



Departure Noise Mitigation Review

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Civil Aviation Authority
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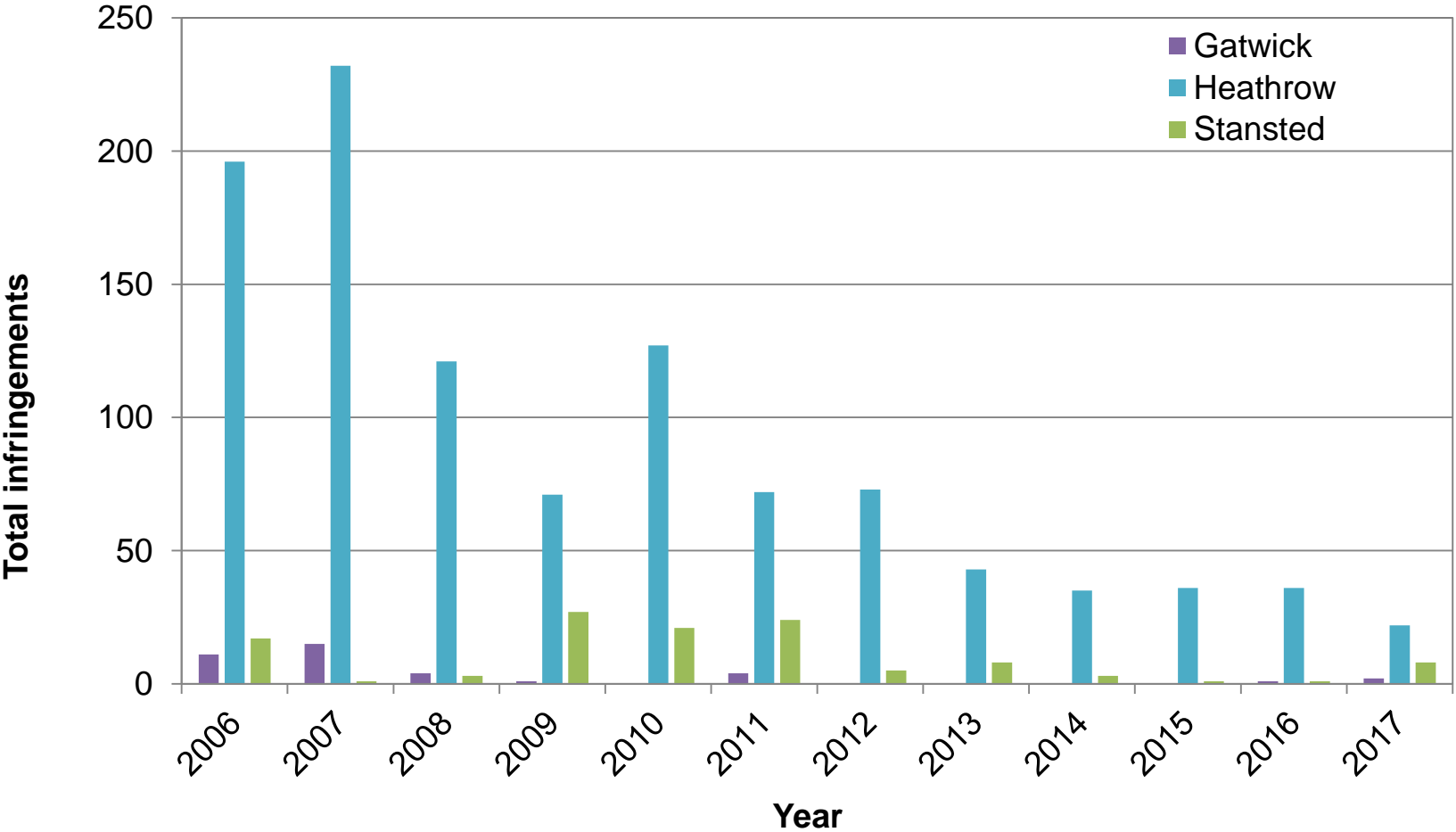
Departure Noise Review: Terms of Reference

- Conduct a review of the existing policy objectives and desired outcomes from a departure noise management regime in order to establish the criteria against which any revised proposals can be assessed. If appropriate, additional or alternative outcomes will be added to the criteria.
- Carry out a systematic review of the current departure noise abatement and monitoring procedures to understand how they help achieve the required outcomes.
- Without prejudice to the review of current procedures, assess the change in infringement rates for an increase in stringency of the current noise limits at Heathrow, Gatwick and Stansted. The current policy of applying uniform noise limits across the three airports should also be reviewed.
- On the basis of findings from these investigations, assess the potential for operational changes to mitigate any significant increase in infringement rate for aircraft of similar types.
- Assess the possible impacts of operational changes in terms of noise, emissions and any other significant factors.
- The Technical Working Group should report their findings back to ANMAC

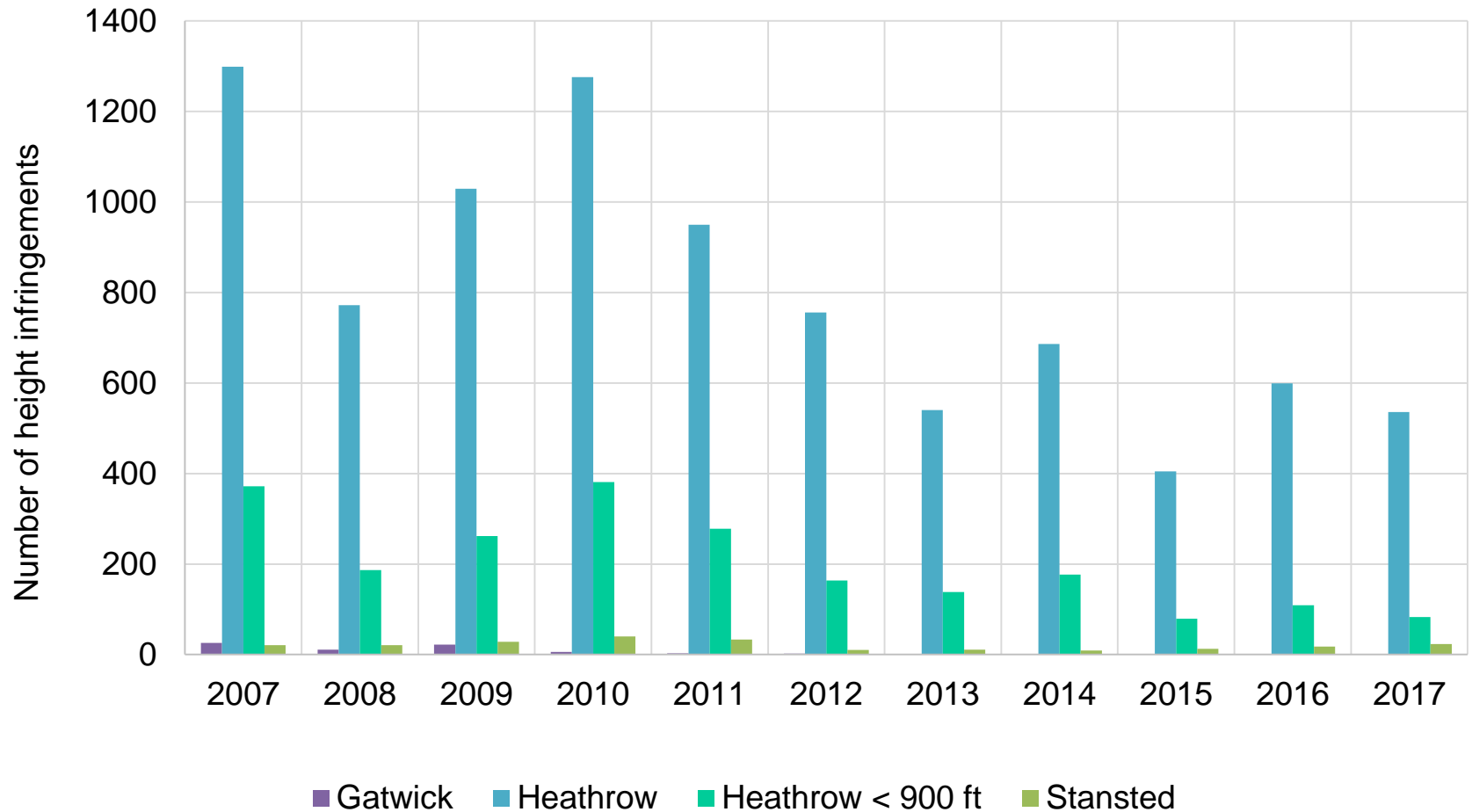
Departure Noise Controls

- Section 78(1) of the Civil Aviation Act 1982
 - Noise limits at 6.5 km after start of take-off roll
 - 94 dBA daytime, 89 dBA should hours, 87 dBA night quota period
 - Financial penalties levied against the limits
 - Reach at least 1,000 ft by 6.5 km after start of take-off roll
 - Maintain a climb gradient of not less than 4% to an altitude of not less than 4,000 feet.
 - Progressively reduce noise beyond 6.5km point
 - Track keeping requirements

