Aircraft Vectoring Below 4000ft

Airspace and Noise Performance Team

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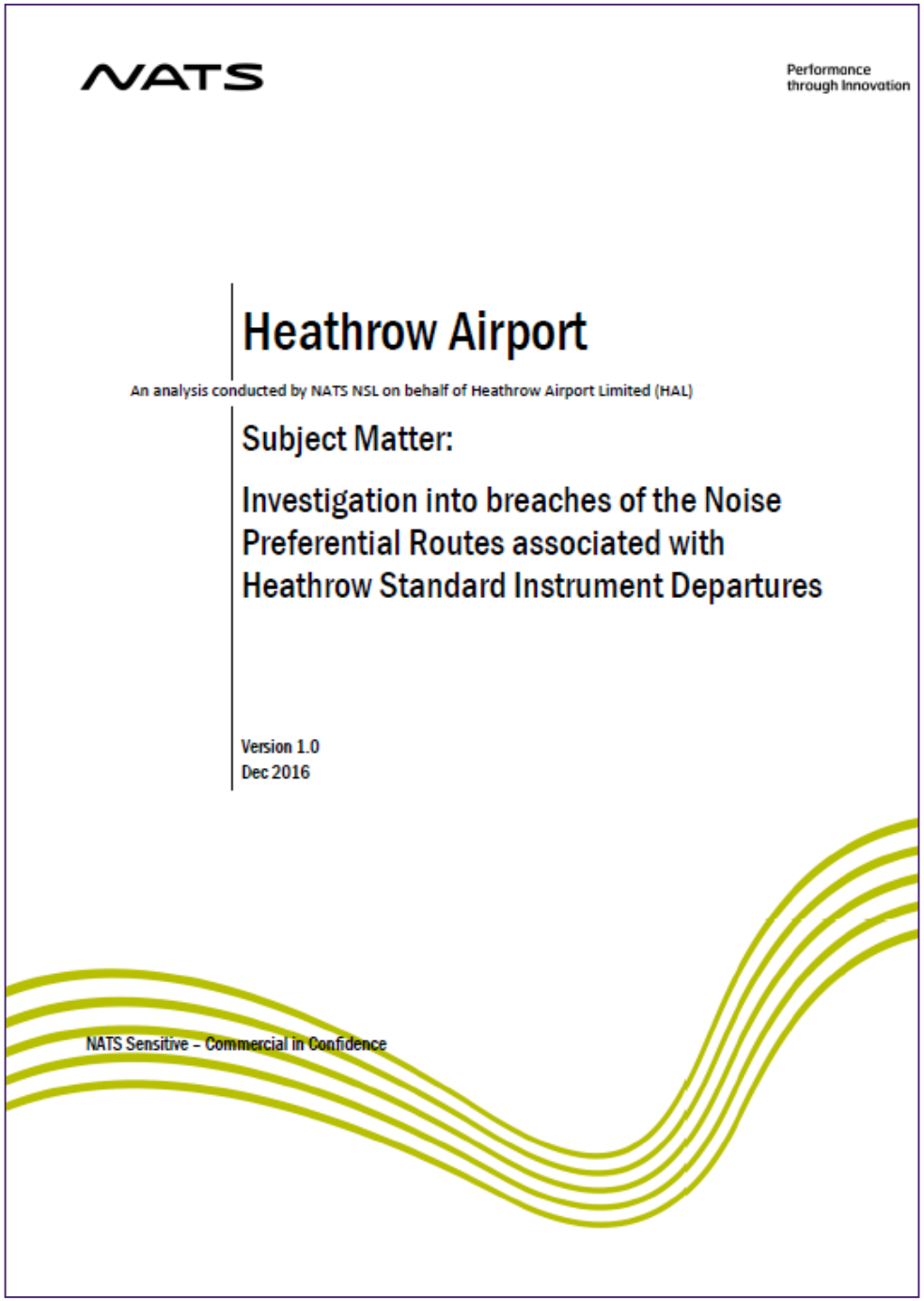

