

# RNN TRIAL ENVIRONMENTAL ANALYSIS 60DB LMAX FOOTPRINTS

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HELIOS  
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# INTRODUCTION

## Context

Gatwick airport is planning a trial to reduce noise from arriving aircraft at night. The trial aims to reduce the incidences of 'outlier' arrivals by reducing the number of aircraft flying excessively noisy profiles and/or flying at unnecessarily low altitudes.

## Document purpose

To show the expected impact of the trial procedures on noise, this document contains noise modelling of different arriving aircraft.

It shows the size of the '60dB  $L_{\max}$ ' footprint which is a measure of the area over which the noise from an aircraft spreads.

The most common and loudest aircraft types expected during the trial are used for the analysis.

## Document scope

The footprint is calculated for three types of arrival:

- 1) An 'outlier' arrival (an actual, recorded arrival) flying an unduly noisier or lower profile than other aircraft
- 2) A 'Trial-like' arrival (an actual, recorded arrival) flying a similar profile to a trial aircraft.
- 3) An expected arrival of a hypothetical Trial arrival

Current tools are not able to accurately calculate noise at the distances from the airport that the trial provides benefits. Therefore, the results of this work are illustrative of the expected effects of the trial but not definitive.

# APPROACH

- For various runways/aircraft types two real recorded flights have been analysed, one low altitude outlier and one flight flying a 'Trial-like' procedure. The noise modelling has been undertaken with the AEDT noise model.
- A third profile, a hypothetical flight track of the same aircraft category, is assigned to the vertical profile of the trial procedure in Volans. Volans and the AEDT model calculates the noise expected from this profile. This comparison provides a reference to the two actual flights.
- The size of the 60 dB  $L_{\max}$  contour and the vertical profiles of the outlier case, the 'Trial-like' case and the hypothetical trial procedure case are then compared.
- Six comparisons were made of a range of aircraft types flying to different runways.
- The lateral position of the aircraft tracks modelled in each comparison are not the same but this does not affect the area of the contours. Aircraft with identical lateral tracks could not be found in the sample of recorded tracks.

## **AEDT<sup>1</sup>**

AEDT is a software system that models aircraft performance in space and time to estimate fuel consumption, emissions, noise, and air quality.

## **Volans<sup>2</sup>**

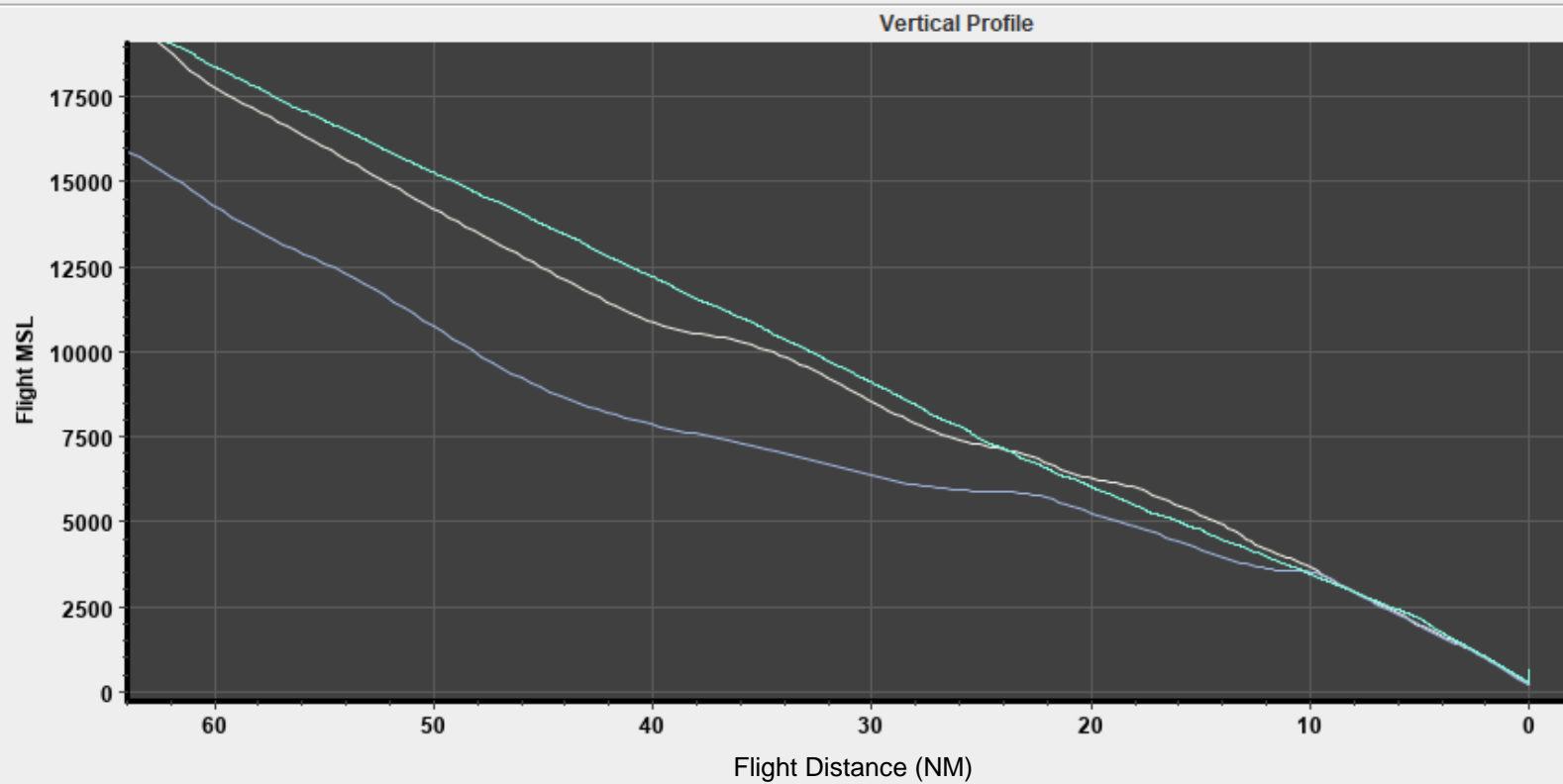
VOLANS is a web-based application designed to create, evaluate and display flight operations in 3D.

