseline	Option B	
≥ 1	612,800	778,100	
≥ 5	288,800	404,900	
≥ 10	209,700	259,300	
≥ 20	155,700	142,600	
≥ 50	66,800	85,300	
≥ 100	22,300	23,400	
≥ 200	11,800	10,800	

### Noise Exposures

Population count	Baseline	Option B	Partial LOAEL contour map
Estimated total population above WHO Threshold (>45 dB L <sub>den</sub> )	597,500	764,400	
Total population within Partial LOAEL (>51 dB L <sub>Aeq,16h</sub> )	159,700	143,300	

### Noise Exposure Change

Change in Noise Exposure	Population experiencing at least 1 dB reduction within partial LOAEL or brought out of partial LOAEL	Population experiencing no change in noise exposure within partial LOAEL	Population experiencing at least 1 dB increase within partial LOAEL or brought into partial LOAEL	Change in noise exposure map
Partial LOAEL	92,600 (of which 75,100 brought out of Partial LOAEL by Option)	37,600	88,300 (of which 58,700 brought into Partial LOAEL by Option)	



# CAP1616 - INITIAL OPTIONS APPRAISAL – SUPPLEMENTARY METRICS



23:00 - 07:00

## PBN Departures – RWY27R Option B (Night)

### Overflight

Rate	Population Overflown		Overflight (0-7000 ft) contour map
	Baseline	Option B	
≥ 1	190,500	570,600	
≥ 5	2,000	2,500	
≥ 10	1,000	900	
≥ 20	0	0	
≥ 50	0	0	
≥ 100	0	0	
≥ 200	0	0	

### Aircraft Noise Events

Rate	Population experiencing noise events above N60 each day		N60 events contour map
	Baseline	Option B	
≥ 1	292,900	308,600	
≥ 5	42,800	35,800	
≥ 10	19,700	16,100	
≥ 20	0	0	
≥ 50	0	0	
≥ 100	0	0	
≥ 200	0	0	

### Noise Exposures

Population count	Baseline	Option B	Partial LOAEL contour map
Estimated total population above WHO Threshold (>40 dB L <sub>night</sub> )	166,600	142,900	
Total population within Partial LOAEL (>45 dB L <sub>Aeq,8h</sub> )	35,700	73,700	

### Noise Exposure Change

Change in Noise Exposure	Population experiencing at least 1 dB reduction within partial LOAEL or brought out of partial LOAEL	Population experiencing no change in noise exposure within partial LOAEL	Population experiencing at least 1 dB increase within partial LOAEL or brought into partial LOAEL	Change in noise exposure map
Partial LOAEL	10,800 (of which 9,200 brought out of Partial LOAEL by Option)	17,300	54,900 (of which 47,200 brought into Partial LOAEL by Option)	