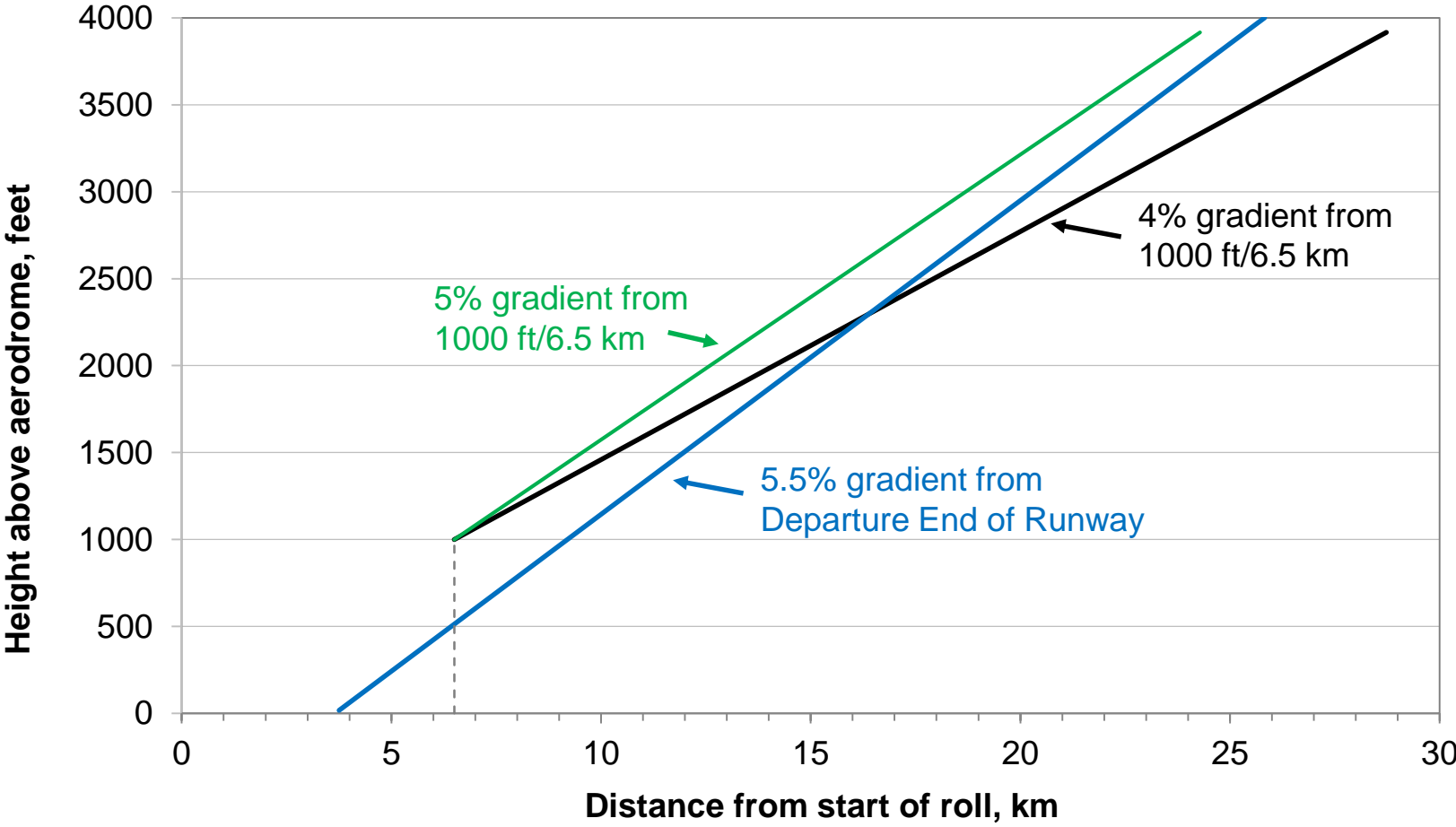
Noise limit infringements



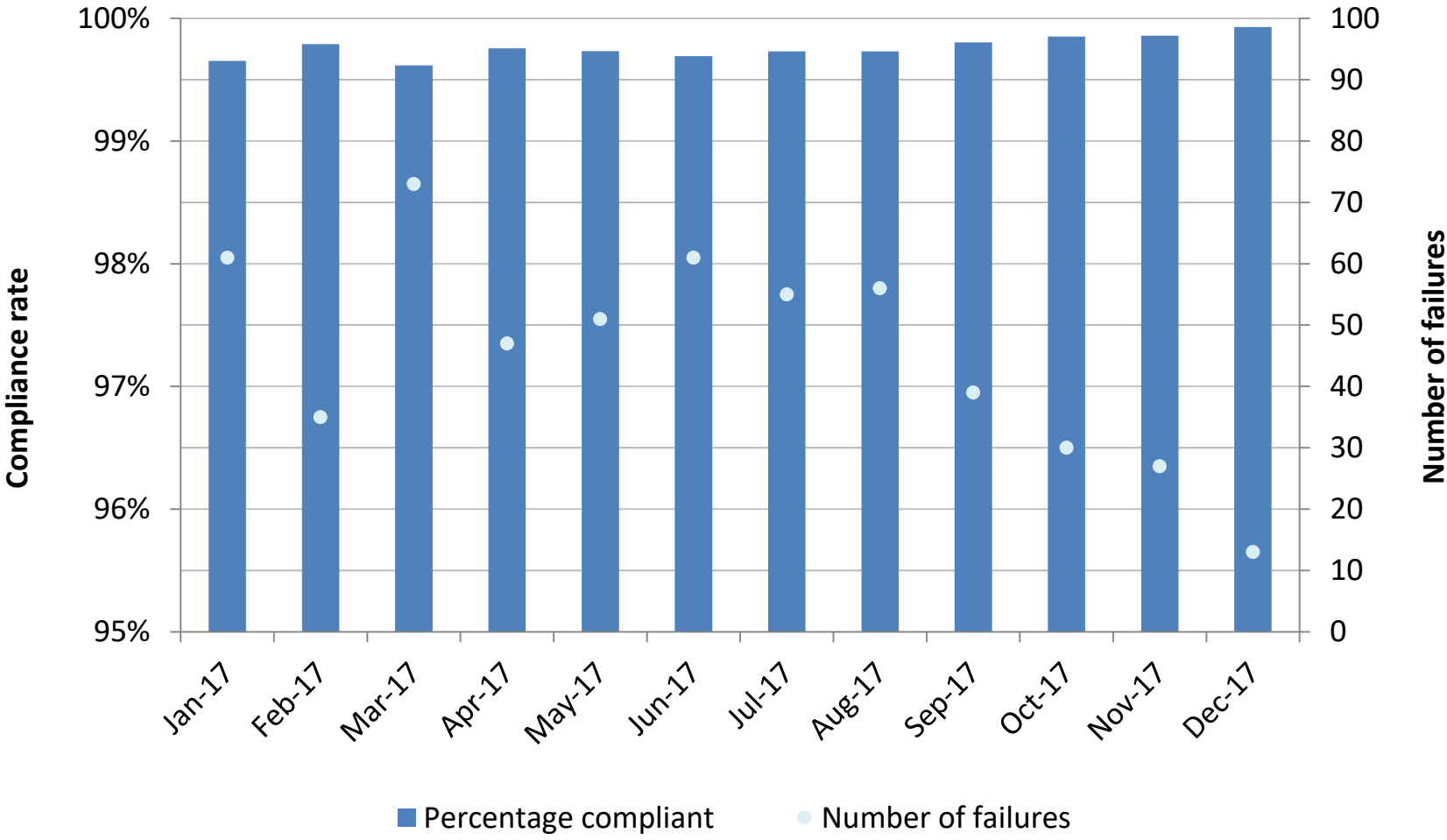
1,000 ft height infringements 2007-2017



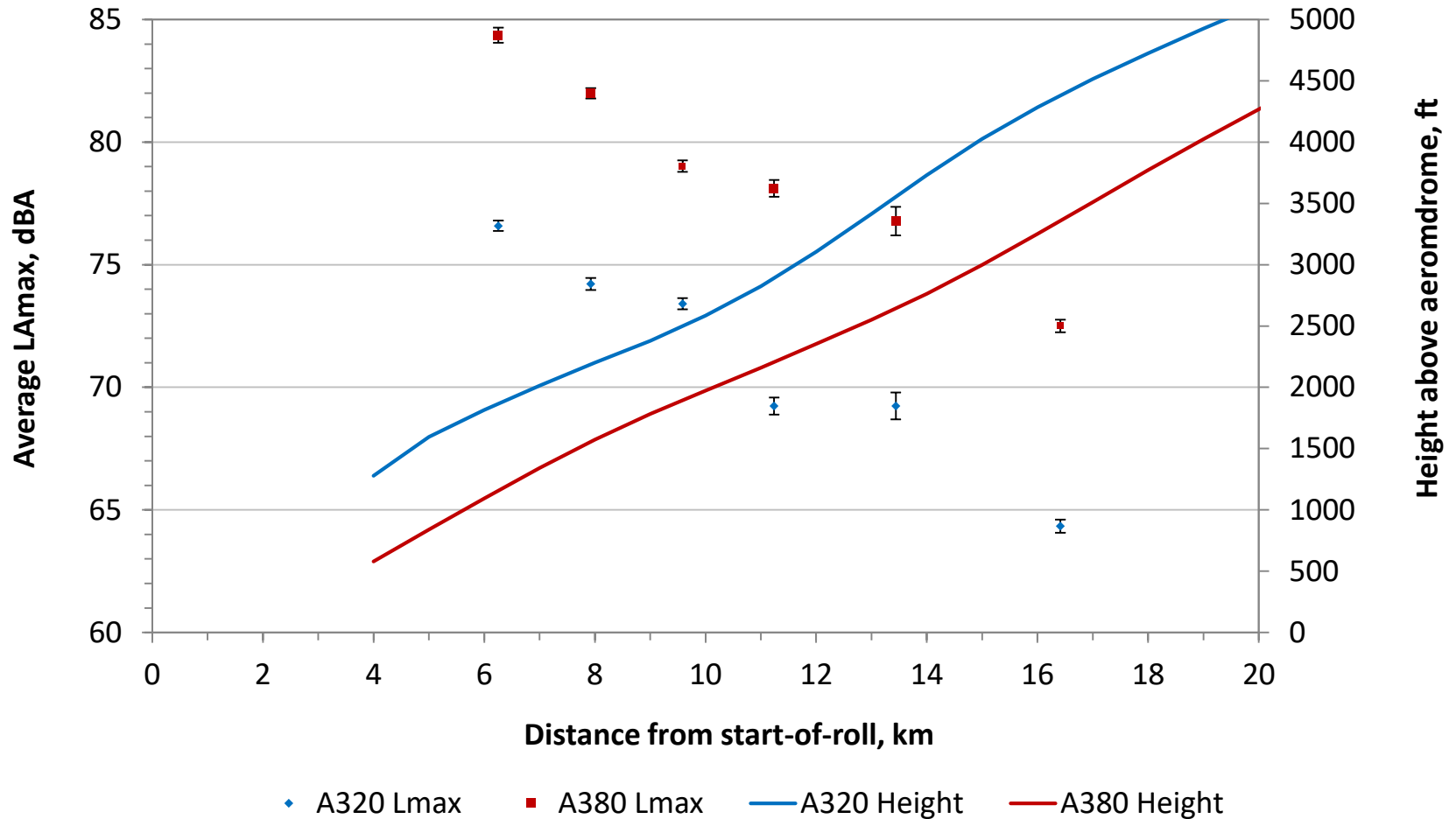
Climb gradient



4% climb gradient performance 2017



Progressively reducing noise beyond 6.5km



Controls conclusions (1)

- There are now relatively few noise infringements due largely to the gradual retirement and replacement of older aircraft types.
- The number of noise infringements at Heathrow historically has been higher than at Gatwick or Stansted due to the greater numbers of large aircraft serving long-haul destinations.
- There is limited scope for reductions in the noise limits at Heathrow until the retirement of the remaining Boeing 747-400 fleet. Half of the current fleet is expected to be withdrawn by 2021 and the remainder by 2024. A small reduction of 1 to 2 dB in the daytime and shoulder limits might be feasible at Heathrow, without causing the overall number of infringements to increase above historic levels.

