Birmingham Airport Airspace Change Proposal

Proposed changes to flightpaths for aircraft departing Runway 33

Contents

Foreword

Birmingham Airport is a strategic national asset, making a significant contribution to the West Midlands economy, serving its demand for air transport and acting as a catalyst to boost employment and inward investment. In 2014 we extended our runway, enabling direct, non-stop services to long-haul destinations in emerging markets, part of a £450 million investment programme to meet the needs of the 12 million passengers who fly from Birmingham each year.

In common with airports throughout the UK, Birmingham Airport Limited (BAL) is required to make changes to its flight paths, known technically as Standard Instrument Departure routes (SIDs). We are bringing forward our proposals as part of a national programme which will deliver improvements and efficiencies to the UK's airspace infrastructure. Before we can make any changes, we must formally present an Airspace Change Proposal (ACP), which is the subject of this document. The airspace change process is owned by the Civil Aviation Authority (CAA) and is determined by a CAA publication known as CAP 725. Any proposal that BAL brings forward is subject to review and approval by the Group Director of the Safety and Airspace Regulation Group (SARG), the body that regulates the use of airspace across the UK.

In developing new flightpaths we are, of course, governed by technical constraints, but we must also take into account the impact on surrounding communities. We take the views of our local stakeholders very seriously and try to maintain a constant dialogue, characterised by an open and honest approach which aims to build understanding, trust and mutual respect. From the very earliest stages of this process we have sought to engage with key representatives from communities which are potentially affected. I would like to offer my personal thanks to all who have given up their time and contributed to the process so far.

This document aims to give a clear and concise explanation of the proposed changes in plain language. Although some consultees will be familiar with aviation terminology and practice, those outside the industry may be less so; consequently detailed explanations are given where necessary and a glossary of technical terms is given at Appendix A. I urge everyone with an interest to respond with their feedback.

David Winstanley, Chief Operating Officer

Introduction

What is an Airspace Change Proposal?

If an airport wants to request a permanent change to its flightpaths, they must, as the 'change sponsor', submit an Airspace Change Proposal.

The introduction of new procedures is regulated by the CAA and is the subject of a detailed process of procedure development and consultation by the Airport, followed by the submission of the Airspace Change Proposal (ACP) which is then assessed by the regulator.

The whole process is set out in a CAA document *Guidance on the Application of the Airspace Change Process (CAP725)* which you can find here:

http://publicapps.caa.co.uk/docs/33/CAP%20725%20update%20March%202016%20amend.pdf

However, you should be aware that the CAA is introducing a new airspace change process which will replace CAP725. Its draft revised guidance material was published for consultation at the end of March 2017 and the consultation closed on 2nd July 2017. Alongside this, the Government has also been consulting on proposals about the policy and criteria against which the CAA assesses airspace change proposals. This consultation closed on 25th May 2017.

Currently, no date for the introduction of the new process has been set. BAL has been advised that **its proposals will be required to follow the existing CAP725 process** and that they will be assessed against the existing criteria.

Background for the changes to flightpaths

Why is an Airspace Change Proposal required?

The aviation industry supports 960,000 UK jobs and makes an annual contribution of £50bn to the UK's GDP. With passenger numbers expected to reach 350 million per year by 2030 it is a key component of the UK economy. Yet the UK's airspace – the network of airways and navigation aids which safely handles over two million flights every year – has remained relatively unchanged in 50 years. This essential part of our national transport infrastructure is in urgent need of modernisation, which means moving from ground-based radio beacons to modern satellite navigation. By restructuring airspace, it is possible to improve safety, increase capacity and reduce delays whilst minimising the impact on the global environment and benefitting some communities under flightpaths.

The changes we are proposing at Birmingham Airport represent our contribution to this process, which is now underway on a national scale as part of the Future Airspace Strategy (FAS). Specifically, there are two elements of airspace modernisation which we have taken into consideration.

Firstly, flightpaths at Birmingham and elsewhere are currently based on a system known as 'VHF Omni Directional Radio Range' (VOR). This enables aircraft to fix their position and stay on course by receiving radio signals transmitted by a network of fixed ground radio beacons. This technology has been in use for decades but is being superseded by more accurate satellite-based navigation. Consequently from 2018, there are plans for some of the radio beacons, which are owned and operated by NATS, the UK's main air service navigation provider, to be withdrawn from service.

