

Heathrow Airspace Design Principles

Heathrow Community Noise Forum

18 July 2018



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Richmond Heathrow Campaign (RHC)

The Richmond Heathrow Campaign represents three amenity groups in the London Borough of Richmond upon Thames which together have over 2000 members: The Richmond Society, The Friends of Richmond Green, and the Kew Society.

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Purpose of Presentation

1. Heathrow is sponsor of a current airspace change process for the introduction of a 3rd runway.
2. The process is at Stage 1 - Step 1b (Design Principles).
3. Stage 1 Gateway is scheduled to be passed (subject to CAA sign-off) in July 2018 after which design principles cannot be changed (deferred to August 2018).
4. There are issues regarding engagement between HAL and Communities.
5. The following presentation does not bridge the gaps in engagement and decision process but aims to highlight some of the issues before Stage 1 Design Principles are finalised.
6. Caveats:
 - RHC and HCNF members have not had full discussion: the views are not necessarily those of other communities.
 - The presentation is therefore without prejudice & the views expressed may change.

Key noise objectives

1. HAL's design process to date seemingly fails to start with the several relevant objectives and jumps straight into the principles that should otherwise flow from the objectives.
2. The Government's noise objectives as contained in the National Aviation Policy Framework 2013 are:
 - ~~a. To limit and where possible reduce the number of people significantly affected by aircraft noise. *~~
 - a. To limit and, where possible, reduce the number of people in the UK significantly affected by adverse impacts from aircraft noise (see Slide 5 on integrating WHO guidelines).**
 - b. As a general principle, any benefits from future improvements in aircraft noise performance should be shared between the aviation industry and local communities.**
 - c. The government wants to strike a fair balance between the negative impacts of noise and the positive economic impacts of flights.**

* objective (a) was replaced by the DfT's Air Navigation Guidance 2017.
3. Air Navigation Guidance 2017 says:

'For the purpose of assessing airspace changes, the government wishes the CAA to interpret this objective to mean that - the total adverse effects on people as a result of aviation noise should be limited and, where possible, reduced, rather than the absolute number of people in any particular noise contour. Adverse effects are considered to be those related to health and quality of life. There is no one threshold at which all individuals are considered to be significantly adversely affected by noise.'
4. **The significance is that WebTAG valuations replace a simple measure for the number of people affected.**

Other Relevant Objectives

1. Other noise objectives are included in the following:
 - The Noise Policy Statement For England 2010,
 - Future Airspace Strategy
 - EU Directives
 - ICAO Balanced Approach
 - Environment Protection Acts
 - Planning Acts
 - Local Authority Local Plans
 - London Plan
2. Other relevant environmental objectives relate to:
 - Carbon emissions
 - Air quality
3. Other relevant non-environment objectives relate to:
 - Safety
 - Efficiency
 - Sustainable development
 - Resilience

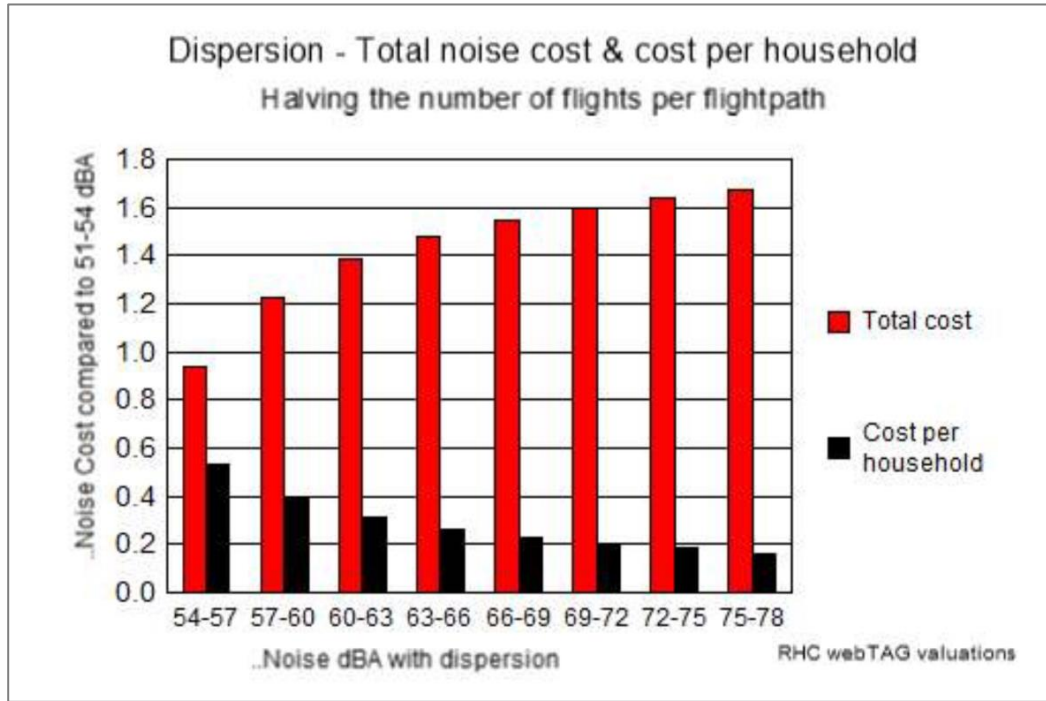
World Health Organisation (WHO) Guidelines

1. The WHO initially published noise guidelines in 1980 and updated them in 1999. In 2009 night noise guidelines were published.
2. Nearly 20 years later (10 years from the night noise update) we are bereft of any government initiative to apply the WHO guidelines to aviation or even reasons why there has been the delay.
3. The WHO will shortly be publishing a review of their guidelines and surely this must be an opportunity for the government to seriously consider the recommendations we make here.
4. The WHO Guidelines are designed to protect human health (as opposed to pure annoyance). Therefore, in the context of the Government's stated objective to use WebTAG, the WHO Guidelines are relevant.
5. We believe it is essential that the Government:
 - a. Establish the legal status of the WHO guideline values.
 - b. Establish a UK strategy and timetable for reducing the levels of community noise from aircraft and from other major sources to the WHO guideline values.
 - c. **Integrate the WHO guidelines with key noise objective (a) concerning reduction in adverse impacts of noise.**

New Community Noise Objective

1. Historically the government has favoured spatial concentration of flight paths but practically this includes some dispersion.
2. PBN technology removes the unplanned dispersion and potentially introduces a high degree of concentration.
3. Multiple flight paths with alternation and rotation (with or without scheduled respite) reduce concentration and increase dispersion.
4. **There needs to be a community noise objective that shares the noise in a fair and reasonable way:**
 - RHC recommends that where there is a reduction in overall noise the benefit be applied to those already most affected and where there is an increase in overall noise the dis-benefit be applied to those already least affected.
5. Proportionality may vary according to circumstance.