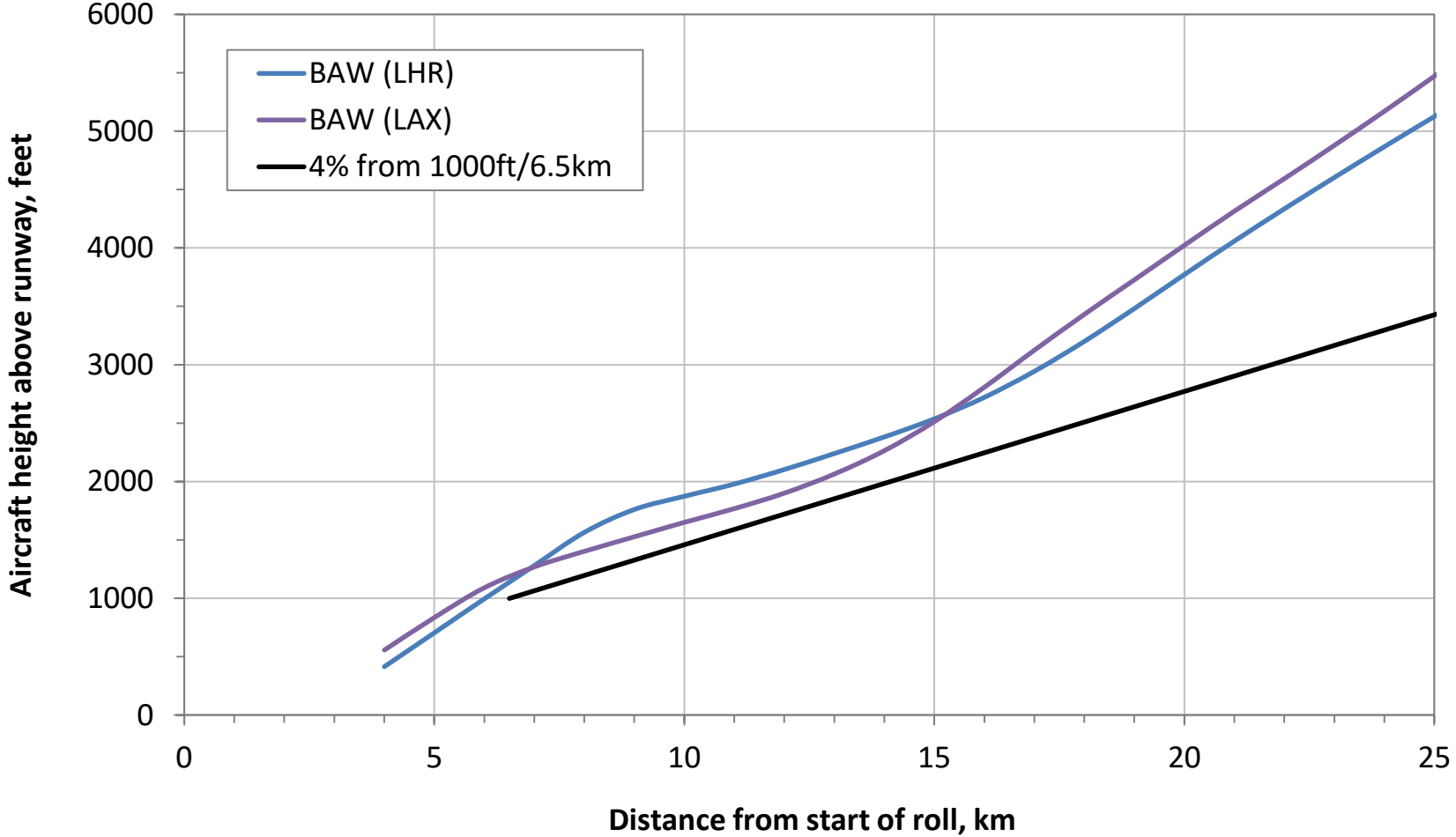
Controls conclusions (2)

- Other noise controls including minimum height and climb gradient requirements appear to be limiting noise further out, since average measured noise levels continue to reduce beyond 6.5 km from start of roll. The compliance rates with these additional controls are very high. However, continued community discontent with departure noise in general suggests that the existing controls may not be sufficient to meet the concerns of the community.
- Additional departure monitors located beyond 6.5 km from start of roll would help to verify that progressively reducing noise levels under the flight path are being achieved. New infringement 'limits' or advisory 'levels' could be applied at each monitor.