Secondly, as part of the Future Airspace Strategy, there are plans to redesign UK airspace to the north of Birmingham in a project known as the Prestwick Lower Airspace Systemisation (PLAS). Our contribution to ensuring the success of this project will be to design new flightpaths for aircraft departing Birmingham for destinations to the north, so that they fit in with the requirements of the PLAS project.

Flight Paths at Birmingham Airport

Birmingham Airport has one runway, which aircraft use in either of two directions, known as Runway 15 and Runway 33. The numbers refer to the runway's directional heading, in degrees. Runway 15 is aligned on a heading of 150^0, approximately south southeast, while Runway 33 lies on a heading of 330^0, or north northwest. The runway only operates in one direction at any one time and it is meteorological conditions – primarily the direction of the wind – which determine this because, where possible, aircraft will usually take off and land heading into the wind. Averaged out over the course of a year approximately 60% of operations use R33, with 40% using R15.

The changes detailed in this document relate only to departures to the north of the Airport, from Runway 33. Departures to the south, from Runway 15, and all arrival routes are unaffected and will not change.

What are Standard Instrument Departure procedures?

Although the term 'flightpath' is in widespread use, a more accurate term for these departure routes is a Standard Instrument Departure procedure or 'SID'. A SID is a set of published instructions to pilots and air traffic controllers, designed to provide safe, standardised routes for aircraft to negotiate entry from the Airport into the airways system and en-route to their destination. In designing SIDs the latest international safety and technical requirements have to be taken into account, alongside the twin objectives of providing for sufficient airspace capacity and utilising routes that minimise the impact of noise and emissions on surrounding communities as far as is practicable.

What are Noise Preferential Routes?

Noise Preferential Routes (NPRs) are routes established in the vicinity of airports where it is desirable that aircraft avoid overflying noise-sensitive areas as far as is practicable. NPRs must mirror the initial stages of SID procedures and vice versa and are essentially corridors whereby you would expect to see aircraft fly within.

An NPR specifies an upper height limit. Once the aircraft has reached the upper limit of the NPR, air traffic controllers are free to redirect aircraft to fit in with other aircraft in the vicinity and the requirements of the wider air traffic management system beyond the airport.

For the sake of clarity, the term 'flightpath' will be used throughout to refer to SIDs and NPRs

What flightpaths are currently in use at Birmingham?

Birmingham Airport currently has four flightpaths for aircraft taking off from runway 33.

1: referred to here as Southbound, (but incorporating a series of individual SIDs known as ADMEX, WESTCOTT & UNGAP). This is the most heavily used, reflecting the fact that the majority of destinations served from Birmingham are in mainland Europe. Currently 68% of departures from Runway 33 follow this route, amounting to approximately 20,000 movements each year.

2: known as TRENT, takes aircraft on a heading just east of north and is used by departures to Scotland. It is currently used by 11% of departures from Runway 33, or around 4,000 movements each year.

3: known as Whitegate, takes aircraft in a north-westerly direction and is used primarily by aircraft heading for destinations across the Irish Sea or the North Atlantic. It currently accounts for 13%, or 4,800 annual departures from Runway 33.

4: known as MOSUN, is a non-standard departure procedure that will be dealt with in more detail later in the document. It currently accounts for only 8% of annual departures from Runway 33, or approximately 1,600 movements.

Stakeholders within the aviation industry may wish to see diagrams showing the extended SID centrelines which can be found in Appendix B.

What do the terms Conventional and RNAV mean?

As we have seen, aircraft navigation has historically been based on a network of fixed radio beacons, requiring aircraft to fly directly towards or away from them and where designing flightpaths meant plotting a route between beacons. This is known as Conventional Navigation. All current departure flightpaths to the north from Birmingham Airport are Conventional Navigation procedures, based on a series of beacons located at TRENT (TNT), Daventry (DTY), Compton (CPT), Whitegate (WHI) and Westcott (WCO).

The introduction of satellite-based navigation systems means that aircraft no longer need to fly along routes which are aligned directly with ground-based beacons. Instead, suitably equipped aircraft can fly on any desired flight path and with much greater accuracy, provided that the flight path has been designed to be compatible with the aircraft's navigation systems. This is known as Area Navigation (RNAV). A large majority of commercial aircraft operating today are equipped with RNAV systems.

By enabling aircraft to fly more efficient routes, RNAV provides additional capacity to ensure the most effective use of the airspace available to meet the increasing demand for air travel.

The removal of ground-based radio beacons planned for 2018 means that flightpaths for aircraft departing from Birmingham will have to change from 'conventional' to 'RNAV'.