- Aircraft taking off from Heathrow are required to follow Noise Preferred Routes. These routes are overseen by the Secretary of State The Heathrow NPRs follow the Standard Instrument Departures as specified in the UKAIP. A corridor 1.5km either side of the centreline demarcates the NPR
- Aircraft should not deviate from this path until reaching an altitude of 4000ft AMSL unless vectored by Air Traffic Control or for safety reasons
- In response to community enquiries, this report (currently in its final draft) investigates aircraft leaving the NPR below 4000ft, the reasons behind the early vector and seeks to offer a number of recommendations to reduce the occurrences and thus disturbance

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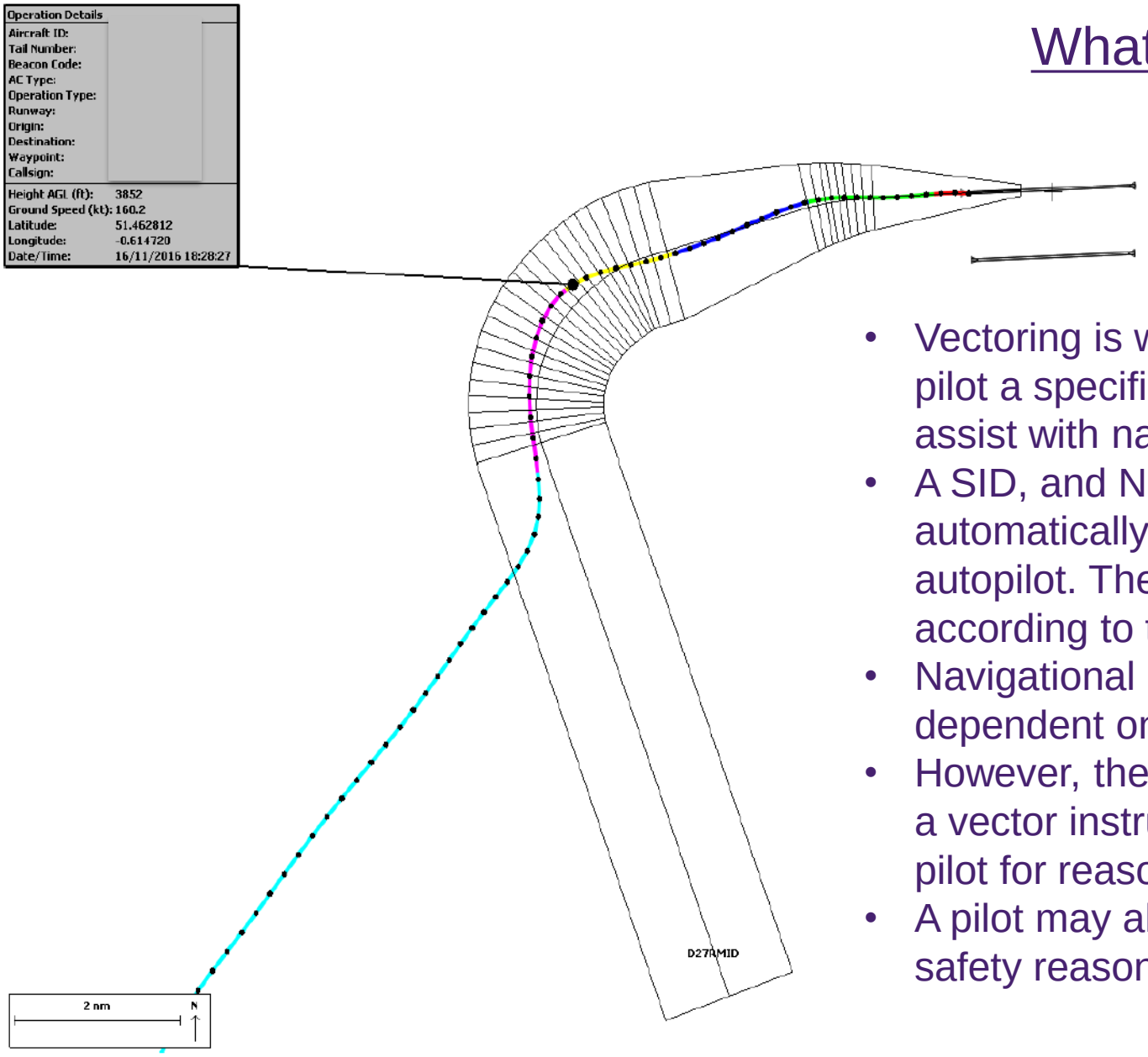
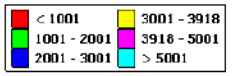
What is Vectoring?