<sup>1</sup> <https://aedt.faa.gov/>

<sup>2</sup> <http://www.airportnetwork.com/volans/>

## COMPARISON 1

- Airbus A320
- Runway 26L
- Outlier arrival (28/08/19)
- Trial-like arrival (18/08/19)



Outlier  
arrival



Trial-like  
arrival



Hypothetical trial  
arrival

### Area of 60 dB contour (sq km)

Outlier arrival	Trial-like arrival	Hypothetical trial arrival
41.1	38.1	37.1



## COMPARISON 1

- Airbus A320
- Runway 26L
- Outlier arrival (28/08/19)
- Trial-like arrival (18/08/19)

### Notes:

- 1) The lateral tracks of the 3 aircraft are not the same but this does not affect the size of the area.
- 2) The Volans tool can slightly alter coordinates of tracks approaching the runway in some circumstances. This is where there are kinks in some contours close to the runway threshold.



Outlier  
arrival



Trial-like  
arrival



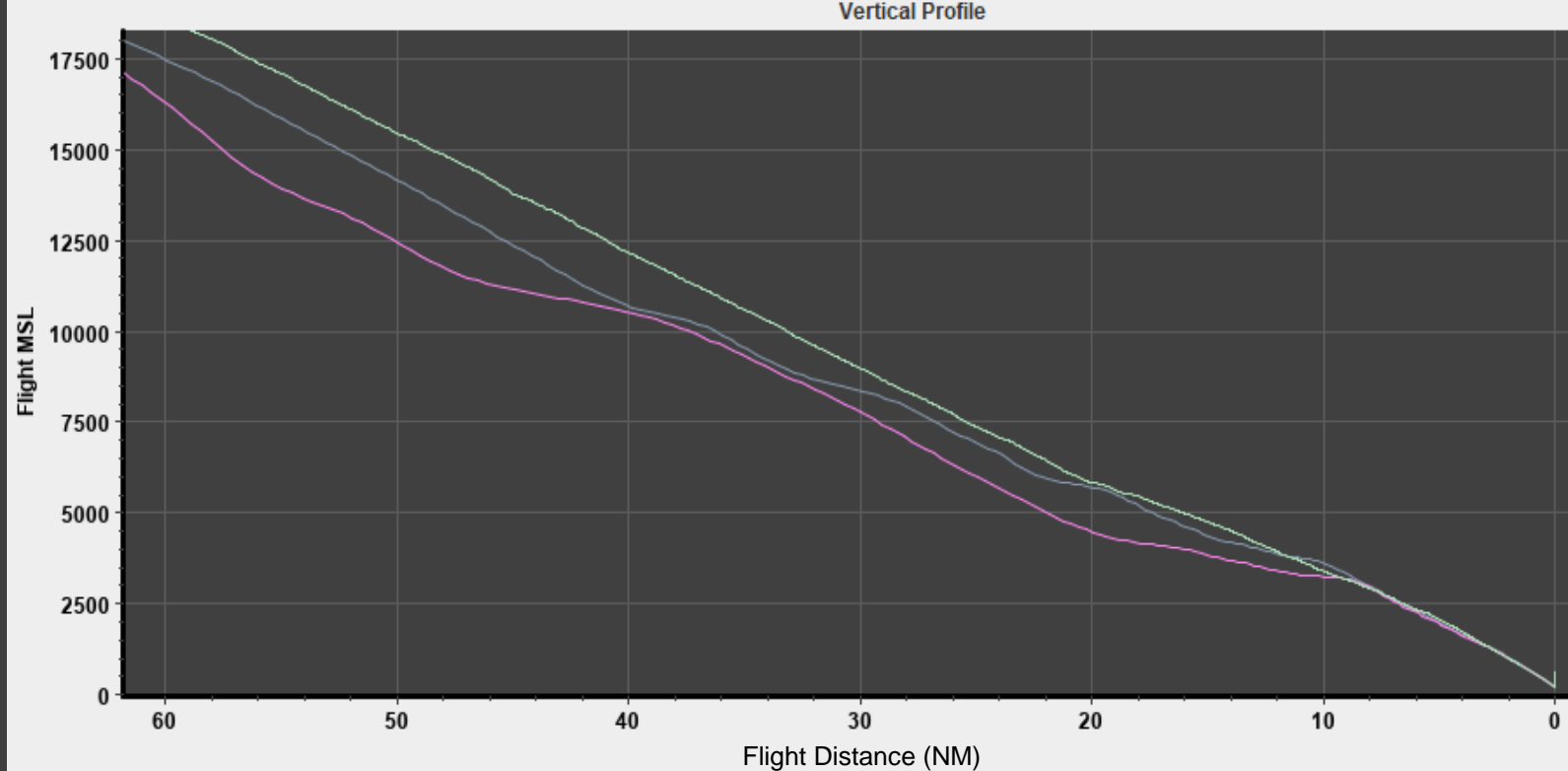
Hypothetical trial  
arrival

### Area of 60 dB contour (sq km)

Outlier arrival	Trial-like arrival	Hypothetical trial arrival
41.1	38.1	37.1

## COMPARISON 2

- Airbus A320
- Runway 26L
- Outlier arrival (22/08/19)
- Trial-like arrival (18/08/19)



