



AIRSPACE MODERNISATION AIRSPACE CHANGE PROPOSAL

STEP 2B INITIAL OPTIONS APPRAISAL

APPENDIX A

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

PART 9



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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 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 1.0 (July 2023)

PBN SIDs – RWY 09R Option C



Option Description

This option was developed to address DP4.

Communities – Noise impact on health & quality of life

Metric	Option Value	Difference to Baseline
Population above Partial LOAEL (daytime, LA _{eq} , 16h)	174,700	+5,500
Population above Partial LOAEL (night-time, LA _{eq} , 8h)	23,100	+2,200
Population experiencing at least one event of N65 (daytime)	1,997,000	-208,000
Population experiencing at least one event of N60 (night-time)	510,600	+18,300

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)	423	-21

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)	15km ²	-100km ²
Total Area of AONBs/NPs overflown experiencing at least one event of N65 on average (daytime)	9km ²	+9km ²
Total Area of Richmond Park overflown between 0-7000ft at least once a day on average (daytime)	5km ²	+1km ²
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	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.

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)	-1,510
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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.

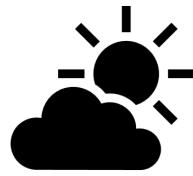
Outcome of PBN SID RWY09R Option C

Option C decreases the total area of AONBs and NPs overflown and reduces the track miles when compared to the Baseline. The option indicates an improvement in airport resilience.

There is a significant increase in the population above the Partial LOAEL (night) and there is a small increase in the population above the Partial LOAEL (daytime). There is an increase in the total area of Richmond Park overflown and the population experiencing at least one N60 (night) noise event and a significant number of biodiversity sites between 0-3000ft that may potentially 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 C (Day)

Overflight

Rate	Population Overflow		Overflight (0-7000 ft) contour map
	Baseline	Option C	
≥ 1	3,602,900	1,799,900	
≥ 5	2,049,700	1,590,800	
≥ 10	1,356,800	1,416,900	
≥ 20	672,800	1,055,900	
≥ 50	5,000	5,500	
≥ 100	300	600	
≥ 200	0	0	

Aircraft Noise Events

Rate	Population experiencing noise events above N65 each day		N65 events contour map
	Baseline	Option C	
≥ 1	2,205,000	1,997,000	
≥ 5	857,200	822,800	
≥ 10	525,800	528,300	
≥ 20	342,200	351,100	
≥ 50	110,300	105,500	
≥ 100	33,500	38,500	
≥ 200	0	0	

Noise Exposures

Population count	Baseline	Option C	Partial LOAEL contour map
Estimated total population above WHO Threshold (>45 dB L _{den})	734,200	741,100	
Total population within Partial LOAEL (>51 dB L _{Aeq,16h})	169,200	174,700	

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	43,200 (of which 26,100 brought out of Partial LOAEL by Option)	88,600	69,100 (of which 31,600 brought into Partial LOAEL by Option)	



CAP1616 - INITIAL OPTIONS APPRAISAL – SUPPLEMENTARY METRICS



23:00 - 07:00

PBN Departures – RWY09R Option C (Night)

Overflight

Rate	Population Overflown		Overflight (0-7000 ft) contour map
	Baseline	Option C	
≥ 1	339,800	565,200	
≥ 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 C	
≥ 1	492,300	510,600	
≥ 5	0	0	
≥ 10	0	0	
≥ 20	0	0	
≥ 50	0	0	
≥ 100	0	0	
≥ 200	0	0	

Noise Exposures

Population count	Baseline	Option C	Partial LOAEL contour map
Estimated total population above WHO Threshold (>40 dB L _{night})	119,900	123,600	
Total population within Partial LOAEL (>45 dB L _{Aeq,8h})	20,900	23,100	

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	3,600 (of which 3,600 brought out of Partial LOAEL by Option)	14,900	8,100 (of which 5,800 brought into Partial LOAEL by Option)	



PBN SIDs – RWY 09R Option D



Option Description

This option is a refinement of Option C, which would require a slightly higher climb gradient to avoid London City Airport.

Communities – Noise impact on health & quality of life

Metric	Option Value	Difference to Baseline
Population above Partial LOAEL (daytime, LA _{eq} , 16h)	172,300	+3,100
Population above Partial LOAEL (night-time, LA _{eq} , 8h)	22,100	+1,200
Population experiencing at least one event of N65 (daytime)	2,669,900	+464,900
Population experiencing at least one event of N60 (night-time)	432,000	-60,300

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)	422	-22

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)	13km ²	-102km ²
Total Area of AONBs/NPs overflown experiencing at least one event of N65 on average (daytime)	9km ²	+9km ²
Total Area of Richmond Park overflown between 0-7000ft at least once a day on average (daytime)	8km ²	+4km ²
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	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.

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)	-1,630
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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 D

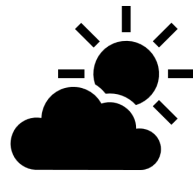
Option D reduces the total area of AONBs and NPs overflown. It indicates a decrease in track miles, in the population experiencing an N60 (night) event and an improvement in airport resilience.