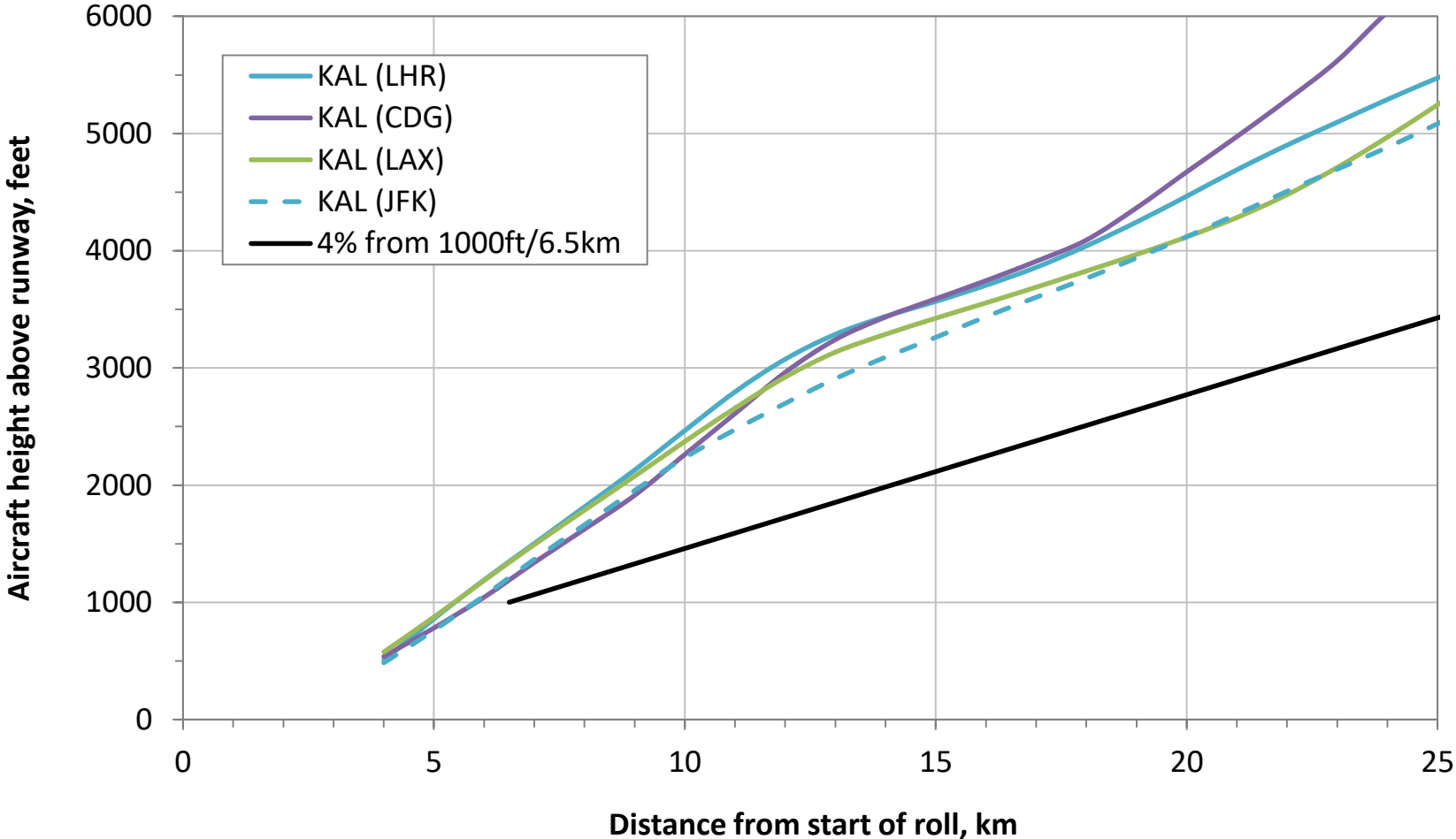
Broader aspects of the review

- International benchmarking of departure climb performance
- Changes in airline procedures over time
- The effects of alternative noise abatement departure procedures
 - NADP 1 vs NADP 2
- The effects of alternative take-off thrust settings
 - Greater thrust reduction after take-off to reduce noise at 6.5km ('Deep cutback')
 - Full thrust take-off

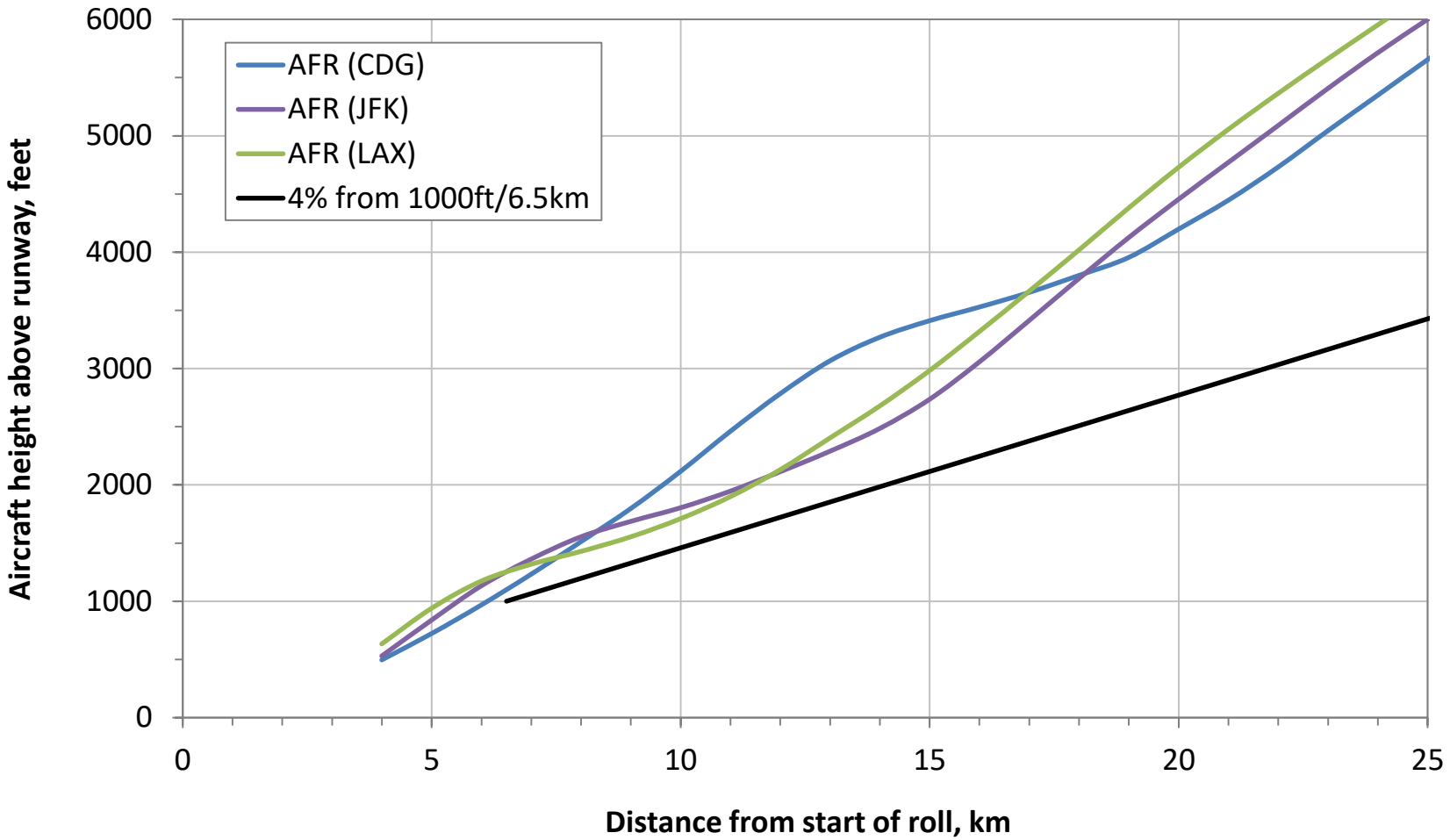
Climb performance – international comparisons