Noise Dispersion

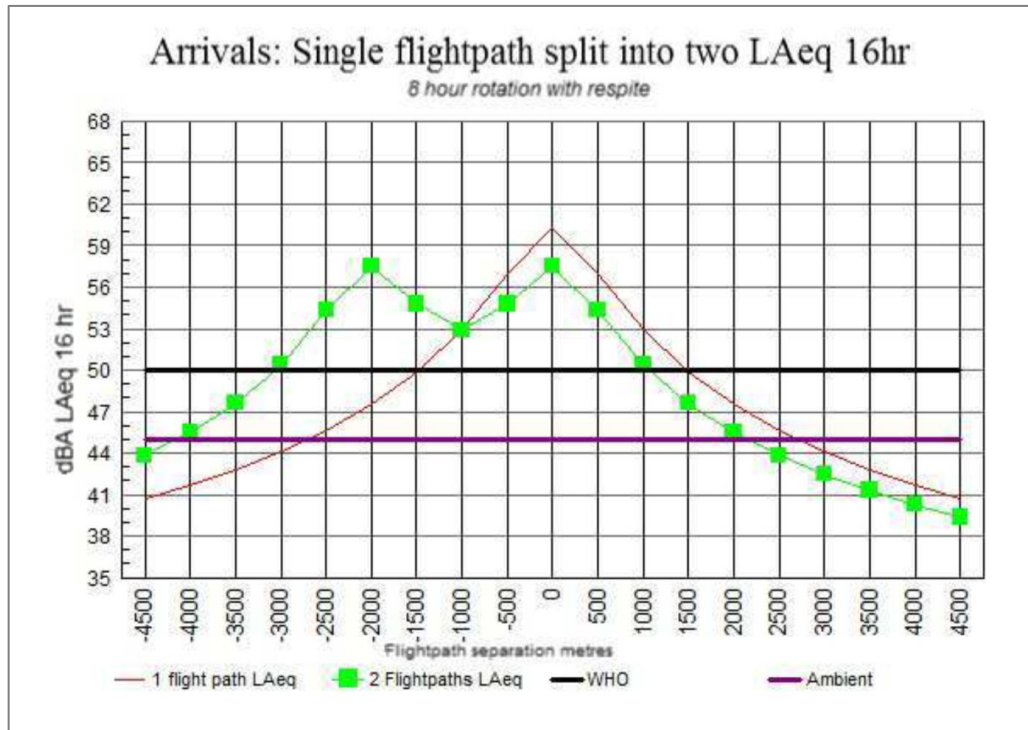


1. The chart illustrates the noise impact of dispersion. The noise cost of introducing a single flight path is compared with the introduction of two flight paths.
 2. The number of flights is halved on each of the two flight paths compared to a single flight path. The noise cost is calculated for several bands of noise compared to a base 51-54 dBA level.
3. For example:
- **Total cost.** Where the noise level increases from 51-54 to 75-78 dBA the total noise cost in WebTAG monetary terms of two flight paths is **1.7 times** the noise cost of one flight path.
 - **Cost per household.** On the assumption household density is the same for one and two flight paths, the number of households doubles for two flight paths. The cost per household is **0.2 times** the cost for a single flight path.

Noise Dispersion - continued

1. In designing Heathrow's airspace the question is whether to minimise total cost or minimise cost per household. If it is the former then the answer is concentration and if it is the latter then the answer is dispersion.
2. **Dispersion would be the choice that satisfies the new community noise objective: Where there is a reduction in overall noise the benefit be applied to those already most affected and where there is an increase in overall noise the dis-benefit be applied to those already least affected.**

Multiple Flight Paths, Respite, and Separation



1. The chart shows a single flight path being divided into two flight paths. The vertical arrivals gate in this example is about 8 Km east of Heathrow.
2. Half the flights on Path 1 are transferred to Path 2. This could be by halving the flow rate or introducing scheduled respite for half the time.
3. Acoustically, reducing the number of flights by half reduces the noise level by 3dBA to 58 dBA.
4. People under the new flight path experience an increase in noise from background to 58 dBA.

Multiple Flight Paths, Respite, and Separation - continued

1. Respite

- a. The table represents the incremental benefit and dis-benefit from sub-dividing an existing flight path.
- b. The WebTAG value of the reduction depends on the new noise level as in the table - ranging in a benefit of between £3,500 and £7,000 per household (NPV 60 year).
- c. The noise costs ranges from zero to £24,000 depending on the new noise level.
- d. **There is a substantial cost to creating multiple flight paths and respite from existing flight paths.**

Respite: Noise benefit and cost from transferring 50% of air traffic to a second flightpath. Figures are not those used in the Chart		
£ per household (NPV 60 yr) webTAG	Noise Benefit to existing households 3dBA reduction to new level	Noise Dis-benefit to new households Increase from 51-54dBA to new level
New level after transfer (dBLAeq 16 hr)	£ per household	£ per household
51-54	3,552	0
54-57	4,040	-3,552
57-60	4,763	-7,592
60-63	5,525	-12,356
63-66	6,301	-17,882
66-69	7,094	-24,182

2. Separation

The chart shows the level of separation needed at this flight path gate. **At 50 dBA the separation required is 3,000 metres. At 45 dBA separation required is 5,500 metres.** This example is for arrivals and will be different for departures.

Integrated Decision Framework

FRAMEWORK FOR HEATHROW EXPANSION, NOISE REDUCTION AND NOISE DISPERSION							
£ Billion (2018 money NPV 60 yrs) valuations Minus sign means cost or dis-benefit; Positive sign means benefit	Date	Community Noise				Carb on & NOX	Industry/ passenger
		Noise Total	Existing legacy population	Newly exposed	Populati on growth		
Population exposed >50 dBA 2018			1,000,000	500,000	0		
Population exposed >50 dBA 2050			550,000	275,000	150,000		
Current costs/benefits	2018	£9bn	£9bn	£0bn	£0bn	?	?
Incremental Change:		£bn	£bn	£bn	£bn	£bn	£bn
Modernisation: No increase in capacity	2024	1	1			1	2
Population growth	2018-2050	-2			-2	-0.25	
Less noisy aircraft	2018-2050	3	2.5		0.5		-1
Do-Minimum 2R	2050	2	3.5	0	-1.5	0.75	1
Expansion	2026-2050	-2		-1.5	-0.5	-2.0	5
Modernisation: Increase in capacity	2025	0	0	0	0	0.75	0.25
Less noisy aircraft	2025-2050	0.35	0	0.25	0.1		-0.5
Noise costs with 3R	2050	0.35	3.5	-1.25	-1.9		
Carbon & NOX costs with 3R						-0.5	
Aviation Industry net benefit with 3R							5.75
THE FIGURES ARE FOR ILLUSTRATION ONLY							

Integrated Decision Framework - continued

1. The framework table has been constructed in WebTAG monetary terms.
2. **Decision inputs are:**
 - a. Community noise costs. Noise impacts above 50 dBA LAeq 16hr. In practice several metrics should be used. Ideally, the three population categories should be further subdivided into households, vulnerable buildings (e.g. schools) and parks.
 - b. Other environmental costs. These include carbon and air pollution for which there are trade-offs with noise.
 - c. Industry costs and benefits. The aviation industry invests in research and development for less noisy aircraft, reduced carbon and pollutants and in replacing Heathrow's fleet. The industry benefits from an increasing number of flights. Costs & benefits ultimately impact passengers.
3. For illustration, the noise costs are valued as of 2018 at £9 Bn (NPV 60 year) and are spread across 1 million people.

