



AIRSPACE MODERNISATION AIRSPACE CHANGE PROPOSAL

STEP 2B INITIAL OPTIONS APPRAISAL

APPENDIX A

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

***Version 2
PART 8***

Heathrow



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Revision History

Version	Date	Amendment	Author
1.0	28 th July 2023	Initial issue	Heathrow Airport Ltd
2.0	07 th 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 09L



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 09L Option J



Option Description

This option was developed to address stakeholder feedback from Stage 2A engagement to avoid Richmond Park.

Communities – Noise impact on health & quality of life

Metric	Option Value	Difference to Baseline
Population above Partial LOAEL (daytime, LA _{eq} , 16h)	182,200	+182,200
Population above Partial LOAEL (night-time, LA _{eq} , 8h)	45,500	+35,000
Population experiencing at least one event of N65 (daytime)	1,755,600	+1,755,600
Population experiencing at least one event of N60 (night-time)	524,400	+469,500

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)	437	-3

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)	11km ²	+11km ²
Total Area of AONBs/NPs overflown experiencing at least one event of N65 on average (daytime)	6km ²	+6km ²
Total Area of Richmond Park overflown between 0-7000ft at least once a day on average (daytime)	Less than 1km ²	Less than 1km ²
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	4	+4

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 routes H10, H3 and/or H9.



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)	+74,630
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Commercial Airlines – Other costs

None identified.

Commercial Airlines – Training 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.

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.

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.

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

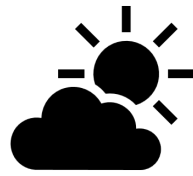
Option is expected to result in conflicts/interdependencies with RAF Northolt, Luton, Biggin Hill, Stansted, London City, Farnborough and Gatwick.

Outcome of PBN SID RWY09L Option J

Runway 09L is not generally used for departures today due to the legacy of the Cranford Agreement. All departure options therefore perform worse than the Baseline. We have not discontinued any of these options and will investigate the likely impacts of them in Stage 3.

OPTION CARRIED FORWARD TO STAGE 3

CAP1616 - INITIAL OPTIONS APPRAISAL – SUPPLEMENTARY METRICS



07:00 - 23:00

PBN Departures – RWY 09L Option J (Day)

Overflight

Rate	Population Overflow		Overflight (0-7000 ft) contour map
	Baseline	Option J	
≥ 1	0	1,472,800	
≥ 5	0	1,276,500	
≥ 10	0	1,156,700	
≥ 20	0	967,800	
≥ 50	0	53,800	
≥ 100	0	3,700	
≥ 200	0	0	

Aircraft Noise Events

Rate	Population experiencing noise events above N65 each day		N65 events contour map
	Baseline	Option J	
≥ 1	0	1,755,600	
≥ 5	0	867,300	
≥ 10	0	553,200	
≥ 20	0	340,800	
≥ 50	0	155,500	
≥ 100	0	45,300	
≥ 200	0	0	

Noise Exposures

Population count	Baseline	Option J	Partial LOAEL contour map
Estimated total population above WHO Threshold (>45 dB L _{den})	0	793,400	
Total population within Partial LOAEL (>51 dB L _{Aeq,16h})	0	182,200	

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	0 (of which 0 brought out of Partial LOAEL by Option)	0	182,200 (of which 162,700 brought into Partial LOAEL by Option)	



CAP1616 - INITIAL OPTIONS APPRAISAL – SUPPLEMENTARY METRICS



23:00 - 07:00

PBN Departures – RWY 09L Option J (Night)

Overflight

Rate	Population Overflow		Overflight (0-7000 ft) contour map
	Baseline	Option J	
≥ 1	3,200	732,600	
≥ 5	0	0	
≥ 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 J	
≥ 1	54,900	524,400	
≥ 5	0	0	
≥ 10	0	0	
≥ 20	0	0	
≥ 50	0	0	
≥ 100	0	0	
≥ 200	0	0	

Noise Exposures

Population count	Baseline	Option J	Partial LOAEL contour map
Estimated total population above WHO Threshold (>40 dB L _{night})	50,400	138,000	
Total population within Partial LOAEL (>45 dB L _{Aeq,8h})	10,500	45,500	

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 (of which 0 brought out of Partial LOAEL by Option)	0	45,500 (of which 35,000 brought into Partial LOAEL by Option)	



Initial Options Appraisal

PBN Standard Instrument Departures (SIDs)

Runway 09R



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)

Standard Instrument Departures (SIDs) – Runway (RWY) 09R Baseline ‘Do Nothing’



Option Description

This represents the baseline for ‘Doing Nothing’ with 09R departures. The image represents the areas overflowed at least once per day on average by 09R departures in 2019.