Outlier  
arrival



Trial-like  
arrival



Hypothetical trial  
arrival

### Area of 60 dB contour (sq km)

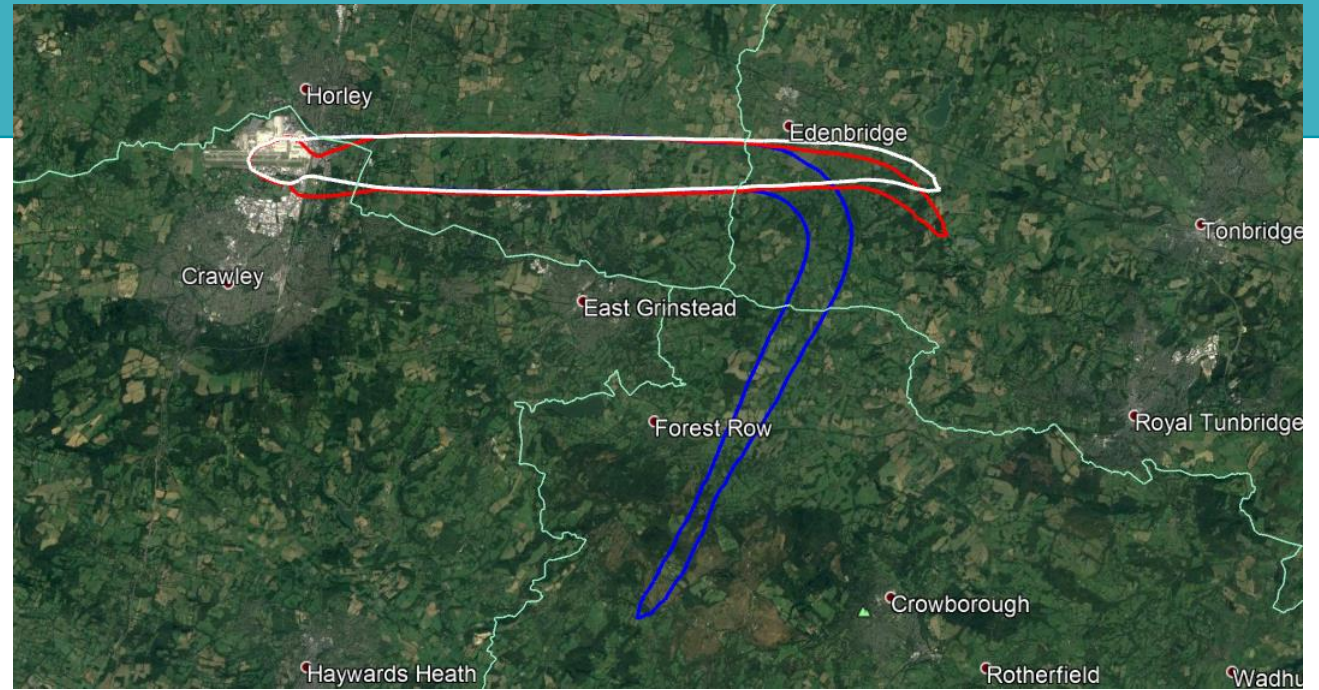
Outlier arrival	Trial-like arrival	Hypothetical trial arrival
50.8	40.0	38.1

## COMPARISON 2

- Airbus A320
- Runway 26L
- Outlier arrival (22/08/19)
- Trial-like arrival (18/08/19)

### Notes:

- 1) The lateral tracks of the 3 aircraft are not the same but this does not affect the size of the area.
- 2) The Volans tool can slightly alter coordinates of tracks approaching the runway in some circumstances. This is where there are kinks in some contours close to the runway threshold.