Integrated Decision Framework - continued

1. Decision outcomes:

a. Two runway impact:

- Modernisation improves noise, efficiency, safety, carbon and NOx emissions. Industry benefits.
- Population growth results in increased emissions.
- Less noisy aircraft cost industry for research, development and fleet replacement.
- Communities and industry gain as a result of modernisation and less noisy aircraft. Growing population experiences noise for the first time.

b. Three runway impact:

- Industry/passenger benefit.
- Based on the community noise objective, all noise costs are allocated to newly exposed population.
- There is an emissions cost.

2. For illustration only, the overall incremental outcome is:

- a. A community noise net benefit of £0.35Bn (£3.5Bn benefit for existing, £1.25 Bn cost for newly affected & £1.9Bn cost for population growth)
- b. An emissions cost of £0.5bn, and
- c. Industry/passenger benefit of £5.75bn.
- d. The population impacted in the 50 dBA contour starts at 1 million in 2018 and ends at 975,000 in 2050.

3. There needs to be an integrated decision framework to bring together and balance the multiple objectives of the several stakeholders - industry/passenger, communities as a whole and individual communities

ANPS Valuation of 3rd Runway Noise Impact WebTAG

Comparison Between 3 rd Runway and Two runway Do-Minimum			WebTAG Values
£mill (2010 NPV 60yr)	Decrease	Increase	Net
	£mill	£mill	£mill
Sleep Disturbance	546	-458	88
Amenity	1,598	-2,250	-652
AMI	5	-11	-6
Stroke	120	-142	-22
Dementia	181	-215	-34
Total	2,450	-3,076	-626

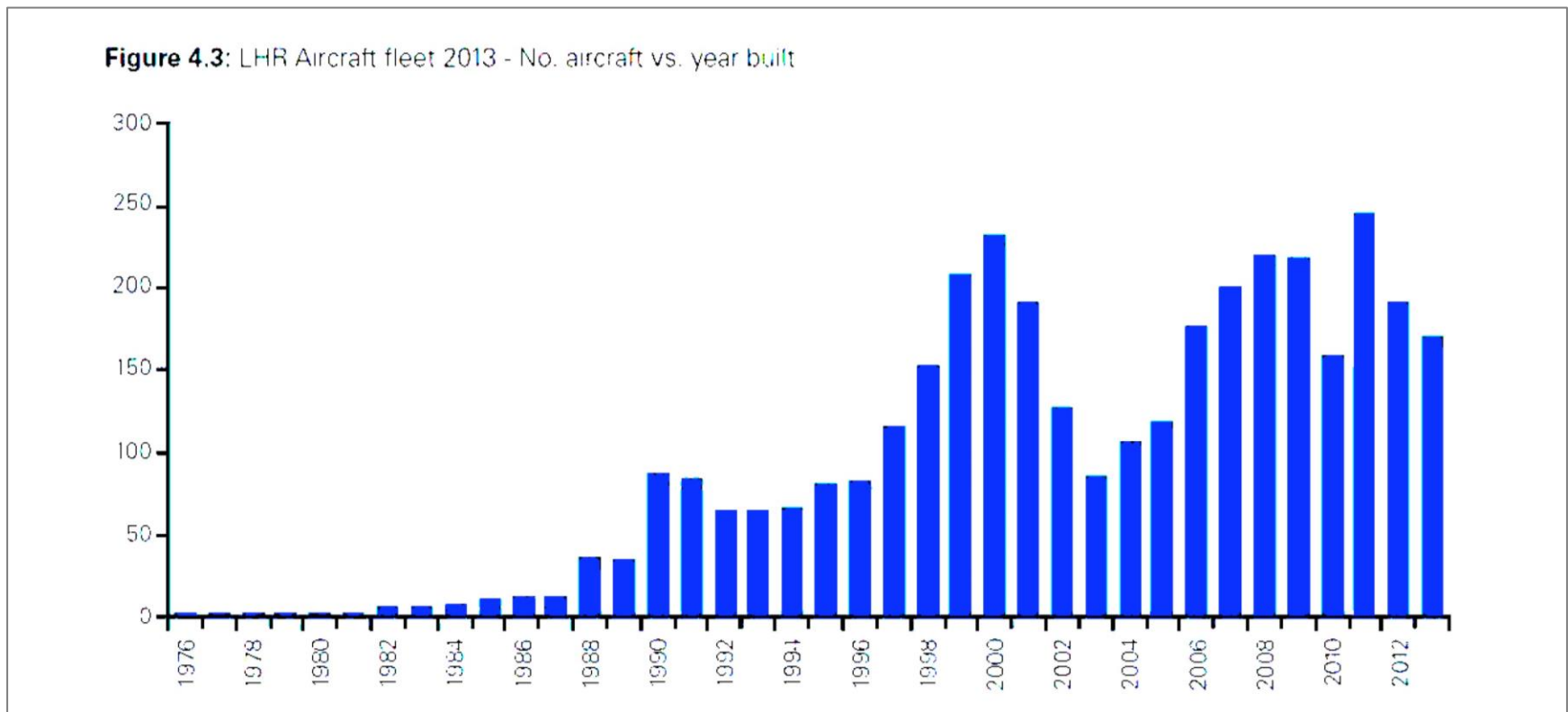
Source: NPS DfT 2017 Option Minimise Total

Comparison Between 3 rd Runway and Two runway Do-Minimum in 2060			
Households	Decrease	Increase	Net
	Households	Households	Households
Day time	673,784	972,957	299,173
Night time	226,675	132,091	-94,584

Note: Assumes an average of 2.3 people per household

1. These tables are derived from the ANPS noise cost of £0.6 Bn.
2. The £2.4 Bn reduction in noise costs will be welcomed by 673,784 households but most if not all of this reduction will be redistributed to other communities who also bear the cost of increased air traffic from a 3rd runway. This will surely be unacceptable to these communities. Also, the re-distribution is contrary to the proposed community noise objective.

Less Noisy Aircraft and Fleet Change



1. There are various estimates of future noise reduction at source but typically these are around **0.1 dBA per annum**. Reduction tends to be larger on departures than on arrivals.
2. Current average life of an aircraft in Heathrow's fleet of 3,000 aircraft is around **25 years**. The airports commission assumed **25 year life** but Heathrow assumed **15 years**.
3. The chart shows the number of aircraft versus year built.