Track-keeping performance, dispersion and concentration

Track-keeping refers to the ability of an aircraft to accurately follow a flightpath. It is closely monitored at Birmingham Airport using the Airport Noise and Operations Monitoring System (ANOMS) and we see excellent levels of track-keeping performance; in 2016 97.3% of aircraft were recorded as 'on-track'. However, conventional procedures will always result in a degree of dispersion around the nominal centreline of the flightpath, particularly during turns. One of the principal reasons for this is that the current flightpaths were designed for earlier generations of navigation systems and are not now compatible with the latest requirements for designing flightpaths. Nor are they compatible with modern aircraft systems, which no longer use the "raw" navigational references to the ground-based navigational aids around which the historic procedures were designed.

Instead, modern aircraft are equipped with a Flight Management System (FMS) to provide navigational guidance. Using sensors to determine the aircraft's position, the FMS uses a database of coded information to calculate a course and guides the aircraft along the flight path. Unfortunately, with the current conventional flightpaths, the database coders have to interpret them as best they can to produce 'overlay' procedures which are then inputted into the FMS. The existing routes cannot be accurately replicated in this way and the result is that aircraft tracks will vary within the flightpath – so-called dispersion. There will always be a degree of dispersion where variations in aircraft design, load and weather conditions lead to differences in aircraft performance, but incompatibility between conventional flightpaths and modern aircraft systems exacerbates the situation.

Conversely, even taking into account variations in individual aircraft performance, where RNAV procedures are designed to the current international criteria, aircraft are able to fly much more accurately than is the case with older navigation techniques, and we can expect to see a much greater ‘concentration’ of aircraft tracks along the centreline of the flightpath.

How have the new flightpaths been developed?

As required by the CAA, BAL has employed CAA-approved instrument flight procedure designers to undertake the design of new RNAV SIDs. In developing the new SIDs, we asked our designers to:

- Design procedures which are safe, flyable by all aircraft and in line with International Civil Aviation Organisation (ICAO) and CAA standards for flight procedure design and using RNAV-1 criteria

- Meet the requirements of the Prestwick Lower Airspace Systemisation (PLAS)

- Design procedures which match as closely as possible the existing arrangements, with priority being given to ensuring that they minimise the number of new people affected by any changes, rather than the total number of people affected

- Minimise the environmental impacts as far as possible, with the focus being on minimising the impact of noise on densely populated areas below 7000 feet

These design objectives were presented and discussed with the CAA at the formal Framework Briefing, as part of the CAP 725 process. They were also presented and discussed at the earliest meetings of the Airspace Focus Group.

In developing the new flightpaths, we considered and rejected a number of options. A description of each of these options is given overleaf.

Changes to the Standard Instrument Departure (SIDs) procedures

What changes are being proposed?

In order to minimise the number of new people affected by the changes, we are proposing, where practicable, to replicate the departure procedures for the four flightpaths currently in use (Southbound, Trent, Whitegate and MOSUN). You can find where these existing flightpaths are located in Appendix B.

We have been able to achieve our objective of replicating, as far as is possible, the current procedures for the Southbound, TRENT and MOSUN flightpaths. More detail is provided below.

We have, however, been unable to replicate the Whitegate flightpath. This is because it is not compatible with the requirements of the PLAS project, which is redesigning the airspace to the north of Birmingham Airport. Consequently, we are proposing that all traffic that previously used the Whitegate flightpath will instead use the re-designed TRENT flightpath.

In order to reach these decisions, we considered three options. These were; 1) do nothing, 2) start with a blank sheet and 3) replicate what is already in place. For clarity, these options are discussed in greater detail below.

Option 1: Do nothing

CAP725 requires the change sponsor to consider the option to “Do Nothing”. This is taken to mean retaining the existing procedures and flightpaths. We have looked at this and we have concluded that the “Do Nothing” option is not practical for two reasons:

1. The existing procedures are based on ground-based radio beacons which NATS plans to remove from 2018.
2. The existing procedures do not fit in with the planned redevelopment of the airspace to the north of Birmingham Airport – the PLAS project.

Option 2: Start with a blank sheet

When, with the help of the Focus Group, we began to consider any new proposed flightpath designs in 2016, we referred to the CAA's policy document '*Guidance on PBN SID Replication for Conventional SID Replacement'*. The document advises that the change sponsor must decide whether to implement PBN procedures by either replicating conventional procedures with RNAV designs, or by the introduction of entirely new RNAV flightpaths. We concluded that to introduce completely new flightpaths, which would overfly communities not previously impacted by departing aircraft, was not desirable.