There are small increases in the population above the Partial LOAEL (daytime and night) and the total area of AONBs and NPs experiencing at least one N65 event (daytime). There are a significant number of biodiversity sites between 0-3000ft that may experience a change in location overflown and an increase in the total area of Richmond Park overflown. Critically, the option failed Test 2 of the shortlisting process as it increases the population experiencing N65 events (daytime) by over 20%.

OPTION DISCONTINUED



CAP1616 - INITIAL OPTIONS APPRAISAL – SUPPLEMENTARY METRICS



07:00 - 23:00

PBN Departures – RWY 09R Option D (Day)

Overflight

Rate	Population Overflow		Overflight (0-7000 ft) contour map
	Baseline	Option D	
≥ 1	3,602,900	2,589,300	
≥ 5	2,049,700	2,315,500	
≥ 10	1,356,800	2,095,500	
≥ 20	672,800	1,526,200	
≥ 50	5,000	4,600	
≥ 100	300	600	
≥ 200	0	0	

Aircraft Noise Events

Rate	Population experiencing noise events above N65 each day		N65 events contour map
	Baseline	Option D	
≥ 1	2,205,000	2,669,900	
≥ 5	857,200	882,000	
≥ 10	525,800	536,600	
≥ 20	342,200	340,600	
≥ 50	110,300	107,400	
≥ 100	33,500	38,900	
≥ 200	0	0	

Noise Exposures

Population count	Baseline	Option D	Partial LOAEL contour map
Estimated total population above WHO Threshold (>45 dB L _{den})	734,200	774,400	
Total population within Partial LOAEL (>51 dB L _{Aeq,16h})	169,200	172,300	

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	63,300 (of which 38,600 brought out of Partial LOAEL by Option)	64,100	83,500 (of which 41,700 brought into Partial LOAEL by Option)	



CAP1616 - INITIAL OPTIONS APPRAISAL – SUPPLEMENTARY METRICS



23:00 - 07:00

PBN Departures – RWY 09R Option D (Night)

Overflight

Rate	Population Overflow		Overflight (0-7000 ft) contour map
	Baseline	Option D	
≥ 1	339,800	546,400	
≥ 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 D	
≥ 1	492,300	431,900	
≥ 5	0	0	
≥ 10	0	0	
≥ 20	0	0	
≥ 50	0	0	
≥ 100	0	0	
≥ 200	0	0	

Noise Exposures

Population count	Baseline	Option D	Partial LOAEL contour map
Estimated total population above WHO Threshold (>40 dB L _{night})	119,900	132,000	
Total population within Partial LOAEL (>45 dB L _{Aeq,8h})	20,900	22,100	

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	4,000 (of which 4,000 brought out of Partial LOAEL by Option)	14,300	7,800 (of which 5,200 brought into Partial LOAEL by Option)	



PBN SIDs – RWY 09R Option E



Option Description

This option was developed to address DP5.

Communities – Noise impact on health & quality of life

Metric	Option Value	Difference to Baseline
Population above Partial LOAEL (daytime, LA _{eq} , 16h)	182,600	+13,400
Population above Partial LOAEL (night-time, LA _{eq} , 8h)	28,900	+8,000
Population experiencing at least one event of N65 (daytime)	3,038,000	+833,000
Population experiencing at least one event of N60 (night-time)	571,000	+78,700

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)	436	-8

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)	8km ²	-108km ²
Total Area of AONBs/NPs overflown experiencing at least one event of N65 on average (daytime)	Less than 1km ²	No change
Total Area of Richmond Park overflown between 0-7000ft at least once a day on average (daytime)	4km ²	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	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)	-770
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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.

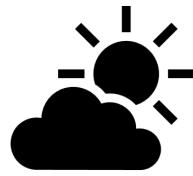
Outcome of PBN SID RWY09R Option E

Option E reduces the total area of AONBs and NPs overflown. It indicates a small decrease in track miles and an improvement in airport resilience. There is no change to overflight of Richmond Park.

The option performs poorly against all the noise metrics and there is a significant number of biodiversity sites between 0-3000ft that may experience a change in location overflown. Critically, the option failed Test 2 of the shortlisting process as it increases the population experiencing N65 events (daytime) by nearly 40% and N60 events (night) by over 15%.