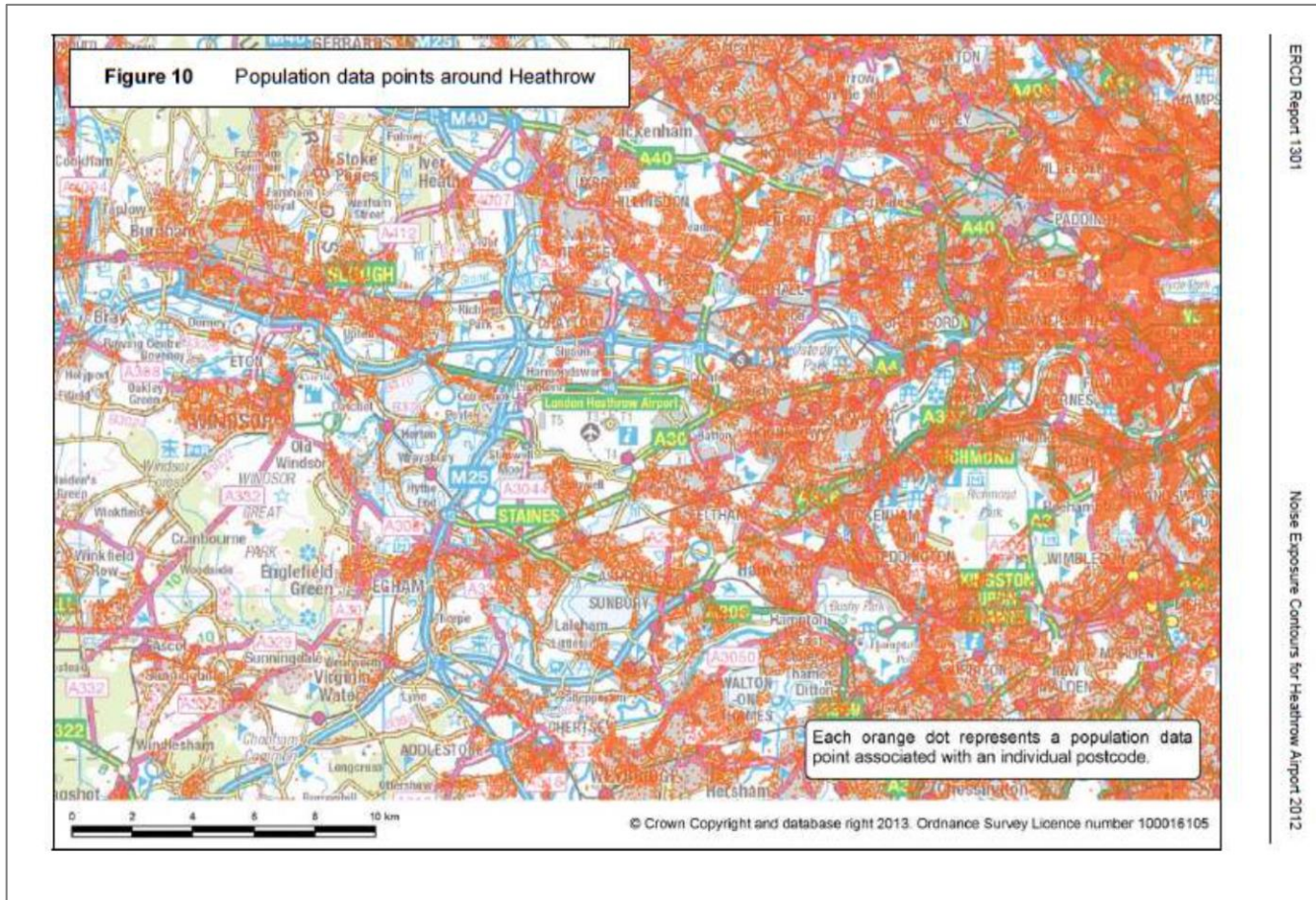
Less Noisy Aircraft and Fleet Change – continued

Aircraft Generation	Two runway 2030		Three runway 2030		Two runway 2040		Three runway 2040	
	HAL	AC	HAL	AC	HAL	AC	HAL	AC
Current	6%	35%	7%	32%		15%		13%
Imminent	94%	65%	93%	67%	78%	73%	80%	76%
Future	0	0	0	0	22%	12%	20%	10%
Total	100%	100%	100%	100%	100%	100%	100%	100%

Source: Heathrow fleet HAL Report Table C1, 2014; Airports Commission (AC) Aviation Noise Local Assessment Appendix A Table A2, 2014

The table compares the Airports Commission fleet with HAL's fleet.

Population Growth & Housing Need



1. Estimated population growth 2011 to 2050: 37%.
2. The Draft London Plan requires the 35 wider-London planning authorities to target **649,340 housing completions over the ten years** from 2019/2020. A portion of these will be in the 54 dB LAeq noise contour.

ICAO balanced approach

1. The main goal of the ICAO land-use planning is to minimise the population affected by aircraft noise by introducing land-use zoning around airports.
2. **The design of flight paths to avoid dense populations is not part of the ICAO land-use planning. The one-sided approach is a major deficiency of the planning process. The ICAO land-use planning is not fit for purpose.**
3. LUP has been revised from 57 dB LAeq to 54 dB LAeq, which covers a large area of London but still does not align with 51 dBA LOEL.

National Parks, Areas of Outstanding National Beauty, and Tranquillity

1. London's parks provide space for relaxation and enjoyment by a large number of people - both visitors and residents.
2. The Royal Botanic Gardens, Kew, is a UNESCO World Heritage Site.
 - The Royal Botanic Gardens have to seek renewal of their heritage status from time to time and need to demonstrate that their "outstanding universal values" are maintained.
 - This could be jeopardised by additional aircraft noise.
3. **There are requirements in the London Plan and local authority plans concerning no increase in noise and pollution at the Royal Botanic Gardens and other parks.**
4. "Quiet Areas" need to be addressed.
5. "Tranquillity" needs to be addressed.

3rd Runway impact on the UK as an Aviation Hub

The following is DFT evidence

Without a 3rd runway:

- The number of passengers terminating their journey at Heathrow grows by 60% by 2050. **Heathrow is not full.**
- UK spare capacity is equivalent to 6 runways in 2050. **UK capacity is well able to satisfy demand through to 2050.**

With a 3rd runway:

- No additional long-haul or domestic business passenger are served at the UK level. **Economic benefit from additional business travel is non-existent.**
- The 43 million additional passengers a year comprise:
 - 17 million cannibalised growth from other UK airports
 - 16 million international-to-international transfers of no value to the UK
 - Only 10 million additional mostly short-haul terminating passengers are served.
- **A 3rd runway harms the UK regional economic balance and is inefficient use of capacity.**
- There are no additional destinations from the UK and frequency of flights at other UK airports is reduced. **UK connectivity is impaired.**
- International-to-international transfers use 37% of additional runway capacity and 94% of the UK's additional long-haul capacity. Only 300,000 out of 24 million annual transfers are on thin routes and are insufficient to support otherwise unviable thin routes. **Heathrow's international transfers provide no UK value and should be replaced by passengers terminating their journeys in the UK .**
- **There is a substantial dis-benefit to the UK aviation market.**