Outlier  
arrival



Trial-like  
arrival



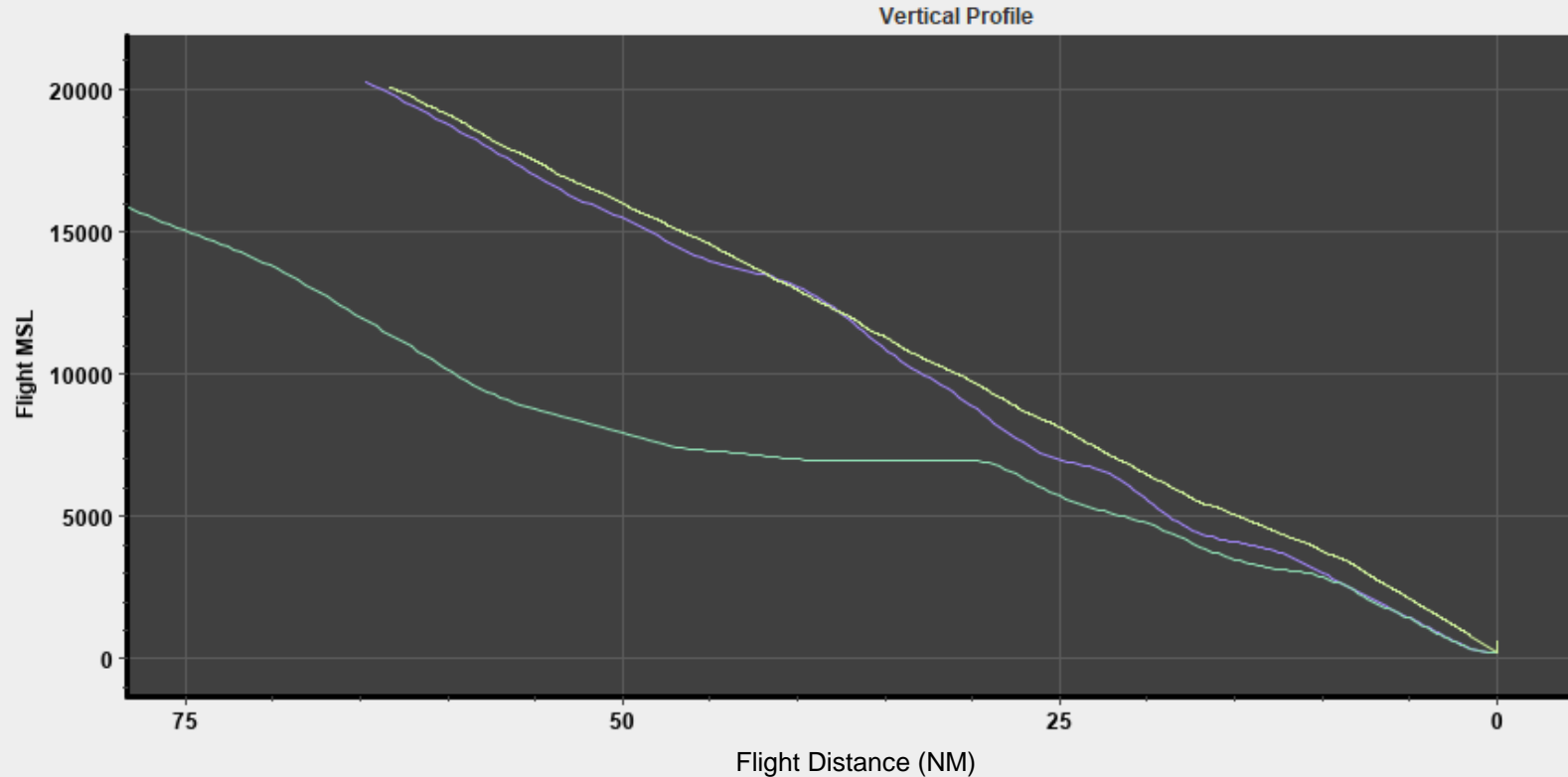
Hypothetical trial  
arrival

### Area of 60 dB contour (sq km)

Outlier arrival	Trial-like arrival	Hypothetical trial arrival
50.8	40.0	38.1

## COMPARISON 3

- Airbus A320
- Runway 08R
- Outlier arrival (26/08/19)
- Trial-like arrival (24/08/19)



Outlier  
arrival



Trial-like  
arrival



Hypothetical trial  
arrival

### Area of 60 dB contour (sq km)

Outlier arrival	Trial-like arrival	Hypothetical trial arrival
54.9	41.6	33.9

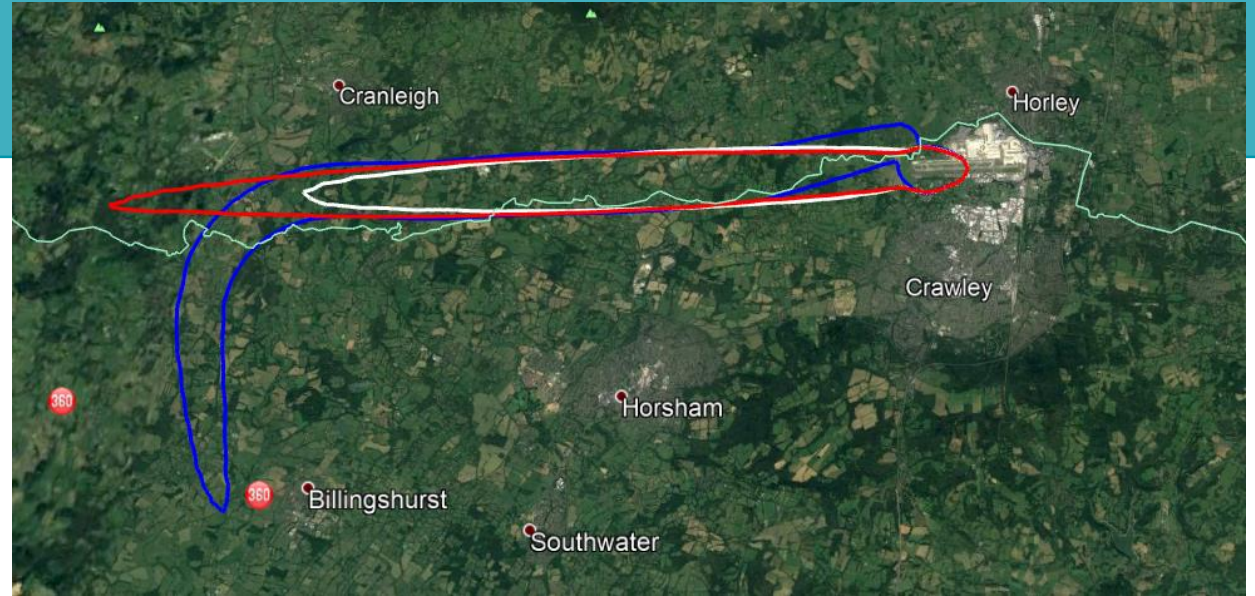


## COMPARISON 3

- Airbus A320
- Runway 08R
- Outlier arrival (26/08/19)
- Trial-like arrival (24/08/19)

### Notes:

- 1) The lateral tracks of the 3 aircraft are not the same but this does not affect the size of the area.
- 2) The Volans tool can slightly alter coordinates of tracks approaching the runway in some circumstances. This is where there are kinks in some contours close to the runway threshold.