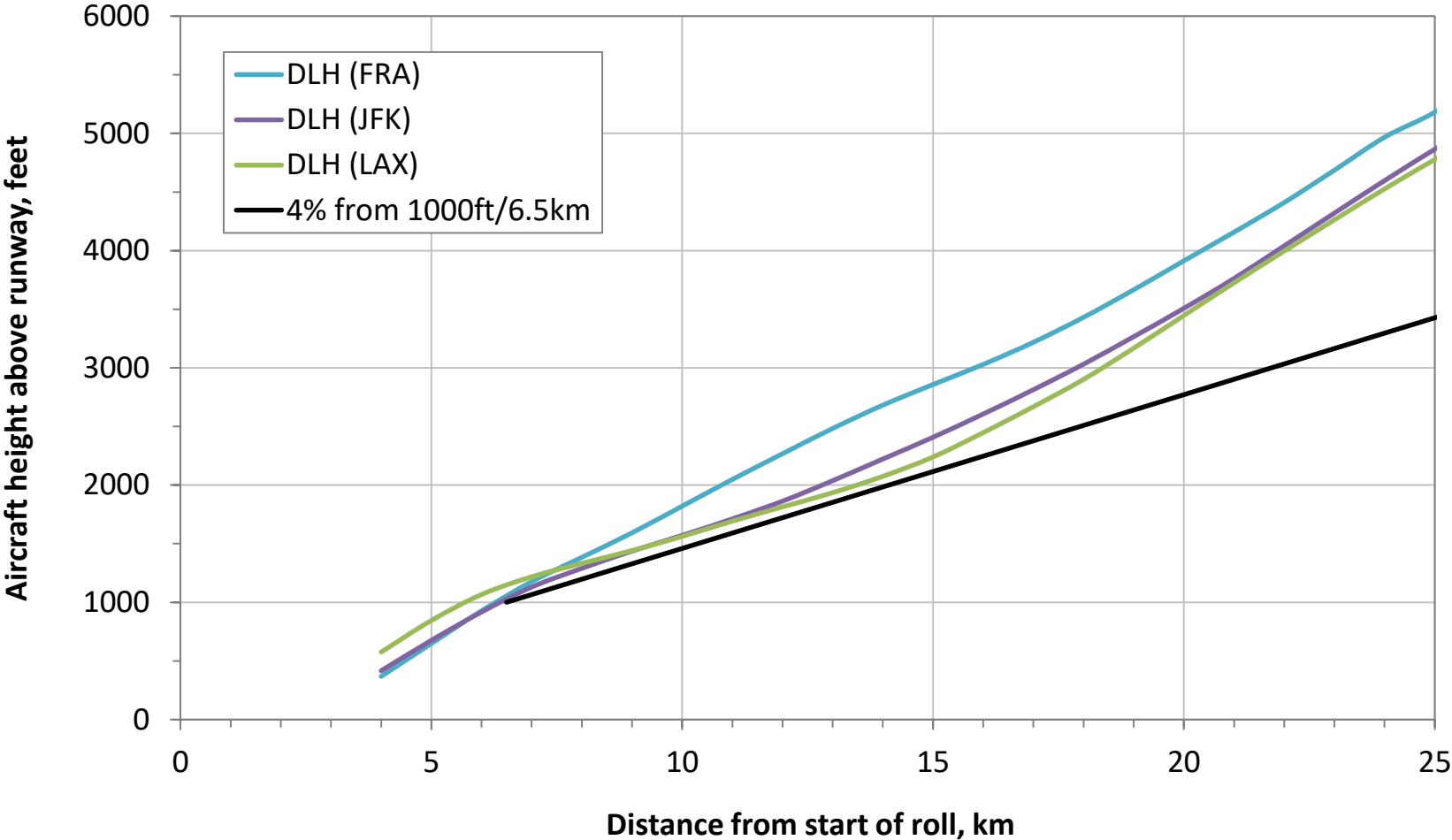
Climb performance – international comparisons



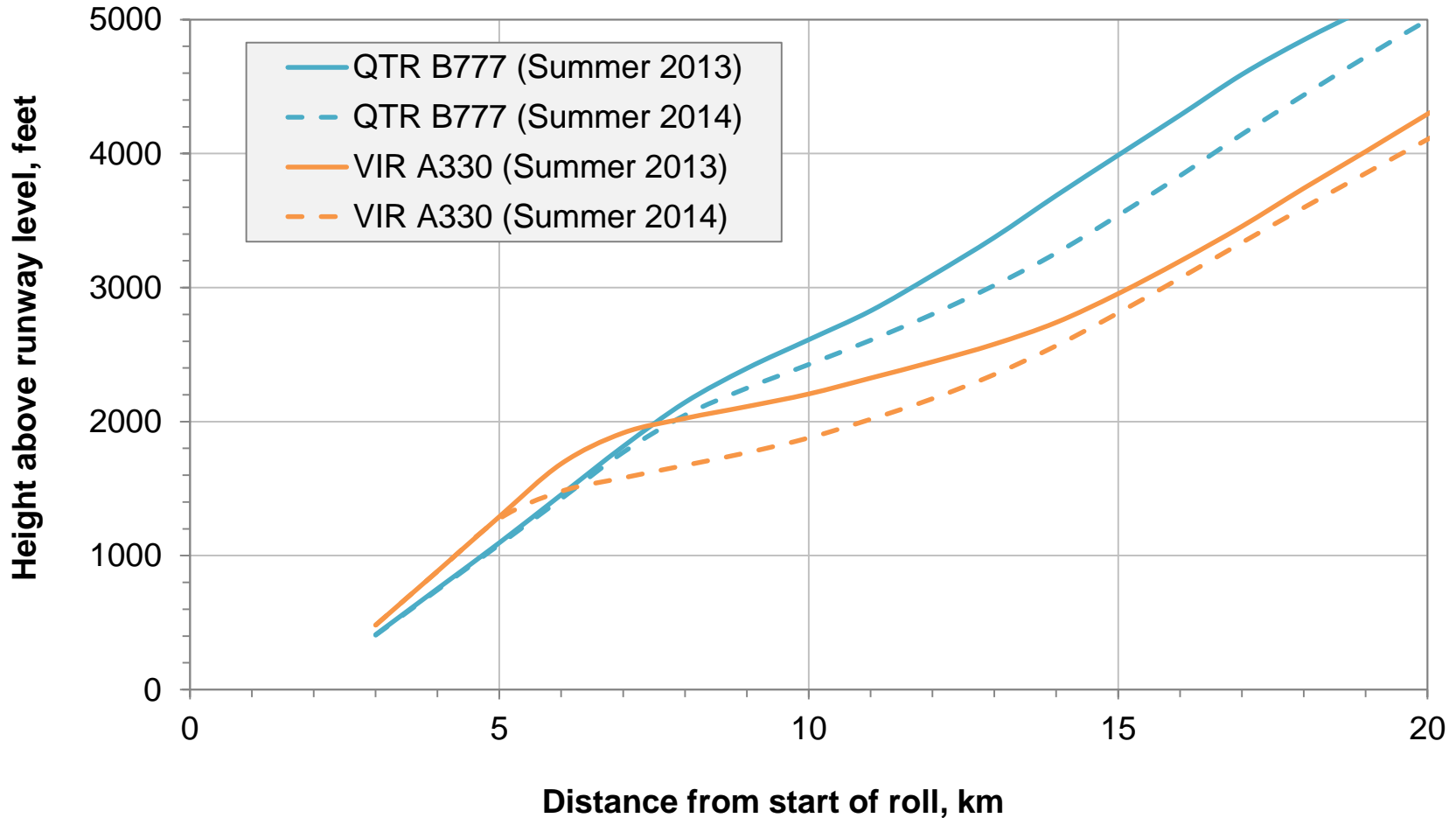
Climb performance – international comparisons