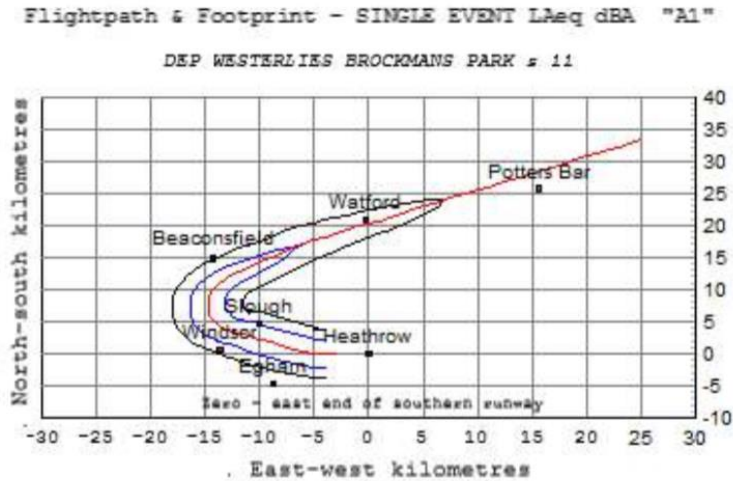
Night Flights

1. Night noise is a major issue for communities. The commission recommended a ban of 6½ hours between 11pm and 7am with exact timing to be agreed; Heathrow and the airlines are not supportive.
2. WHO recommends 8 hours sleep.
- 3. RHC believes there should be an 8 hour ban between 11pm and 7am.**
4. We have made the case in the past that a 8 hour ban would not have negative operational or economic impact.
5. RHC is especially concerned that a ban as proposed would not protect communities from a substantial increase in flights and hence noise in the early morning shoulder period, 6-7am, which would be wholly unacceptable. At the very least there should be a reduction in flights in this shoulder period.

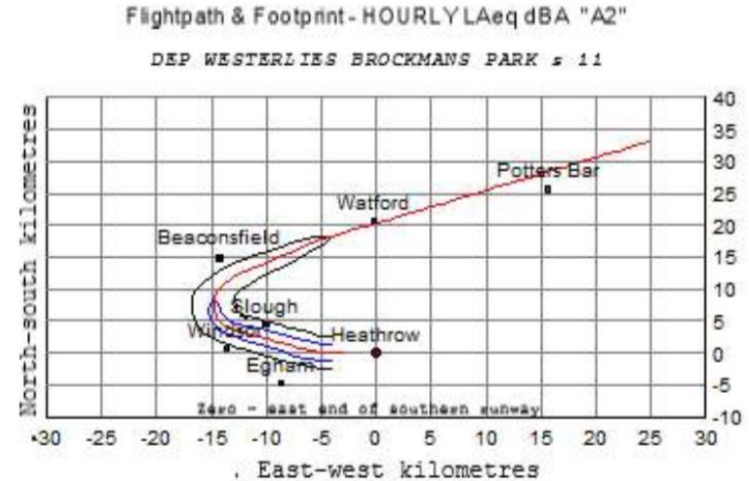
Independent parallel runways & runway length

1. HAL's consultation on airport expansion raised the question of a runway shorter than **3,500 metres**.
2. It is essential that all three Heathrow runways and related airport layout are capable of handling large aircraft. An unequal allocation of large aircraft to one or other of the three runways would have a material impact on airspace design and noise impact.

Altitude based priorities (ANG17)



SINGLE EVENT



HOURLY (9 ATMS)

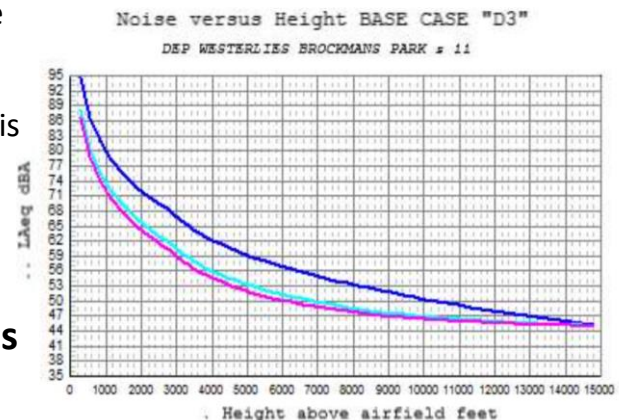
Charts are for two runway Brookmans departures on Westerlies.

Black is 50 dBA footprint and blue is 57 dBA contour.

1. ANG17:

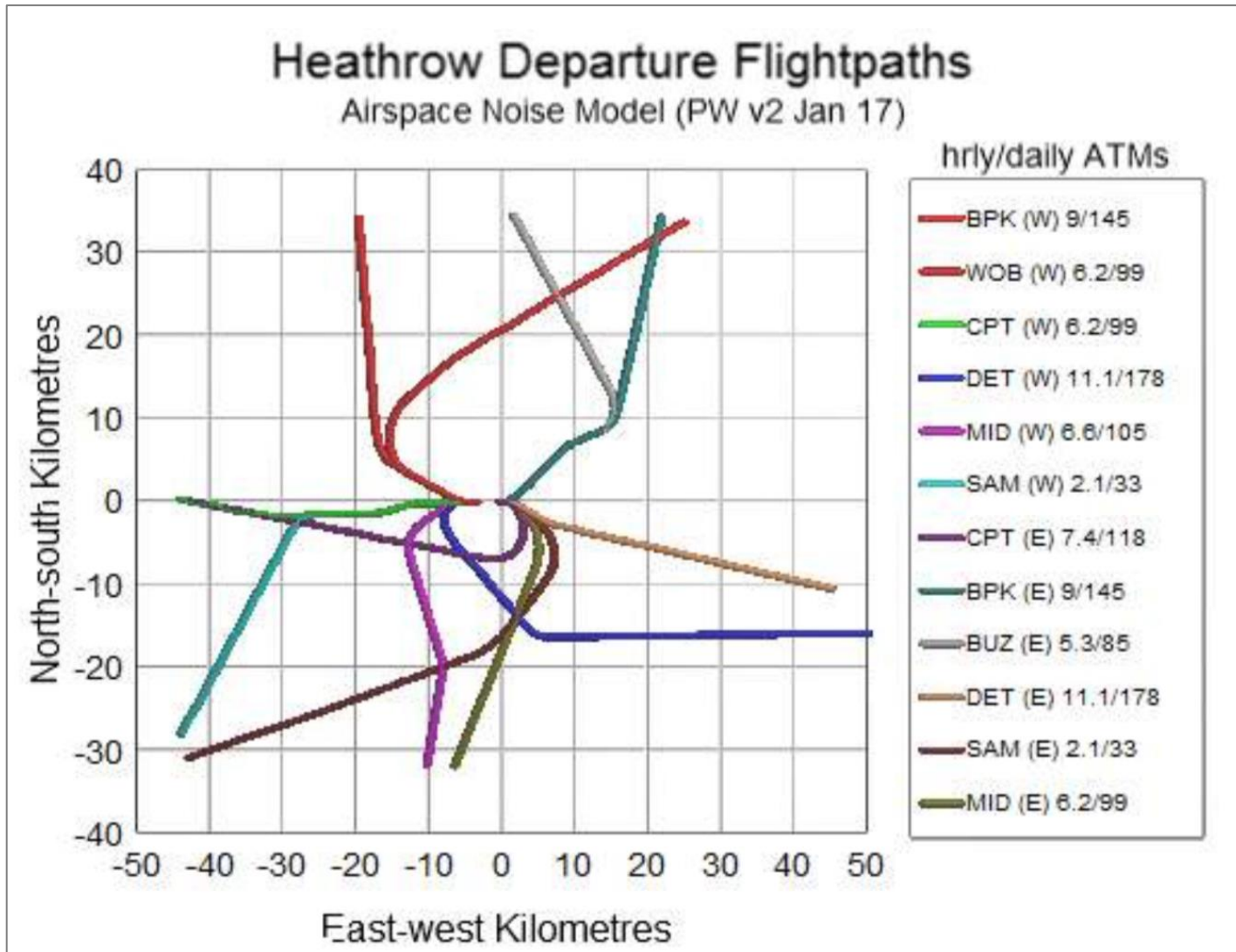
‘In the airspace at or **above 4,000 feet to below 7,000 feet**, the environmental priority should continue to be minimising the impact of aviation noise in a manner consistent with the Government’s overall policy on aviation noise, unless the CAA is satisfied that the evidence presented by the sponsor demonstrates this would disproportionately increase CO₂ emissions.’