In addition, we also took into account the requirements of the PLAS project, where the existing TRENT flightpath provided a suitable entry point into the planned airspace north of Birmingham Airport

Option 3: Replicate the existing published flight paths

Having considered and rejected the previous two options, BAL concluded that the most appropriate course of action was to replicate, as far as possible, the existing procedures. The following explains in more detail what factors influenced the design of each of the proposed new flightpaths.

WHITEGATE

When considering whether the current Whitegate flightpath could be replicated by an RNAV SID, it became clear that no solution was possible. This is because a Whitegate flightpath does not fit in with the planned redevelopment of the airspace to the north of the airport (PLAS). Specifically, it would be impractical for aircraft departing Birmingham on the Whitegate flightpath to achieve the airway arrival point (currently known as BIMBA) on which the whole network redesign is predicated upon. This is explained below.

Our proposal therefore is that all traffic currently using the Whitegate flightpath will instead use the new RNAV TRENT flightpath.

Recognising that this would result in an increase in the number of overflights of communities beneath the TRENT flightpath, we considered designing a completely new Whitegate flightpath, which did not replicate the existing procedure, with a view to providing respite for those communities located beneath the TRENT Flightpath.

We discounted this option however, when it became clear any new option would potentially overfly densely populated areas such as Oscott and Four Oaks which had previously not been overflown. In addition, a new Whitegate flightpath would also require aircraft to fly further in order to reach the required airway entry point (BIMBA) to the north of Lichfield. This longer track, when compared to the existing Whitegate routeing, would result in an increase in both fuel burn and CO_2 emissions. Furthermore, to reach BIMBA any redesigned Whitegate flightpath would have to overfly Sutton Park, a designated National Nature Reserve, incorporating a Scheduled Ancient Monument and Site of Special Scientific Interest (SSSI).

A count of the number of residential properties located within the Whitegate Noise Preferential Route reveals that a total of 90,265 properties would benefit from its removal and would no longer be subject to the impact of departing aircraft.

Furthermore, the removal of the Whitegate flightpath has implications when considering the issue of respite. As it closely mirrors the approach track of aircraft arriving on to runway 15, the removal of the Whitegate flightpath would provide significant respite for those people living beneath the extended runway centreline who currently experience aircraft activity - either departures or arrivals - at all times, as can be seen in Appendix B.

TRENT

We have been working with NATS to agree a new location for the airway entry point (BIMBA) so that the route that aircraft departing Birmingham need to follow in order to reach it replicates, as closely as possible, the current TRENT flightpath.

Our first draft design was presented to the Focus Group on 15th December 2016. The group noted that the designed track for the new TRENT flightpath was slightly to the west of the current flightpath and asked us to work with our appointed procedure designers to try to move it further east to more closely replicate the existing procedure. We passed this feedback on to the designers and the changes were made. This new version of the TRENT flightpath, compared to the original design, can be seen in Appendix D.

It can be seen however, that even after this change was made, the flightpath still does not exactly replicate the existing track, particularly further out from the airfield, and we did explore the option of a further design which would have pushed the track still further to the east and in line with where it is flown today. However, a consequence of making these changes would be to alter the early part of the track, closer to the Airport, where noise levels are higher. We gave greater weight to this factor and decided that it was important to replicate the existing track in these communities. Overall, a count of residential properties beneath the existing and proposed TRENT flightpaths shows a modest benefit; there are 46,234 properties beneath the existing flightpath compared to 46,148 under the proposed new one.

In summary therefore, we have been able to replicate the existing TRENT flightpath as closely as possible, while minimising the impact of aircraft noise on those properties closer to the airport.

SOUTHBOUND

The Airport began by taking the view that it should consider two options for the replication of the Southbound flightpaths, owing to an historical discrepancy between the published routes of the NPR and the SIDs.

To explain this, it is necessary to look back to 2006, when we launched 'Operation Pathfinder'. This was a joint programme, involving our partner airlines and Air Traffic Control, and its aim was to find ways to improve the track-keeping performance of aircraft by having them adhere more closely to the route of the published NPR. As a result, a small number of airlines modified their procedures in order to more accurately fly the NPR. The majority however, continued to fly the route of the published SID which takes aircraft on a route south of the NPR. You can see the result of this in in Appendix E, which shows aircraft tracks largely concentrated in two distinct swathes. (It is worth noting that once an RNAV flightpath is published and introduced, it will no longer be possible for airlines to make their own modifications in this way).