Outlier  
arrival



Trial-like  
arrival



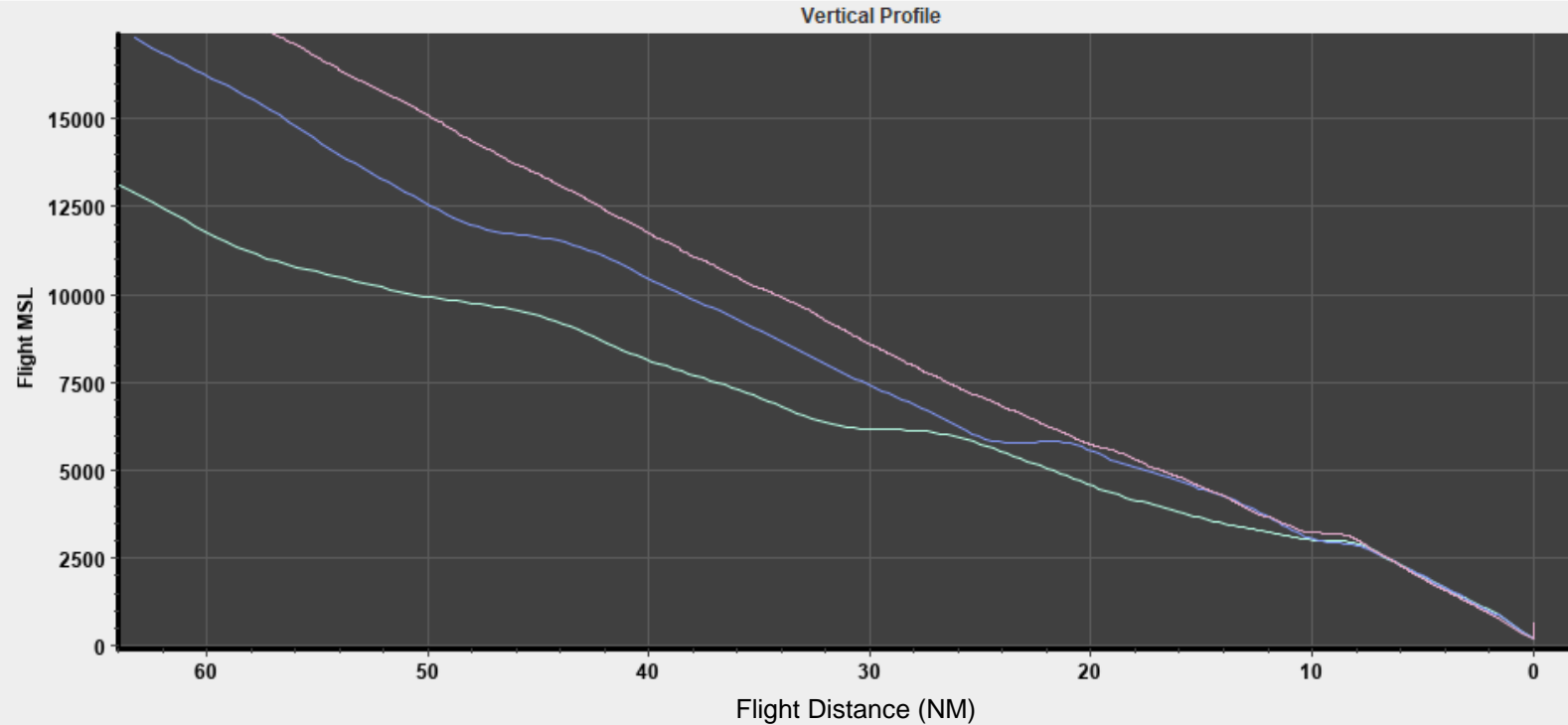
Hypothetical trial  
arrival

### Area of 60 dB contour (sq km)

Outlier arrival	Trial-like arrival	Hypothetical trial arrival
54.9	41.6	33.9

## COMPARISON 4

- Boeing 787-9
- Runway 26R
- Outlier arrival (07/08/19)
- Trial-like arrival (14/08/19)



Outlier arrival

Trial-like arrival

Hypothetical trial arrival

### Area of 60 dB contour (sq km)

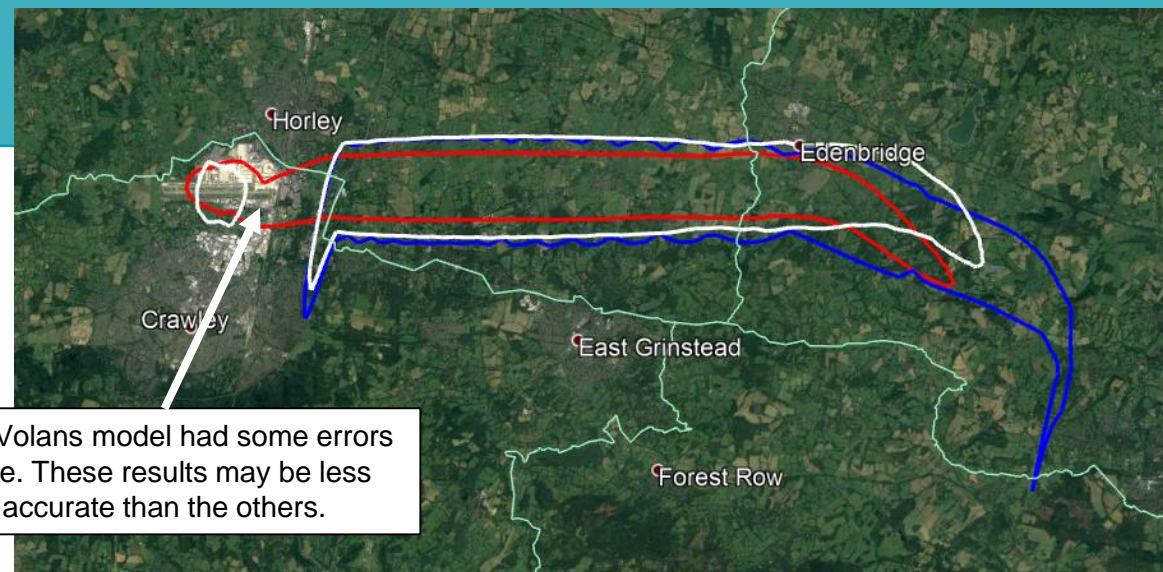
Outlier arrival	Trial-like arrival	Hypothetical trial arrival
76.0	44.8	60.8

## COMPARISON 4

- Boeing 787-9
- Runway 26R
- Outlier arrival (07/08/19)
- Trial-like arrival (14/08/19)

### Notes:

- 1) The lateral tracks of the 3 aircraft are not the same but this does not affect the size of the area.
- 2) The Volans tool can slightly alter coordinates of tracks approaching the runway in some circumstances. This is where there are kinks in some contours close to the runway threshold.