- Vectoring is where an ATC gives the pilot a specific heading to fly to assist with navigation
- A SID, and NPR, is normally flown automatically up to 4000ft by the autopilot. The route is chosen according to the end destination
- Navigational accuracy can be dependent on a number of factors
- However, there may be times where a vector instruction is given to the pilot for reasons of safety
- A pilot may also request a vector for safety reasons



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Statistics

Year	Departure Routes (all) excluding Easterly Compton %
2007	96.6
2008	97.1
2009	97.5
2010	97.7
2011	97.7
2012	97.9
2013	98.0
2014	97.5
2015	98.0
2016	97.7

- Heathrow has a responsibility to monitor track keeping compliance
- Track keeping data is published on the operational data website
- Track keeping performance also forms a key metric in the Fly Quiet league tables
- Continued poor performance can lead to slot restrictions being imposed on the airline

http://www.heathrow.com/noise/making-heathrow-quieter/fly-quiet-programme

http://heathrowoperationaldata.com/

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Methodology

- Flight tracks were monitored using the ANOMS noise and track keeping system
- Two sample periods during 2016 were chosen as a basis for this analysis
- A breach was recorded if the aircraft left the NPR swathe prior to reaching 4000ft AMSL
- 09R CPT departures were excluded due to the nature and complexity of the procedure

Sample A – Establish a baseline by looking at all departures during period

1st Sept – 30th Sept

19,882 deps

495 NPR deviations (29 of which were permitted on the grounds of safety/weather)

Sample B – investigate every track that was believed to have been a breach

24th October – 29th November

22,036 deps

504 NPR deviations (28 of which were permitted on the grounds of safety/weather)

In some circumstances a reason for deviation was obvious. Where further investigation was required, data was submitted to NATS to review radar replays or to replay ATC voice communications

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Categorisation of Issues

Following the 2 sample periods, reasons for deviations were sorted into the following categories:

1. Aircraft behaviours or weather effect
2. Pilot error
3. Failure to maintain sufficient altitude by the end of the NPR
4. ATC error
5. ATC instruction for safety
6. Combination of the above

Categorising each breach made it easier to identify potential solutions to prevent future re-occurrences

Conclusions

- Numbers of breaches were comparatively small when compared with overall number of departures. **Sample B** shows that 2.28% of aircraft did not complete the NPR
- DET27 showed a large number of breaches potentially due to speed control of newer, more aerodynamic types
- MID27 showed similar issues for wide body aircraft

	Observed Number in Sample B	Percentage
FMS	450	89.5
Weather	28	5.6
Pilot	8	1.6
Missed Approach Link	6	1.2
NATS	6	1.2
NPR Below	5	1.0

A vast majority of breaches (non-safety related) were due to the aircraft "ballooning" outside of the NPR during the turn. Further investigation surrounding this is required. It is believed that resolving this issue alone will further improve track keeping at Heathrow