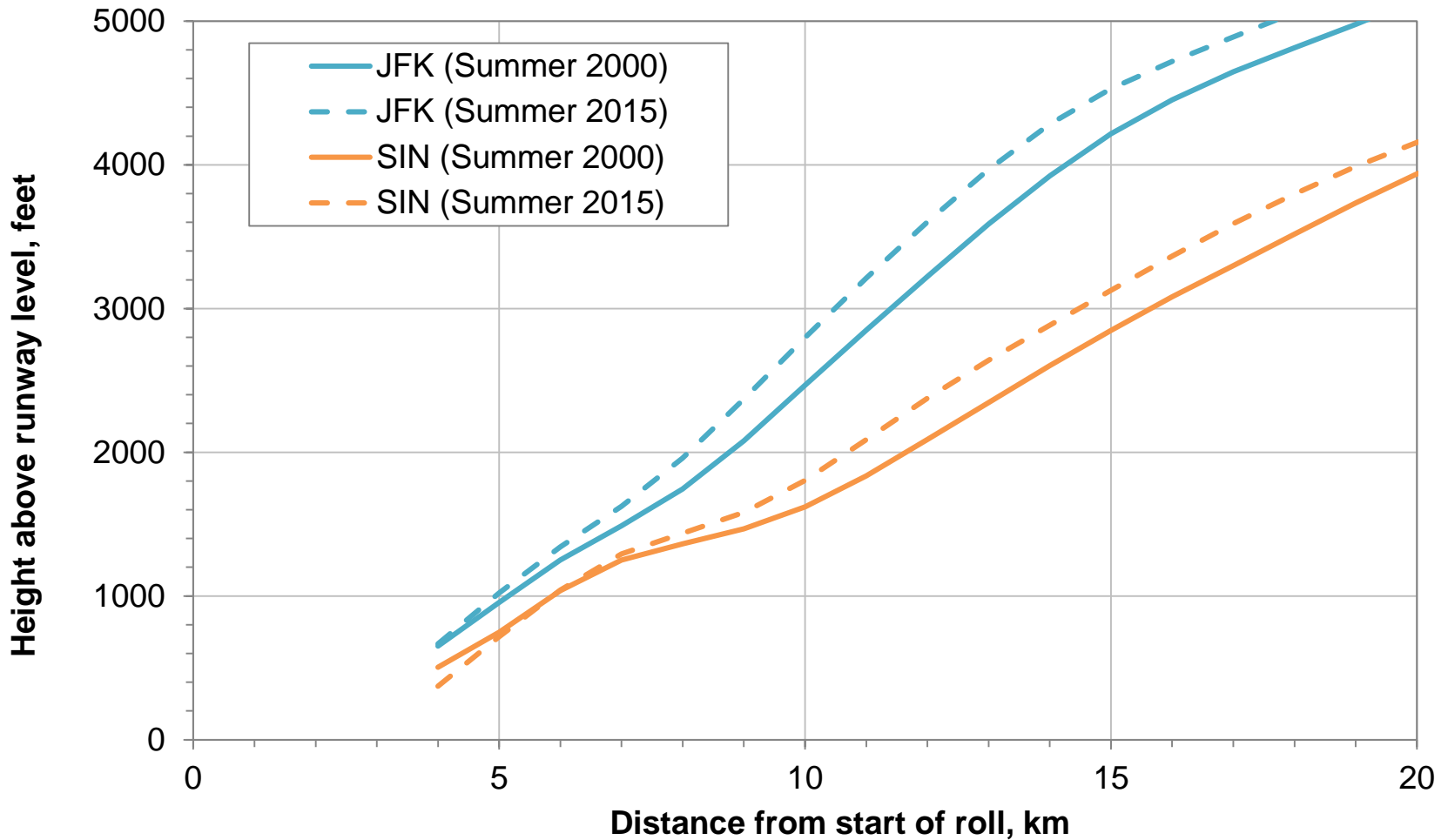
Climb performance – international comparisons



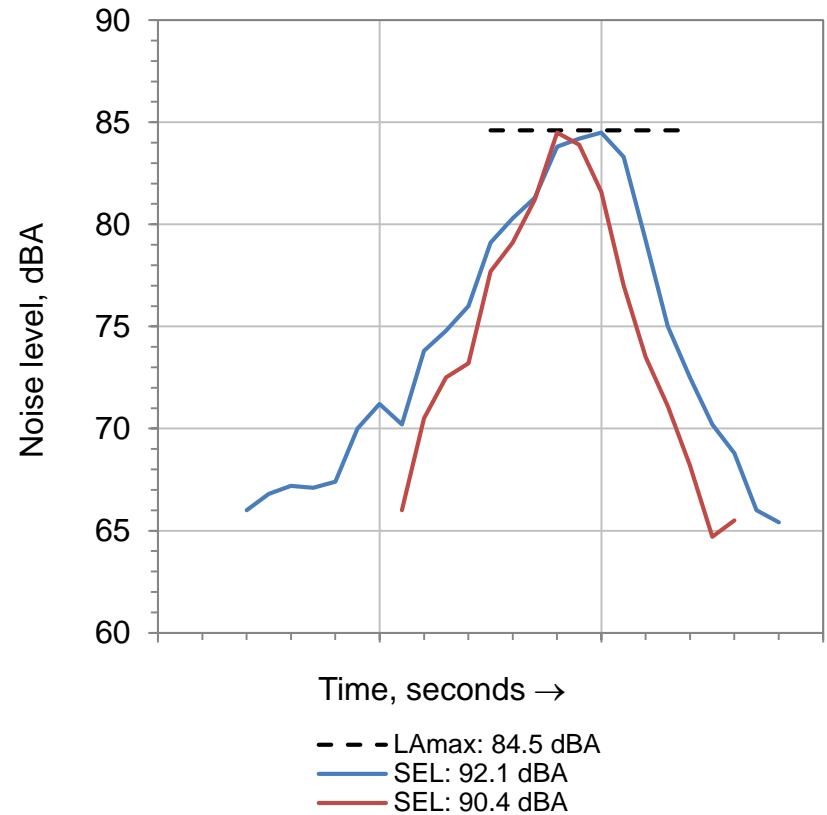
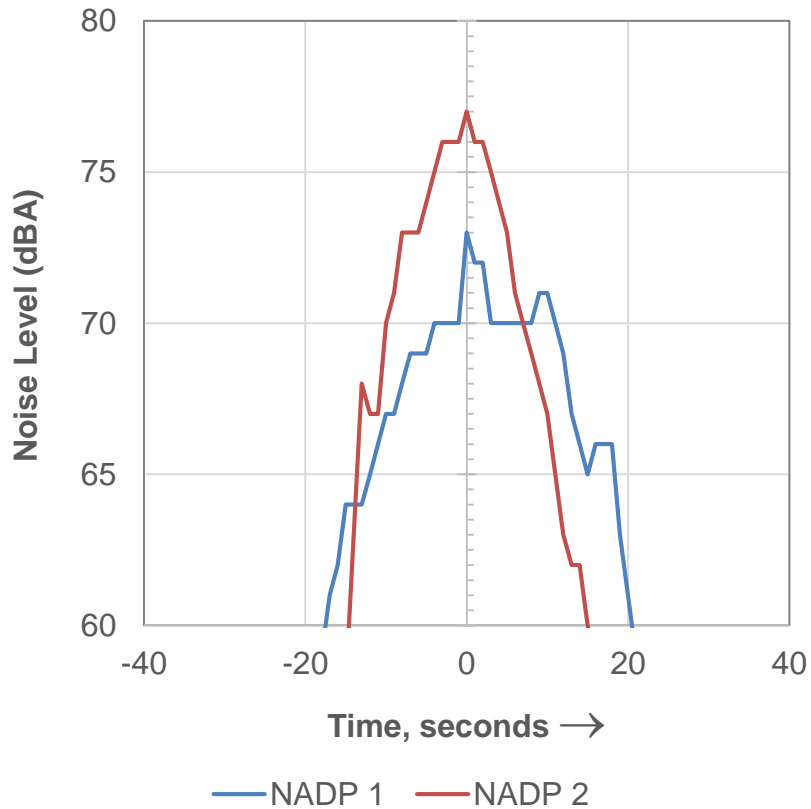
Changes in airline procedures over time