Outlier  
arrival



Trial-like  
arrival



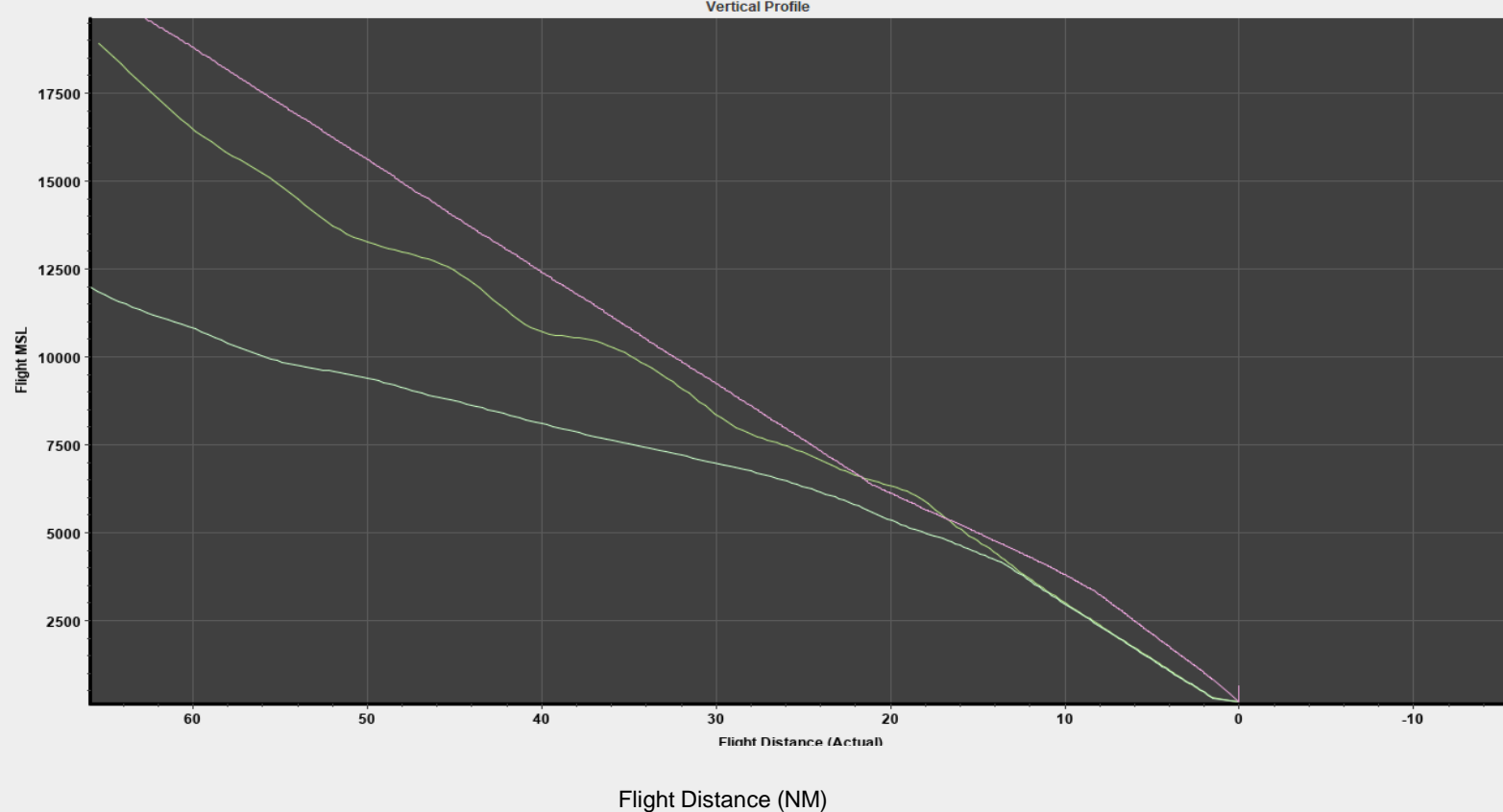
Hypothetical trial  
arrival

### Area of 60 dB contour (sq km)

Outlier arrival	Trial-like arrival	Hypothetical trial arrival
76.0	44.8	60.8

## COMPARISON 5

- Boeing 737-800 with winglets (B73H)
- Runway 08R
- Outlier arrival (24/08/19)
- Trial-like arrival (02/08/19)