2. Noise versus height. Should not 4K and 7K band be raised and should there not also be number of events (e.g. N60)?

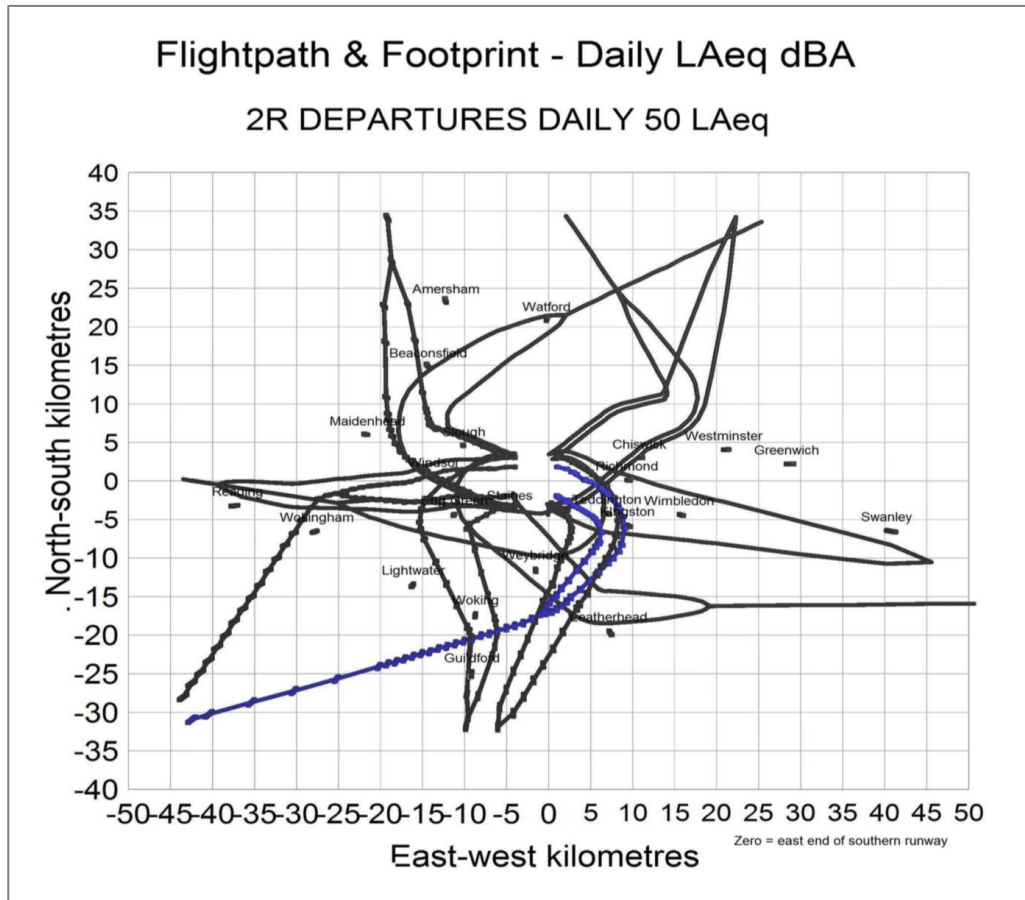


Blue: single event
Turquoise: hourly
Pink: annual

Existing Departure Flight Paths



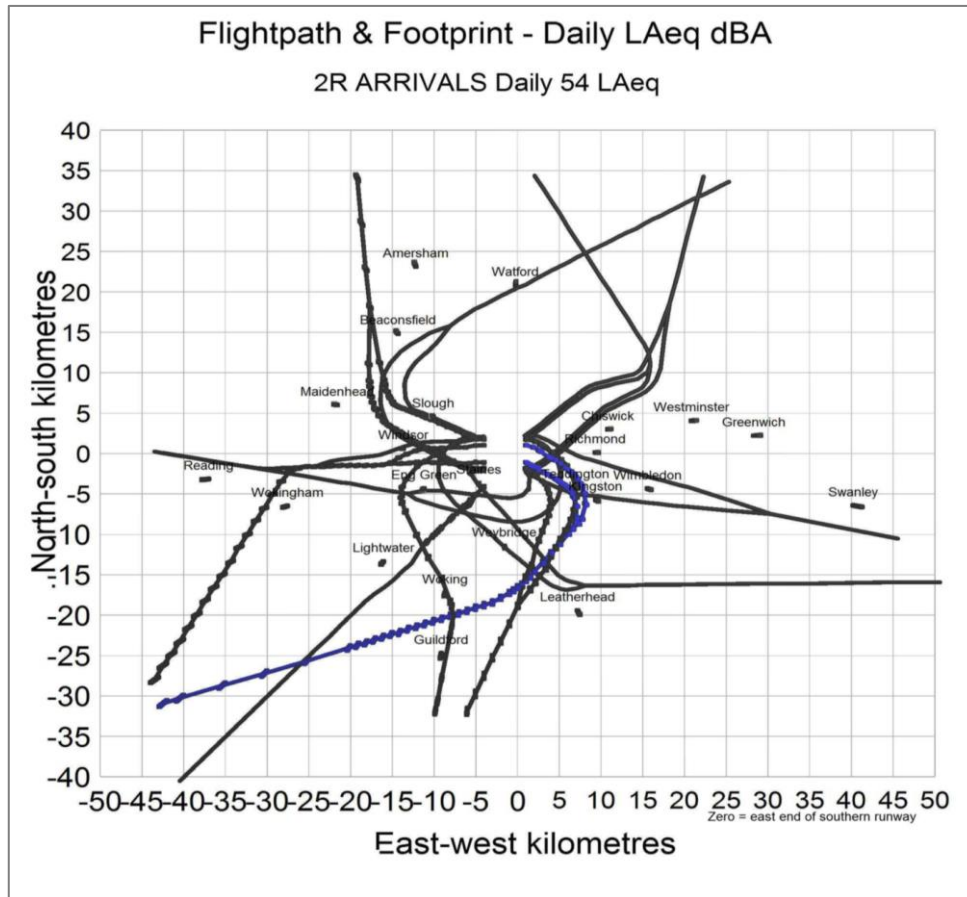
Existing departure flight path daily 50 dBA footprints



*100% concentrated footprints
Footprints not acoustically combined
For illustration only*

1. Existing unplanned dispersion within the current NPRS is likely to widen each footprint and reduce its length.
2. Dispersed footprints could be designed with PBN to match as nearly as possible the current noise climate. Given the relatively narrow dispersion around the central flight path the benefit of respite may be minimal.
3. 3rd runway flight paths over new territory to avoid adding noise to existing populations would have to be fitted into the pattern of existing flight paths. Capacity may be insufficient.