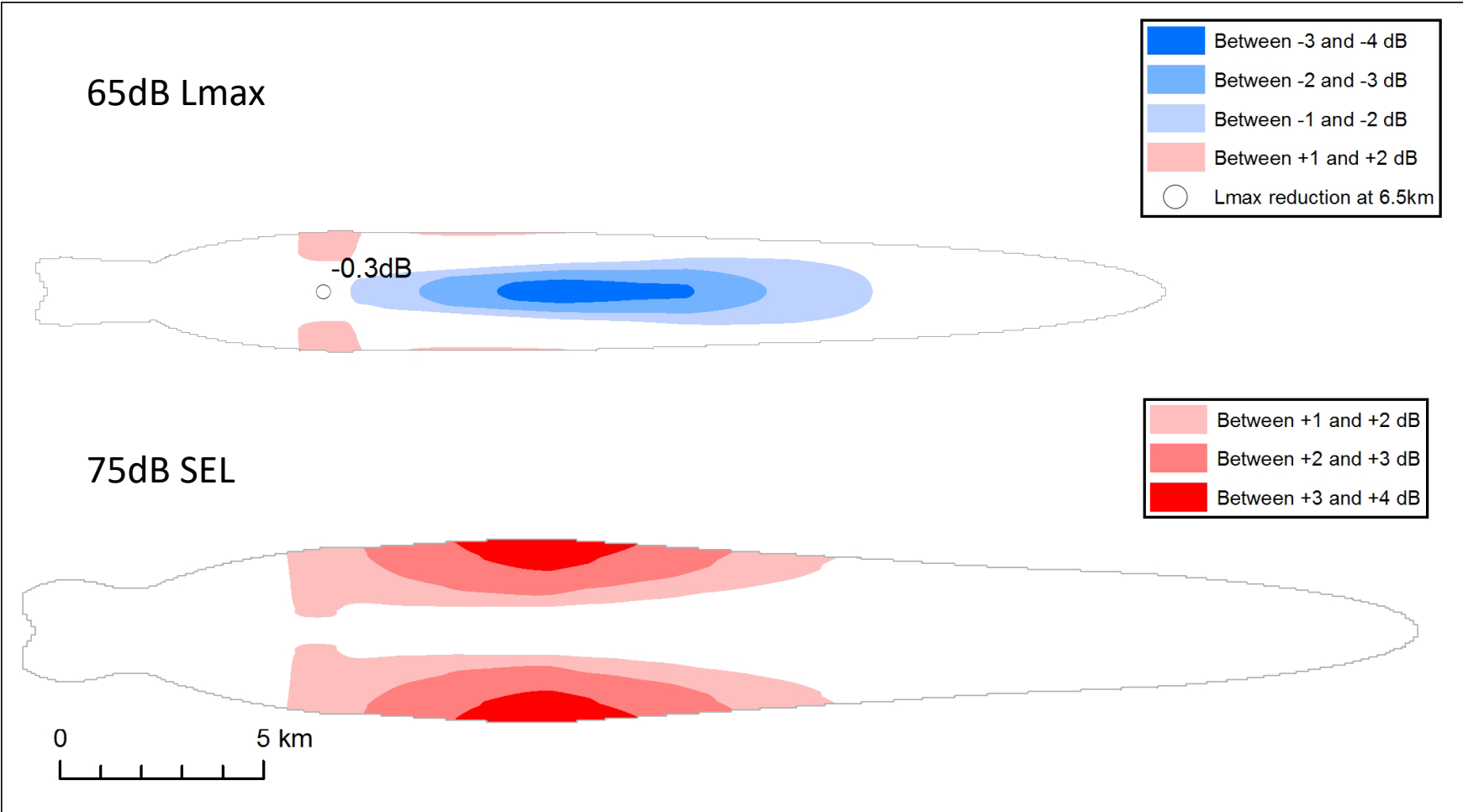
Changes in airline procedure over time



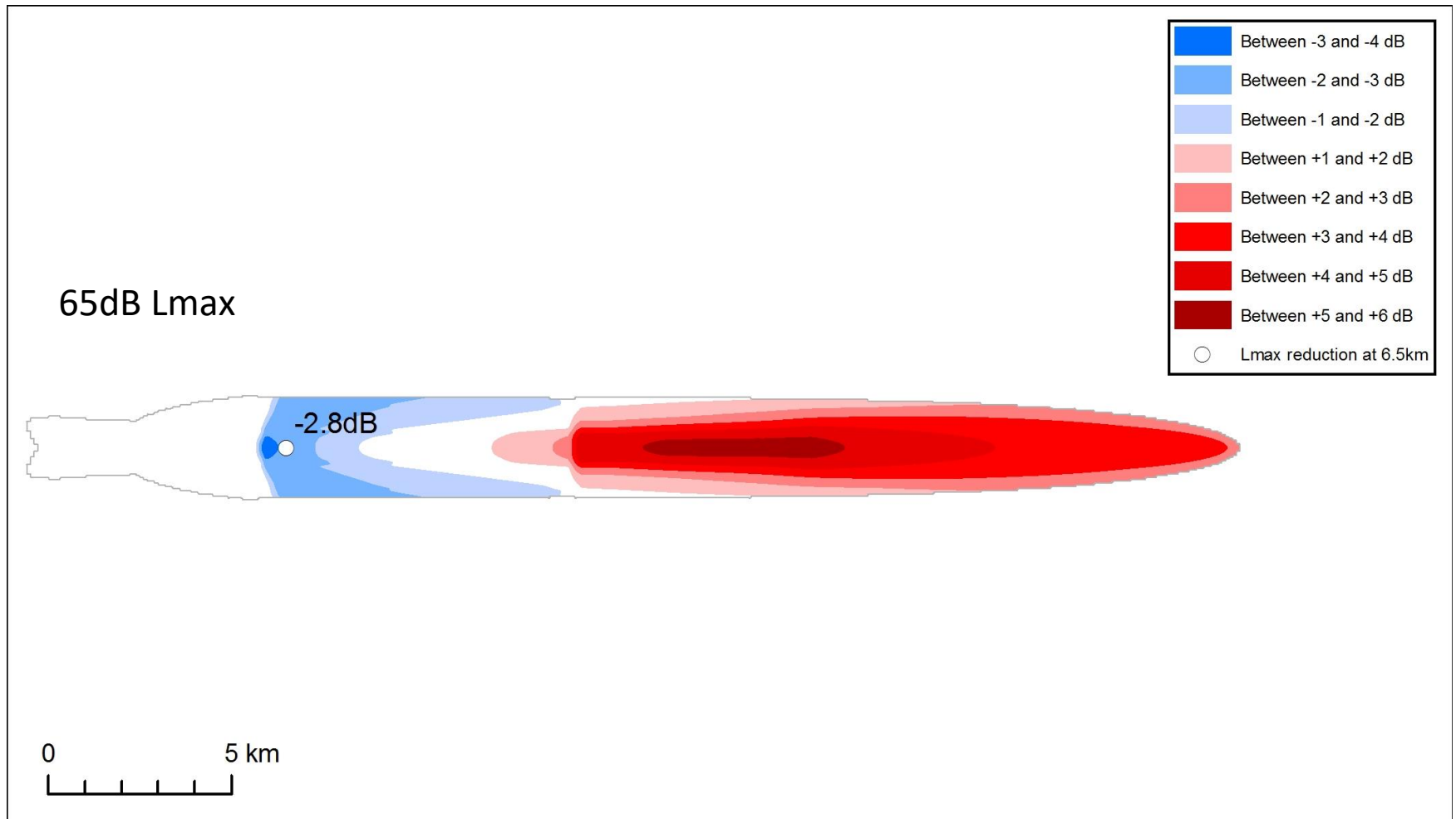
Effect of aircraft speed on noise event level and duration