Outlier arrival



Trial-like arrival



Hypothetical trial arrival

### Area of 60 dB contour (sq km)

Outlier arrival	Trial-like arrival	Hypothetical trial arrival
41.0	39.4	31.2

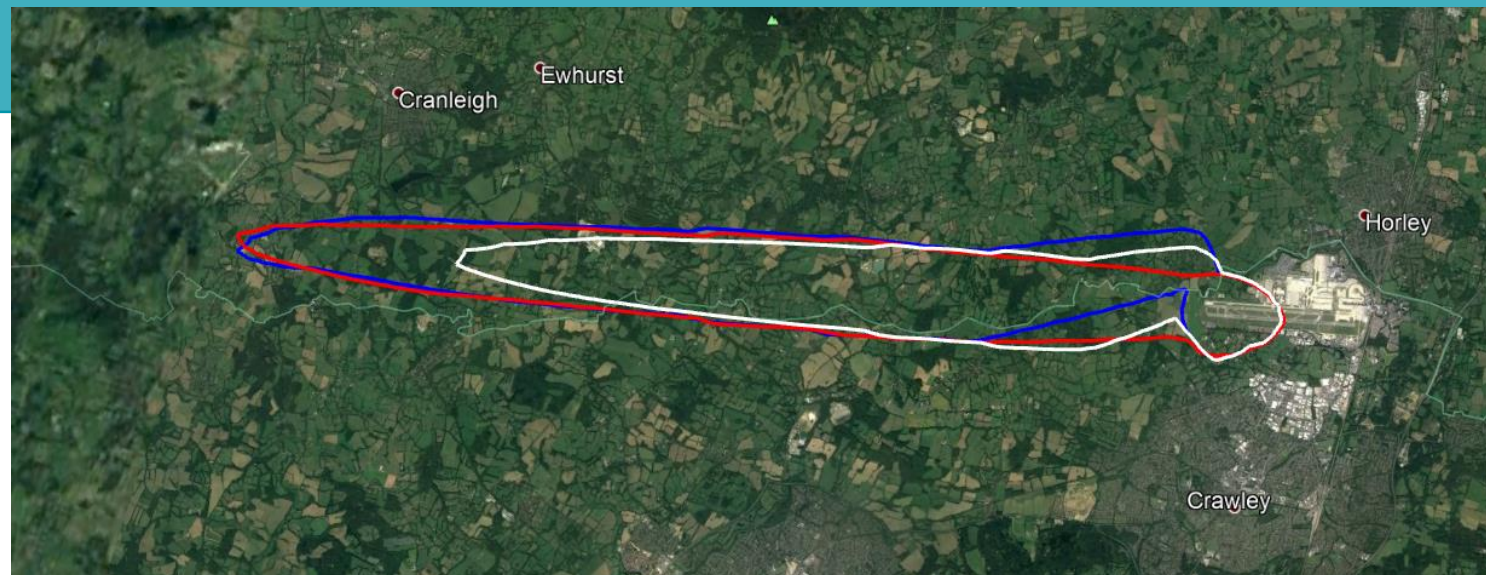


## COMPARISON 5

- Boeing 737-800 with winglets (B73H)
- Runway 08R
- Outlier arrival (24/08/19)
- Trial-like arrival (02/08/19)

### Notes:

- 1) The lateral tracks of the 3 aircraft are not the same but this does not affect the size of the area.
- 2) The Volans tool can slightly alter coordinates of tracks approaching the runway in some circumstances. This is where there are kinks in some contours close to the runway threshold.



Outlier  
arrival



Trial-like  
arrival



Hypothetical trial  
arrival

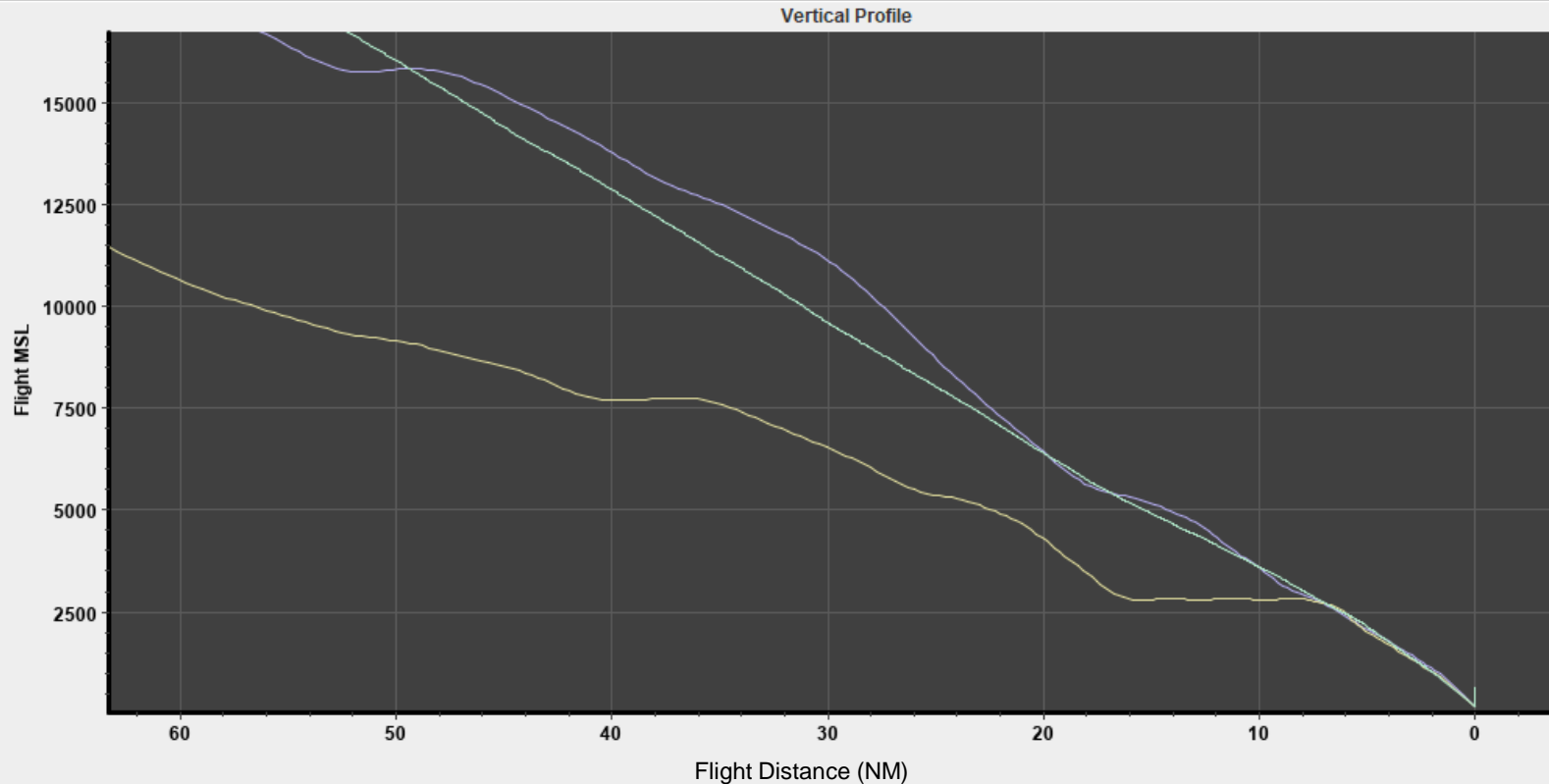
### Area of 60 dB contour (sq km)