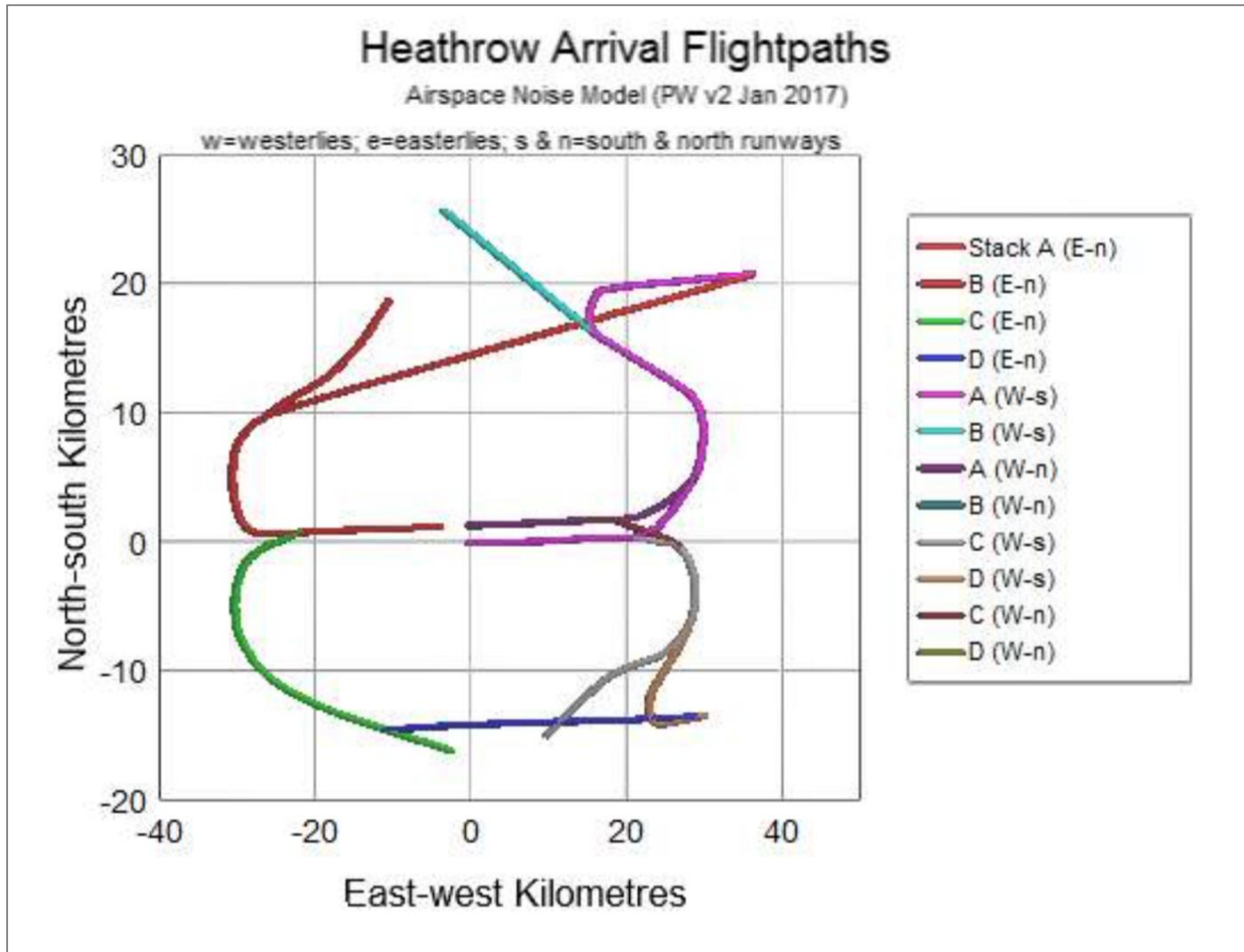
Existing departure flight path daily 54 dBA footprints



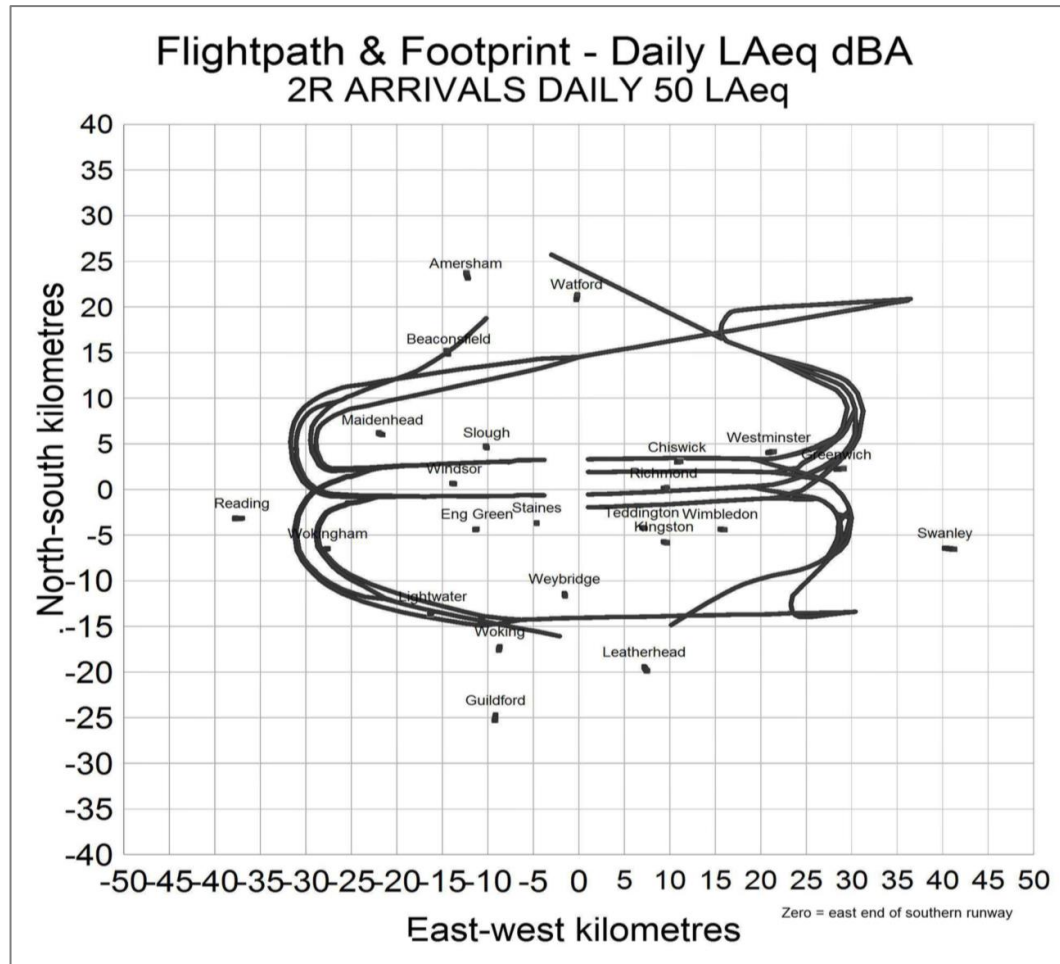
*100% concentrated footprints
Footprints not acoustically combined
For illustration only*

1. Compared to the 50 dBA chart there is clearly more space at the 54 dBA to introduce 3rd runway flight paths.
2. The contours are daily (16 hour) LAeq averages. No respite is assumed so the charts match the hourly charts. The single event charts would have larger footprints. The annual chart would have slightly smaller footprints after taking account of the westerly/easterly split.

