

Flight path accuracy of the Gatwick Noise and Track Keeping System

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Summary

This report describes a study that was undertaken to assess the accuracy of the flight path information provided by the new Noise and Track Keeping (NTK) system ANOMS, installed at Gatwick Airport in April 2019, and its suitability for use in aircraft noise analysis.

Aircraft positional data recorded using Mode S/ADS-B receiving equipment were used for independent comparison against ANOMS outputs, which are based on Secondary Surveillance Radar data. For the flights analysed, the study has confirmed that flight tracks and aircraft heights in the system are being reported correctly with no obvious errors or significant bias in the data.

A comparison of the ANOMS NTK aircraft operations database with corresponding records from air traffic control runway logs has shown a very close agreement between the two data sources.

The analysis confirms that the system continues to provide reliable flight data for the types of studies carried out by the Environmental Research and Consultancy Department (ERCD) of the CAA.

Chapter 1

Introduction

The Environmental Research and Consultancy Department (ERCD) of the CAA provides a range of research and advisory services in the field of aviation and the environment. Much of this work involves the collection and analysis of data from the Noise and Track Keeping systems (NTK) installed at Gatwick, Heathrow and Stansted airports. The NTK system at each airport matches air traffic control radar data (aircraft flight paths) to related noise measurements from noise monitors at prescribed ground positions. ERCD obtains data from the airports' systems via a link to the NTK remote servers.

In 2014, ERCD published the results of a study to assess the general accuracy of the flight path information collected by and held in the Gatwick NTK system¹. For the sample of flights analysed, the results indicated that flight tracks in the Gatwick NTK system were being recorded and displayed correctly.

In April 2019, Gatwick Airport replaced its then current 'Casper Noise' NTK system with a new system called ANOMS. Although ANOMS continues to use Secondary Surveillance Radar (SSR) for its source of aircraft height and position information, additional checks have been undertaken by ERCD to ensure that the new system at Gatwick continues to provide reliable flight track data.

Chapter 2 of this report gives a technical assessment comparing horizontal position and height data from the ANOMS NTK system at Gatwick against an independent source. An assessment of the flight operations information is provided in Chapter 3. The study conclusions are summarised in Chapter 4.

¹ CAP 1246, *Accuracy of data in the Gatwick Noise and Track Keeping System*, Civil Aviation Authority, December 2014

Chapter 2

Flight track data

Methodology

The source of aircraft positional data collected by and held in the Gatwick NTK system is Secondary Surveillance Radar. The system's radar coverage is currently a circular area approximately 60 NM in radius (110 km), centred on the airfield, covering aircraft at heights of up to approximately 30,000 ft above airfield level. The radar feed into the Gatwick NTK system also provides altitude reporting in 25 ft intervals for Mode S equipped aircraft.

To assess the accuracy of the Gatwick radar data, it is necessary to perform direct checks of the NTK data against independently derived precision data. For this study, the NTK data have been checked against height and positional information supplied by Mode S/ADS-B broadcasts using a portable receiver that decodes transponder signals from aircraft. As noted above, aircraft equipped with Mode S transponders provide altitude reporting in 25 ft intervals, with ADS-B adding global navigation data typically obtained from the aircraft's GPS (Global Positioning System) receiver.

The aerial rotation period of the radar head at Gatwick Airport is approximately four seconds, therefore it provides aircraft positional information every four seconds. By comparison, Mode S/ADS-B position and ground speed messages are typically broadcast every half-second. In addition, since GPS can generally provide position data accurate to within a few metres², a Mode S/ADS-B receiver enables accurate determination of an aircraft's position at any given time for independent comparison against the output from ANOMS.