Communities – Noise Impact on Health & Quality of Life

Metric	Option Value	Difference to Baseline
Population above Partial LOAEL (daytime, LA _{eq} , 16h)	169,200	N/A
Population above Partial LOAEL (night-time, LA _{eq} , 8h)	20,900	N/A
Population experiencing at least one event of N65 (daytime)	2,205,000	N/A
Population experiencing at least one event of N60 (night-time)	492,300	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)	444	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)	115km ²	N/A
Total Area of AONBs/NPs overflowed experiencing at least one event of N65 on average (daytime)	Less than 1km ²	N/A
Total Area of Richmond Park overflowed between 0-7000ft at least once a day on average (daytime)	4km ²	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

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 Easterly 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

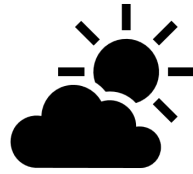
Doing nothing would not be in support of the AMS. There are many interdependencies with routes to/from other airports in the LTMA and without changes to Heathrow’s routes, enhancements to the wider LTMA would be severely constrained.

Outcome of SID RWY09R Baseline ‘Do Nothing’

The Baseline (Do Nothing) Option was discontinued during the Design Principles Evaluation (DPE) phase of Stage 2 owing to it 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 – RWY 09R Do Nothing (Day)

Overflight

Rate	Population Overflown		Overflight (0-7000 ft) contour map
	Baseline	Do Nothing	
≥ 1	3,602,900	3,602,900	
≥ 5	2,049,700	2,049,700	
≥ 10	1,356,800	1,356,800	
≥ 20	672,800	672,800	
≥ 50	5,000	5,000	
≥ 100	300	300	
≥ 200	0	0	

Aircraft Noise Events

Rate	Population experiencing noise events above N65 each day		N65 events contour map
	Baseline	Do Nothing	
≥ 1	2,205,000	2,205,000	
≥ 5	857,200	857,200	
≥ 10	525,800	525,800	
≥ 20	342,200	342,200	
≥ 50	110,300	110,300	
≥ 100	33,500	33,500	
≥ 200	0	0	

Noise Exposures

Population count	Baseline	Do Nothing	Partial LOAEL contour map
Estimated total population above WHO Threshold (>45 dB L _{den})	734,200	734,200	
Total population within Partial LOAEL (>51 dB L _{Aeq,16h})	169,200	169,200	

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	0 (0 brought out of Partial LOAEL by Option)	0	0 (0 brought into Partial LOAEL by Option)	



CAP1616 - INITIAL OPTIONS APPRAISAL – SUPPLEMENTARY METRICS

PBN Departures – RWY 09R Do Nothing (Night)



23:00 - 07:00

Overflight

Rate	Population Overflown		Overflight (0-7000 ft) contour map
	Baseline	Do Nothing	
≥ 1	339,800	339,800	
≥ 5	0	0	
≥ 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	Do Nothing	
≥ 1	492,300	492,300	
≥ 5	0	0	
≥ 10	0	0	
≥ 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 _{night})	119,900	119,900	
Total population within Partial LOAEL (>45 dB L _{Aeq,8h})	20,900	20,900	

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 09R 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 _{eq} , 16h)	196,200	+27,000
Population above Partial LOAEL (night-time, LA _{eq} , 8h)	32,700	+11,800
Population experiencing at least one event of N65 (daytime)	1,707,100	-498,000
Population experiencing at least one event of N60 (night-time)	475,000	-17,300

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)	441	-3

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)	19km ²	-96km ²
Total Area of AONBs/NPs overflown experiencing at least one event of N65 on average (daytime)	11km ²	+11km ²
Total Area of Richmond Park overflown between 0-7000ft at least once a day on average (daytime)	7km ²	+3km ²
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	5	+5

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 routes H10, H3 and/or H9.



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)	-90
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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.

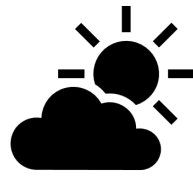
Outcome of PBN SID RWY09R Option A

Option A significantly reduces the population experiencing at least one N65 day event, and reduces the population experiencing at least one N60 night event. It indicates a small decrease in track miles and an improvement in airport resilience.

There are increases in the population above the Partial LOAEL (daytime). There is a significant number of biodiversity sites between 0-3000ft that may experience a change in location overflowed. Critically, the option failed Test 1 of the shortlisting process as it increases the population with the Partial LOAEL (night) by more than 50% compared with the Baseline.

OPTION DISCONTINUED

CAP1616 - INITIAL OPTIONS APPRAISAL – SUPPLEMENTARY METRICS



07:00 - 23:00

PBN Departures – RWY 09R Option A (Day)

Overflight

Rate	Population Overflow		Overflight (0-7000 ft) contour map
	Baseline	Option A	
≥ 1	3,602,900	1,256,900	
≥ 5	2,049,700	1,063,800	
≥ 10	1,356,800	999,700	
≥ 20	672,800	875,700	
≥ 50	5,000	44,800	
≥ 100	300	4,300	
≥ 200	0	0	

Aircraft Noise Events

Rate	Population experiencing noise events above N65 each day		N65 events contour map
	Baseline	Option A	
≥ 1	2,205,000	1,707,100	
≥ 5	857,200	786,700	
≥ 10	525,800	497,400	
≥ 20	342,200	347,200	
≥ 50	110,300	141,700	
≥ 100	33,500	54,900	
≥ 200	0	0	