Existing Arrival Flight Paths

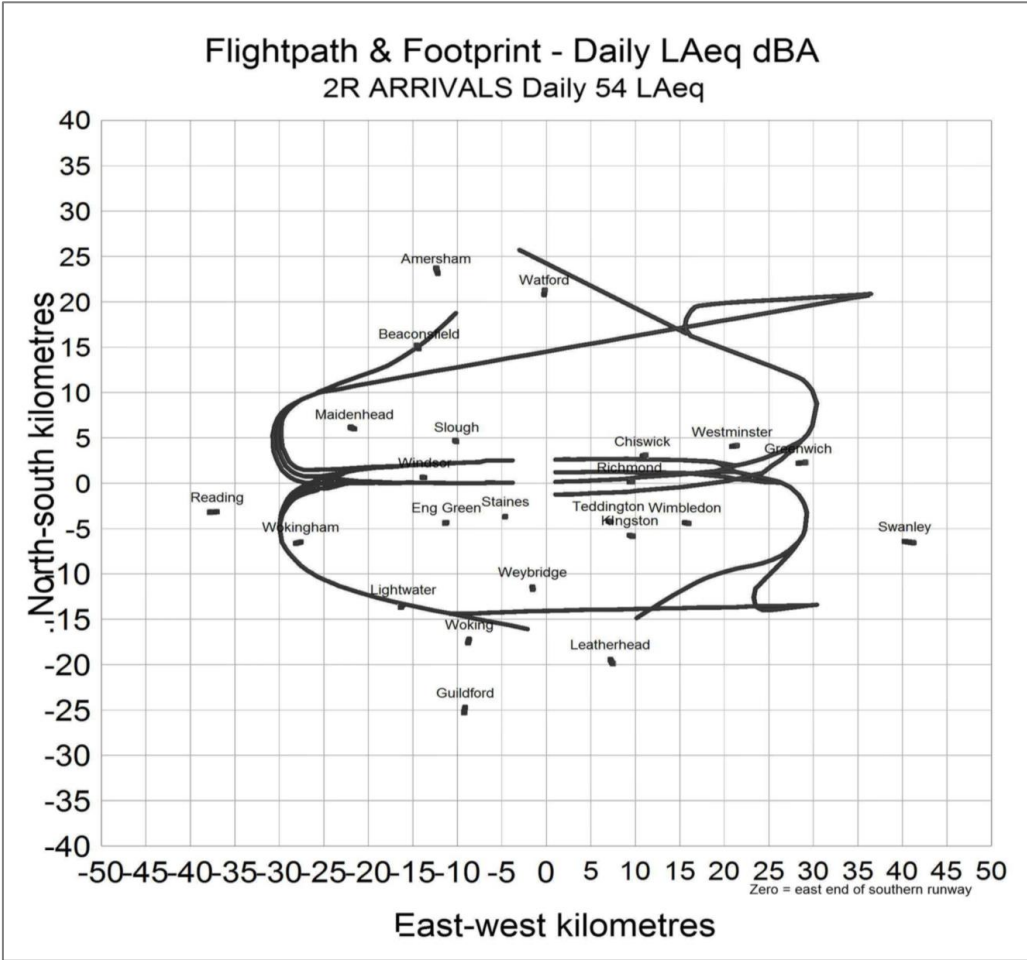


Existing arrival flight path daily 50 dBA footprints



*100% concentrated footprints
Footprints not acoustically combined
For illustration only*

Existing departure flight path daily 54 dBA footprints



*100% concentrated footprints
Footprints not acoustically combined
For illustration only*

Summary – 1 of 2

1. Last chance saloon: HAL's proposed airspace principles will be signed off by CAA in the next few months and be forever fixed (S2).
2. Currently the principles are constructed in a vacuum without objectives from which they should flow (S3).
3. RHC acknowledges the three existing government noise objectives: reducing noise impact, sharing noise reduction benefits with industry and balancing aviation's economic benefits with noise and other environmental costs. But we recommend:
 - The noise reduction objective incorporate WHO guidelines.
 - An additional key community noise objective that establishes the basis of sharing noise between communities.
 - RHC recommends that where there is a reduction in overall noise the benefit be applied to those already most affected currently and where there is an increase in overall noise the dis-benefit be applied to those already least affected (S3, 5, 6).
4. In WebTAG terms the new fourth objective means dispersion and minimising the cost per household/individual across Heathrow's airspace (S7 & 8).
5. Creating respite from existing flight paths is potentially costly in WebTAG terms (S9 & 10).
6. Flight path separation to avoid overlapping noise footprints is vitally necessary (S9 & 10).
7. There needs to be an integrated decision framework to bring together and balance the multiple objectives of the several stakeholders - industry/passenger, communities as a whole and individual communities (S11, 12, 13).

Summary – 2 of 2

8. The ANPS valuation of noise re-allocates £2.4 Bn of noise costs from existing population affected to newly affected. This is likely to be unacceptable (S14).
9. Less noisy aircraft and Heathrow's fleet change is a key driver but currently with a wide spectrum of estimates. This needs to be remedied (S15 & 16).
10. Population growth and housing need is a major factor in considering noise and the ICAO's land use component of the 'balanced approach' is unfit for purpose (S17 & 18).
11. National parks are being undervalued when considering noise. There are risks to world heritage status of the Royal Botanic Gardens Kew. The London and other Plans require no increase in noise affecting UNESCO and other parks (S19).
12. When balancing noise and other environmental impacts with industry/passenger benefits and costs there needs to be a clear valuation. RHC claims there is a dis-benefit to the UK aviation market and a substantial environmental cost (S20).
13. RHC seeks an 8 hour ban on night flights and no air traffic increase in shoulder periods (S21).
14. Uncertainty on 3rd runway length risks heavy aircraft being allocated to existing two runways which would be unacceptable. The matter needs to be resolved before design principles are fixed (S22).
15. Altitude base priority heights need to be raised in line with re-assessments of noise impacts on people (S23).
16. There is uncertainty as to whether there is sufficient airspace to accommodate the four noise objectives and their fair application (S24 to 29).

Thank You