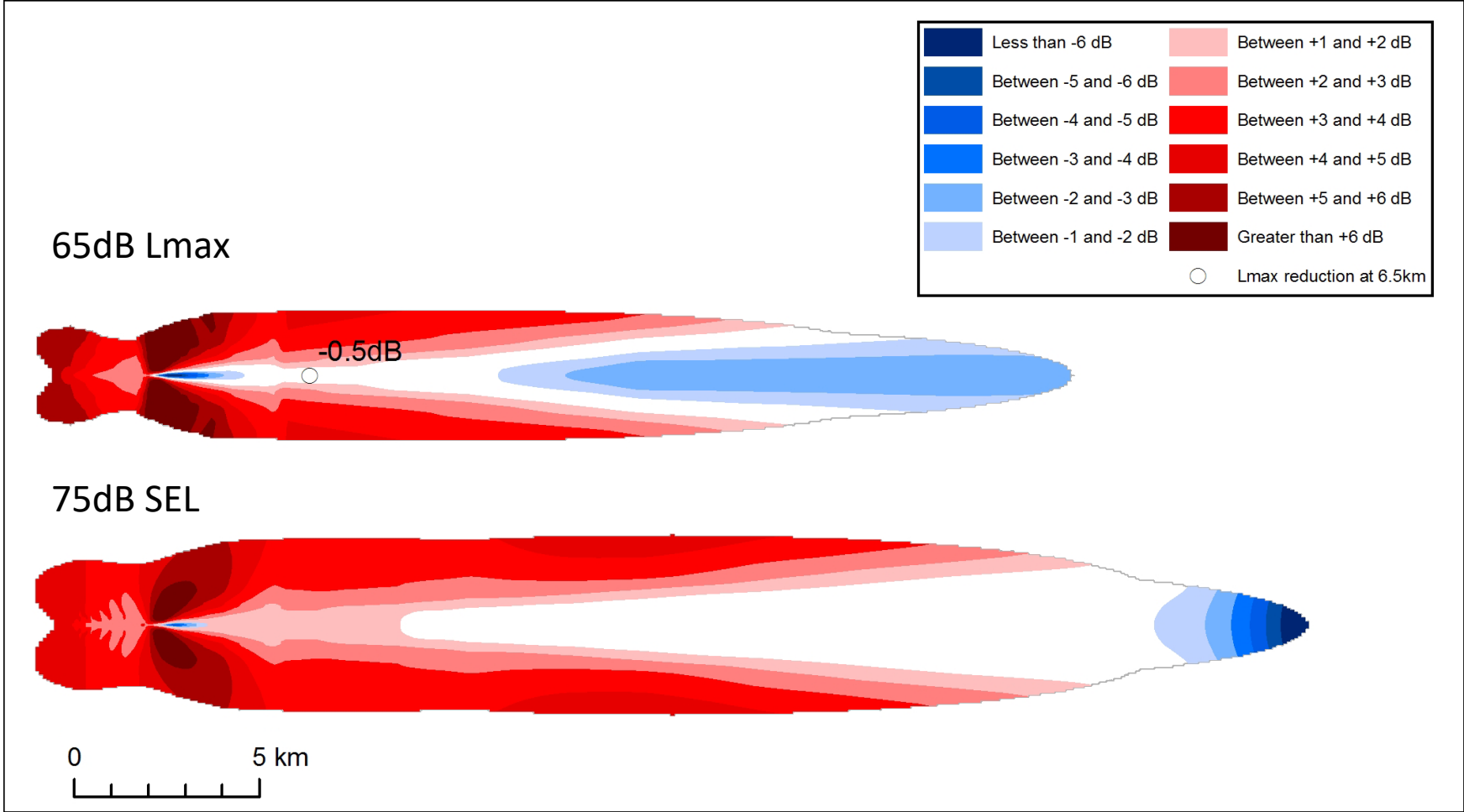
A380: NADP 1 vs NADP 2



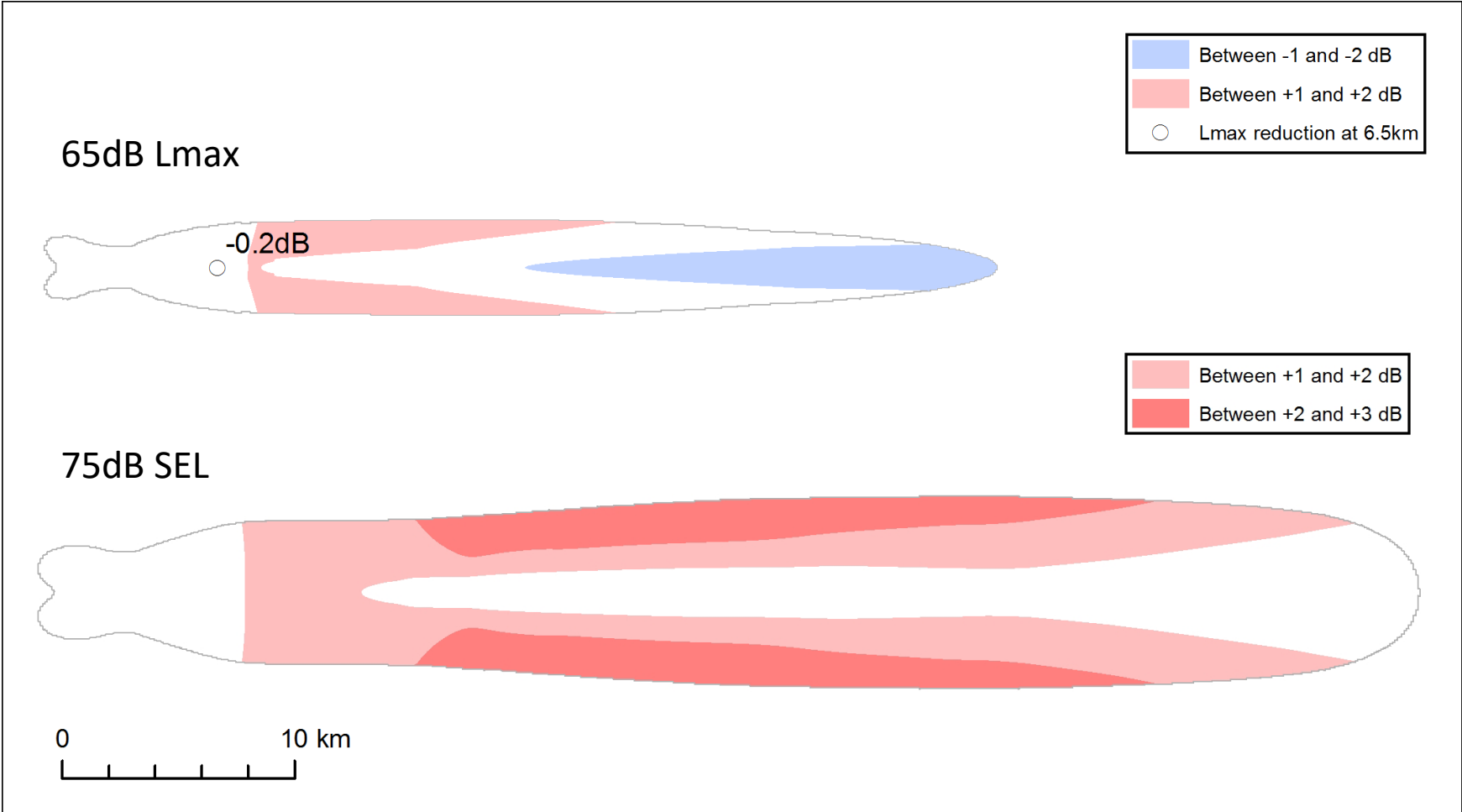
A380: 'Deep cutback'



A380: Effect of full take-off power vs reduced 3,000nm range flight (Middle-east)



A380: Effect of full take-off power vs reduced 5,500nm range flight (Far-east)



Full vs reduced power: effect on NO_x emissions

Case study: Baseline procedure vs. alternative procedure	NO _x difference to 1,000 ft (percent)	NO _x difference to 3,000 ft (percent)	CO ₂ difference to cruise (percent)
1) R/T NADP 2 (1,000 ft) vs. R/T NADP 1 (1,500 ft) 3,000 NM stage length	None	-11%	+2%
2) R/T NADP 2 (1,000 ft) vs. R/T NADP 2 deep c/b (1,000 ft) 3,000 NM stage length	None	+1%	+2%
3) R/T NADP 2 (1,000 ft) vs. F/T NADP 2 (1,000 ft) 3,000 NM stage length	+47%	+49%	-2%
4) R/T NADP 2 (1,500 ft) vs. F/T NADP 2 (1,500 ft) >5,500 NM stage length	+5%	+8%	>-1%

Overall conclusions

- The study by the ANMAC Technical Working Group has identified that there is limited scope for reductions in the noise limits at Heathrow until the retirement of the remaining Boeing 747-400 fleet. A small reduction of 1 to 2 dB in the daytime and shoulder limits might be feasible without causing the overall number of infringements to increase above historic levels.
- The analysis shows that there is no single NADP that will reduce departure noise in all locations; a change of NADP simply moves noise from one location to another.

Report Recommendation

- Although the current controls appear to be limiting noise further out and compliance rates are very high, continued community discontent with departure noise in general suggests that the existing controls may not be sufficient to meet the concerns of the community.
- Given the continued community expectation that departure noise should be minimised, additional departure monitors located beyond 6.5 km from start of roll would help to verify that progressively reducing noise levels under the flight path are being achieved.
- It is recommended that guidance be developed on the application of supplementary departure noise monitoring and associated levels. This could be taken forward through an industry-led group to develop an updated Departures Code of Practice. In the short term however, a voluntary arrangement at each airport may be appropriate.