Noise Exposures

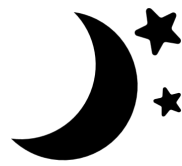
Population count	Baseline	Option A	Partial LOAEL contour map
Estimated total population above WHO Threshold (>45 dB L _{den})	734,200	698,300	
Total population within Partial LOAEL (>51 dB L _{Aeq,16h})	169,200	196,200	

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	86,400 (of which 56,100 brought out of Partial LOAEL by Option)	38,600	127,400 (of which 83,100 brought into Partial LOAEL by Option)	



CAP1616 - INITIAL OPTIONS APPRAISAL – SUPPLEMENTARY METRICS



23:00 - 07:00

PBN Departures – RWY09R Option A (Night)

Overflight

Rate	Population Overflown		Overflight (0-7000 ft) contour map
	Baseline	Option A	
≥ 1	339,800	729,500	
≥ 5	0	0	
≥ 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 A	
≥ 1	492,300	475,000	
≥ 5	0	0	
≥ 10	0	0	
≥ 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 _{night})	119,900	143,800	
Total population within Partial LOAEL (>45 dB L _{Aeq,8h})	20,900	32,700	

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	5,700 (of which 5,700 brought out of Partial LOAEL by Option)	11,600	21,100 (of which 17,500 brought into Partial LOAEL by Option)	



PBN SIDs – RWY 09R Option B



Option Description

This option was developed to prioritise noise to 4000ft and give more weight to CO₂ from 4000ft to 7000ft.

Communities – Noise impact on health & quality of life

Metric	Option Value	Difference to Baseline
Population above Partial LOAEL (daytime, LA _{eq} , 16h)	194,400	+25,200
Population above Partial LOAEL (night-time, LA _{eq} , 8h)	24,200	+3,300
Population experiencing at least one event of N65 (daytime)	1,942,000	-263,000
Population experiencing at least one event of N60 (night-time)	476,400	-15,900

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)	432	-12

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)	25km ²	-90km ²
Total Area of AONBs/NPs overflown experiencing at least one event of N65 on average (daytime)	10km ²	+10km ²
Total Area of Richmond Park overflown between 0-7000ft at least once a day on average (daytime)	7km ²	+3km ²
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	4	+4

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 routes H10, H3 and/or H9.

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)	-870
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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 RWY09R Option B

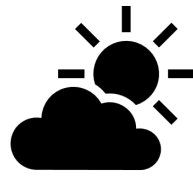
Option B performs well against N65 (daytime) and N60 (night) noise events when compared to the Baseline. It indicates decreases in track miles. The option indicates an improvement in airport resilience.

There are increases in the population above the Partial LOAEL (daytime and night) and a significant number of biodiversity sites between 0-3000ft that may experience a change in location overflown. 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 – RWY 09R Option B (Day)

Overflight

Rate	Population Overflow		Overflight (0-7000 ft) contour map
	Baseline	Option B	
≥ 1	3,602,900	1,690,200	
≥ 5	2,049,700	1,479,500	
≥ 10	1,356,800	1,293,600	
≥ 20	672,800	976,300	
≥ 50	5,000	30,900	
≥ 100	300	2,500	
≥ 200	0	0	

Aircraft Noise Events

Rate	Population experiencing noise events above N65 each day		N65 events contour map
	Baseline	Option B	
≥ 1	2,205,000	1,942,000	
≥ 5	857,200	771,900	
≥ 10	525,800	484,300	
≥ 20	342,200	344,400	
≥ 50	110,300	150,800	
≥ 100	33,500	51,700	
≥ 200	0	0	

Noise Exposures

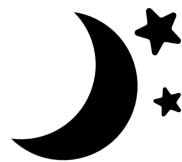
Population count	Baseline	Option B	Partial LOAEL contour map
Estimated total population above WHO Threshold (>45 dB L _{den})	734,200	677,400	
Total population within Partial LOAEL (>51 dB L _{Aeq,16h})	169,200	194,400	

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	88,800 (of which 60,300 brought out of Partial LOAEL by Option)	43,400	122,600 (of which 85,500 brought into Partial LOAEL by Option)	



CAP1616 - INITIAL OPTIONS APPRAISAL – SUPPLEMENTARY METRICS



23:00 - 07:00

PBN Departures – RWY 09R Option B (Night)

Overflight

Rate	Population Overflown		Overflight (0-7000 ft) contour map
	Baseline	Option B	
≥ 1	339,800	642,600	
≥ 5	0	0	
≥ 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 B	
≥ 1	492,300	448,000	
≥ 5	0	0	
≥ 10	0	0	
≥ 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 _{night})	119,900	137,100	
Total population within Partial LOAEL (>45 dB L _{Aeq,8h})	20,900	24,200	

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	6,200 (of which 6,100 brought out of Partial LOAEL by Option)	9,700	14,400 (of which 9,500 brought into Partial LOAEL by Option)	