OPTION DISCONTINUED

CAP1616 - INITIAL OPTIONS APPRAISAL – SUPPLEMENTARY METRICS



07:00 - 23:00

PBN Departures – RWY 09R Option E (Day)

Overflight

Rate	Population Overflow		Overflight (0-7000 ft) contour map
	Baseline	Option E	
≥ 1	3,602,900	2,821,400	
≥ 5	2,049,700	2,580,200	
≥ 10	1,356,800	2,286,400	
≥ 20	672,800	1,667,700	
≥ 50	5,000	13,100	
≥ 100	300	700	
≥ 200	0	0	

Aircraft Noise Events

Rate	Population experiencing noise events above N65 each day		N65 events contour map
	Baseline	Option E	
≥ 1	2,205,000	3,038,000	
≥ 5	857,200	933,100	
≥ 10	525,800	599,400	
≥ 20	342,200	399,800	
≥ 50	110,300	122,900	
≥ 100	33,500	46,800	
≥ 200	0	0	

Noise Exposures

Population count	Baseline	Option E	Partial LOAEL contour map
Estimated total population above WHO Threshold (>45 dB L _{den})	734,200	811,800	
Total population within Partial LOAEL (>51 dB L _{Aeq,16h})	169,200	182,600	

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	60,800 (of which 42,400 brought out of Partial LOAEL by Option)	77,400	86,700 (of which 55,800 brought into Partial LOAEL by Option)	



CAP1616 - INITIAL OPTIONS APPRAISAL – SUPPLEMENTARY METRICS



23:00 - 07:00

PBN Departures – RWY09R Option E (Night)

Overflight

Rate	Population Overflow		Overflight (0-7000 ft) contour map
	Baseline	Option E	
≥ 1	339,800	1,002,700	
≥ 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 E	
≥ 1	492,300	571,000	
≥ 5	0	0	
≥ 10	0	0	
≥ 20	0	0	
≥ 50	0	0	
≥ 100	0	0	
≥ 200	0	0	

Noise Exposures

Population count	Baseline	Option E	Partial LOAEL contour map
Estimated total population above WHO Threshold (>40 dB L _{night})	119,900	135,400	
Total population within Partial LOAEL (>45 dB L _{Aeq,8h})	20,900	28,900	

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	5,300 (of which 5,300 brought out of Partial LOAEL by Option)	11,500	17,400 (of which 13,300 brought into Partial LOAEL by Option)	



PBN SIDs – RWY 09R Option F



Option Description

This option was developed to address DP9.

Communities – Noise impact on health & quality of life

Metric	Option Value	Difference to Baseline
Population above Partial LOAEL (daytime, LA _{eq} , 16h)	177,700	+8,500
Population above Partial LOAEL (night-time, LA _{eq} , 8h)	25,600	+4,700
Population experiencing at least one event of N65 (daytime)	1,737,900	-467,100
Population experiencing at least one event of N60 (night-time)	486,900	-5,400

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	-7

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)	37km ²	-79km 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	+4km 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)	-530
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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.

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.

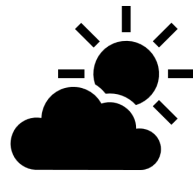
Outcome of PBN SID RWY09R Option F

Option F decreases the population experiencing N65 (daytime) and N60 (night) events when compared to the Baseline. It also decreases track miles and the total area of AONBs and NPs overflown. The option indicates improved airport resilience.

There is an increase in the total area of Richmond Park overflown. There is an increase in the population above the Partial LOAEL (daytime and night) and in the area of AONBs and NPs experiencing at least one N65 event. There is 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 F (Day)

Overflight

Rate	Population Overflow		Overflight (0-7000 ft) contour map
	Baseline	Option F	
≥ 1	3,602,900	1,221,500	
≥ 5	2,049,700	1,086,100	
≥ 10	1,356,800	1,003,000	
≥ 20	672,800	852,200	
≥ 50	5,000	19,700	
≥ 100	300	1,600	
≥ 200	0	0	

Aircraft Noise Events

Rate	Population experiencing noise events above N65 each day		N65 events contour map
	Baseline	Option F	
≥ 1	2,205,000	1,737,900	
≥ 5	857,200	849,800	
≥ 10	525,800	542,400	
≥ 20	342,200	364,400	
≥ 50	110,300	131,300	
≥ 100	33,500	47,200	
≥ 200	0	0	

Noise Exposures

Population count	Baseline	Option F	Partial LOAEL contour map
Estimated total population above WHO Threshold (>45 dB L _{den})	734,200	752,000	
Total population within Partial LOAEL (>51 dB L _{Aeq,16h})	169,200	177,700	

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	70,700 (of which 42,000 brought out of Partial LOAEL by Option)	60,500	88,500 (of which 50,500 brought into Partial LOAEL by Option)	



CAP1616 - INITIAL OPTIONS APPRAISAL – SUPPLEMENTARY METRICS



23:00 - 07:00

PBN Departures – RWY 09R Option F (Night)

Overflight

Rate	Population Overflow		Overflight (0-7000 ft) contour map
	Baseline	Option F	
≥ 1	339,800	618,700	
≥ 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 F	
≥ 1	492,300	486,900	
≥ 5	0	0	
≥ 10	0	0	
≥ 20	0	0	
≥ 50	0	0	
≥ 100	0	0	
≥ 200	0	0	

Noise Exposures

Population count	Baseline	Option F	Partial LOAEL contour map
Estimated total population above WHO Threshold (>40 dB L _{night})	119,900	127,100	
Total population within Partial LOAEL (>45 dB L _{Aeq,8h})	20,900	25,600	

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	5,500 (of which 5,300 brought out of Partial LOAEL by Option)	12,100	13,300 (of which 10,000 brought into Partial LOAEL by Option)	