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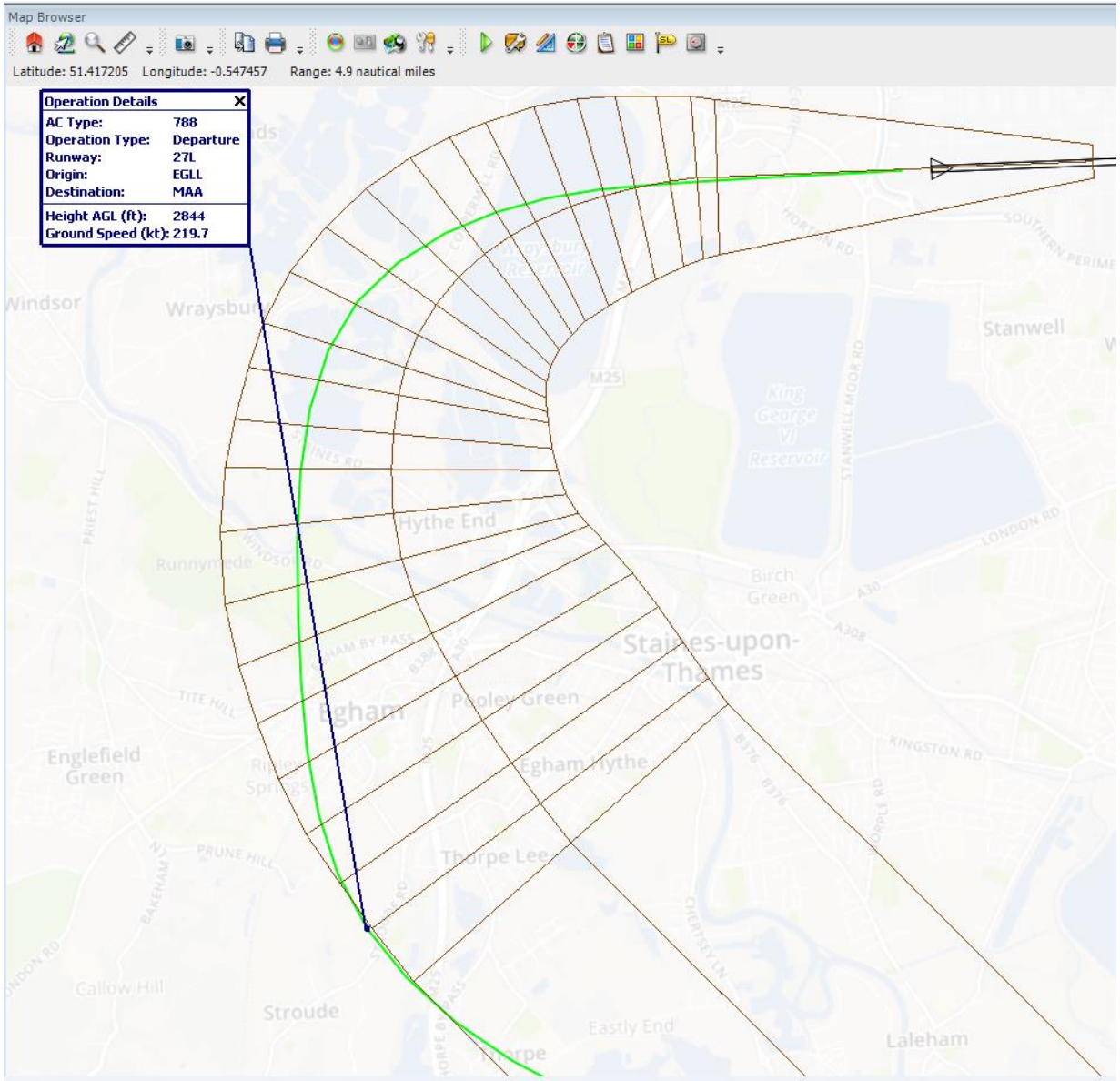
What does this look like?



This diagram shows an example of an aircraft that has ballooned around the outside of the turn

How can this be resolved?

- Working with airlines
- Working with manufacturers
- Working with coding houses
- Engaging with the HCNF

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Solutions

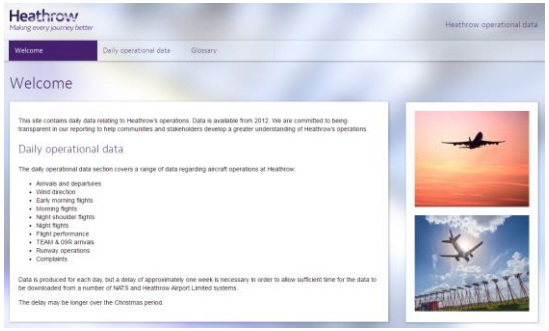
Speed intervention through:

- Airline Standard Operating Procedures (SOPS)
- AIP amendment specifying a maximum speed. However, this will constitute an ACP as we are making a published change
- Vectoring will **always** be required on the grounds of safety. Speed intervention will be the most effective way of bringing aircraft back on track

Data Transparency

- The report showing full data will be released
- A study looking at vectoring practices between 4000-6000ft is also in its final draft
- Investigating ways of displaying off track aircraft in Webtrak. This may involve an icon colour change as the aircraft leaves the NPR corridor
- Statistical data will be available on the operational data website

Colour	Airport	Operation Type
	HEATHROW, LONDON, ENGLAND	Arrival
	HEATHROW, LONDON, ENGLAND	Departure
	Unknown Airport	Over Flight



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