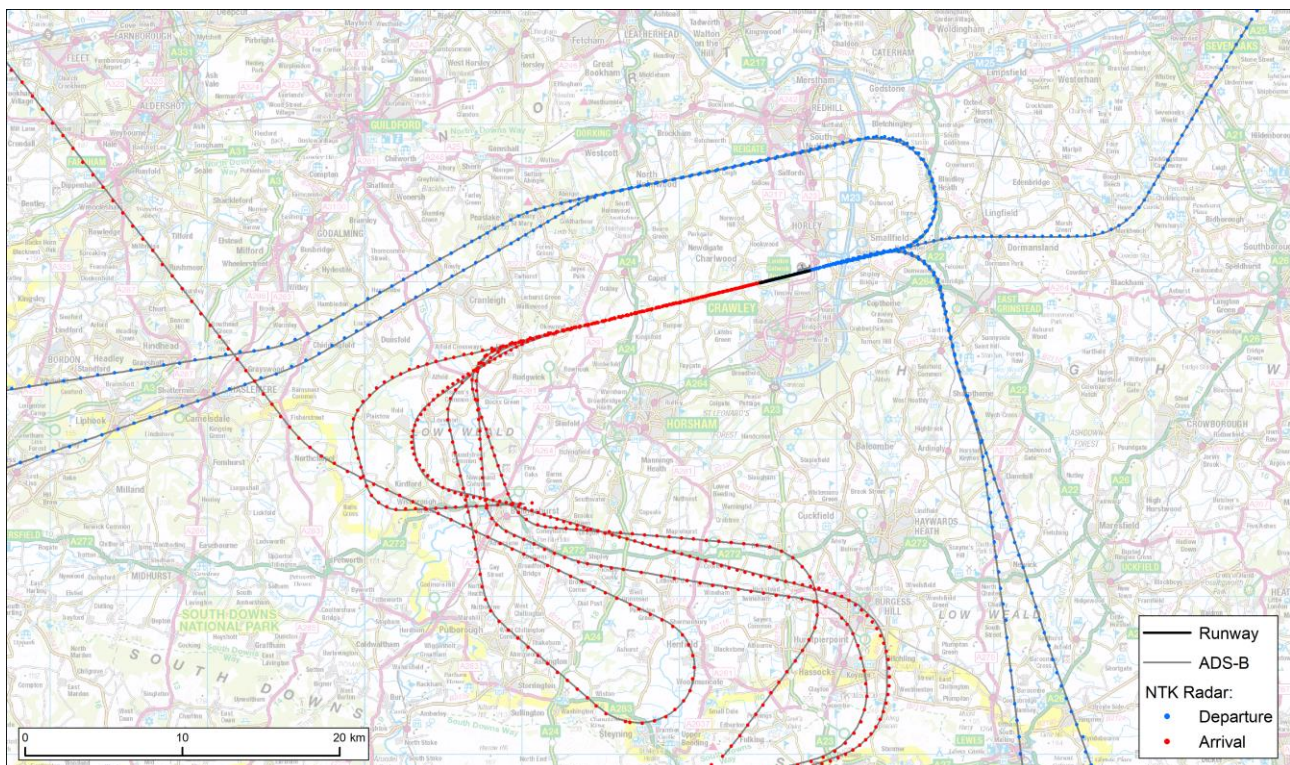
Mode S/ADS-B data were logged by ERCD for a sample of flights at Gatwick on 24 August 2019, using a receiver located close to the airfield. Because the Mode S/ADS-B receiver relies on a good line-of-sight to the aircraft, the signal can occasionally be interrupted by nearby buildings or other large obstructions. This resulted in occasional broken tracks in some of the logged data, which meant that some of the radar points could not be matched to Mode S/ADS-B data for comparison.

² Global Positioning System Standard Positioning Service Performance Standard, Assistant for GPS, Positioning and Navigation, 6000 Defense Pentagon, Washington DC, 4th Edition, September 2008.

Horizontal position data

Figure 1 compares the horizontal component of the NTK radar points with the equivalent Mode S/ADS-B data for a sample of five arrivals and five departures recorded on 24 August 2019. For all the monitored flights, Mode S/ADS-B position values were logged out to a distance of at least 30 km from the airport, with height values up to 10,000 ft or higher in most cases. The radar points shown in Figure 1 are the raw values exported from the NTK system³. The corresponding height profiles for each flight are provided in Appendix A and discussed in the next section of this report.

Figure 1 Gatwick arrival and departure tracks



The ground track comparisons show a close agreement between the NTK position data and the ADS-B position data. The measured positional differences have been quantified in further detail below. When considering these results, it should be recognised that the ADS-B data against which NTK points are compared are also subject to some uncertainty.

Comparison of the position data at any given point in time can be strongly affected by small time synchronisation differences between the two data sets. For example, for an aircraft travelling at a ground speed of 200 kt, a one second time synchronisation difference would itself account for a positional difference of about 100 m in the direction of flight. To account for this as far as possible in this assessment, the Mode S/ADS-B

³ To aid comparison with the radar points, the ADS-B tracks shown in Figure 1 are illustrated as continuous lines rather than discrete position values.