Outlier arrival	Trial-like arrival	Hypothetical trial arrival
41.0	39.4	31.2



## COMPARISON 6

- Boeing 767 (B767)
- Runway 26L
- Outlier arrival (30/07/19)
- Trial-like arrival (21/06/19)



Outlier  
arrival



Trial-like  
arrival



Hypothetical trial  
arrival

### Area of 60 dB contour (sq km)

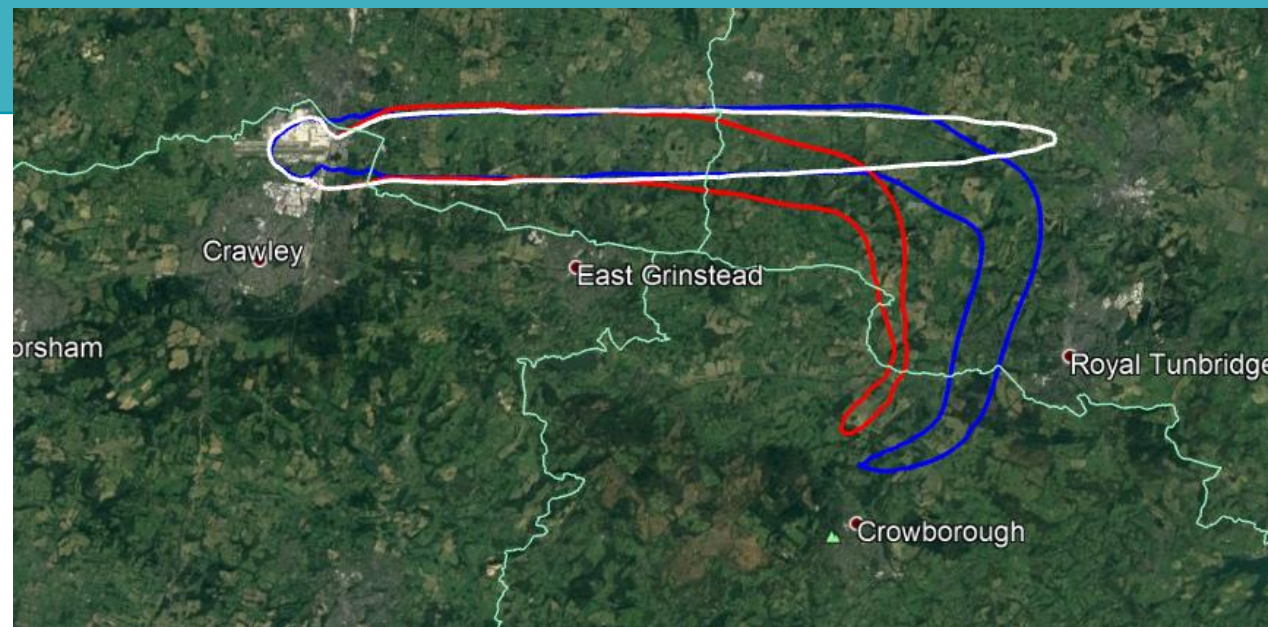
Outlier arrival	Trial-like arrival	Hypothetical trial arrival
93.7	69.2	68.6

## COMPARISON 6

- Boeing 767 (B767)
- Runway 26L
- Outlier arrival (30/07/19)
- Trial-like arrival (21/06/19)

### Notes:

- 1) The lateral tracks of the 3 aircraft are not the same but this does not affect the size of the area.
- 2) The Volans tool can slightly alter coordinates of tracks approaching the runway in some circumstances. This is where there are kinks in some contours close to the runway threshold.



Outlier  
arrival



Trial-like  
arrival



Hypothetical trial  
arrival

### Area of 60 dB contour (sq km)

Outlier arrival	Trial-like arrival	Hypothetical trial arrival
93.7	69.2	68.6

# SUMMARY

	Outlier arrival	Trial-like arrival		Hypothetical trial arrival	
	Area of 60 dB contour (sq km)	Area of 60 dB contour (sq km)	Area compared to outlier arrival	Area of 60 dB contour (sq km)	Area compared to outlier arrival
Comparison 1	41.1	38.1	7% smaller	37.1	10% smaller
Comparison 2	50.8	39.7	22% smaller	38.1	25% smaller
Comparison 3	54.9	41.6	24% smaller	33.9	38% smaller
Comparison 4	76.0	44.8	41% smaller	60.8	20% smaller
Comparison 5	41.0	39.4	4% smaller	31.2	24% smaller
Comparison 6	93.7	69.2	26% smaller	68.5	27% smaller

# CONCLUSIONS

- The results show that the Trial-like arrivals and the hypothetical trial arrivals have a smaller 60dB  $L_{\max}$  noise footprint than the outlier aircraft
- The trial-like arrivals have a smaller footprint than the outlier aircraft by between 4% and 41%
- The hypothetical trial arrivals have a smaller footprint than the outlier aircraft by between 10% and 38%



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