So, if we were to replicate the current situation, which of these should we choose? To address this issue, we decided to commission two designs. Our aim was to try to replicate both flightpaths and then to examine and understand the relative impact of each before deciding which proposal to take forward. We have identified these as Option 1, for that which replicates the NPR and Option 2 for that replicating the SID.

Firstly, we looked at Option 1, designed to replicate the published NPR centreline. The design proved to be successful from a technical point of view and suggested that it would produce a good concentration of aircraft tracks along the published centreline.

We then looked at Option 2, replicating the mean track of the majority of existing aircraft movements which are flying the published SID. When we met with the Focus Group it was observed that when airlines currently fly this procedure, aircraft tracks show a degree of dispersion. Likewise, when the draft designs were presented to the Focus Group, it was noted and agreed that replication of this route would continue to produce some degree of dispersion and that aircraft tracks would not be as concentrated as they are likely to be on, for example, the new TRENT flightpath. The reason for this is a technical one and involves the type of waypoint used in the design to initiate the turn, where it is anticipated that differing aircraft types and meteorological conditions will cause different rates of turn around this point, leading to a natural dispersal.

Although the Focus Group saw both draft designs, we did advise that it would be the results of studies to examine the impact of aircraft noise which would ultimately inform the decision as to which option would be preferred. The two different designs can be seen in Appendix F.

The results show that Option 2, to replicate the current flightpath, provides a modest noise benefit when compared to Option 1, which aims to replicate the NPR centreline. These results are presented in Appendix G.

In addition, by more closely replicating what is flown today, Option 2 minimises any change to the current situation. There is also a modest benefit to the redesigned flightpath, which brings about a small reduction in the number of residential properties beneath the NPR when compared to today – from 41,435 down to 40,924.

MOSUN

MOSUN is a non-standard departure procedure that has been in place at Birmingham for some years. We are seeking to replace the non-standard departure procedure with an RNAV SID.

As there is no existing procedure which we can replicate, we have attempted to replicate the actual tracks of aircraft over the ground as they fly today. We have approached this by analysing aircraft track data and producing a track density plot to understand the mean track flown. Once this mean track had been established, the new RNAV procedure was designed to replicate it. It should be noted that because the current procedure is non-standard, it is manually flown by pilots rather than aircraft Flight Management Systems. This results in a significant level of dispersion. It is not possible to replicate this level of dispersion when designing an RNAV SID and so we can expect to see a greater degree of concentration than is currently the case.

A key requirement for the design of this flightpath was to ensure that it minimised the overflight of residential areas wherever possible. Instead the aim was to overfly industrial areas, such as those adjacent to the Tyburn Road, and transport infrastructure, such as Junction 6 of the M6 (Spaghetti Junction). This has been achieved and can be observed not only by following the centreline on the map, but also by reference to the count of commercial properties located under the proposed NPR which shows a total of 19,322.

A note on Property Counts

We based our property counts on the areas beneath Noise Preferential Route swathes. This is because the NPRs have been widely published for many years, are widely recognised as the areas in which residents would expect aircraft to operate and may well have been a point of reference for those moving to properties in the area.

To allow for an easily understandable comparison between existing and proposed flightpaths, we counted the number of residential properties under both the existing NPR's and the proposed NPR's, which are of equal length. It is acknowledged in CAP 725 that there are limitations to this approach, where it is noted that *not all individuals within the swathe are affected to the same extent. For example, a resident living 15 miles..from the airport..will experience less impact than a resident at 5 miles from the runway..However, the population count method considers both residents to be somehow equivalent.*

This methodology does, however, acknowledge the impact of aircraft operations on properties that fall outside the Noise Contours. Current policy is that noise should be considered up to an altitude of 7,000 feet. All of the existing NPR's at Birmingham end at a point where departing aircraft have reached this same altitude (approximately). For the purposes of making a direct comparison, we have therefore used the same end point for the proposed NPRs. (The exception to this was the NPR associated with the existing TRENT flightpath, which ends at a point before aircraft have reached 7,000 feet. For consistency and to make a direct comparison possible, we extended our property count area for both the existing and proposed TRENT flightpaths by 2.2kms, to the point at which aircraft are at approximately 7,000 feet.

These calculations show that there are 196,538 properties beneath that existing NPRs compared with 186,763 under the proposed NPRs.

Appendix G shows an example image of the NPR swathes used for residential property calculation, where each red cross represents a property. The data, supplied by Ordnance Survey, is also provided, broken down by NPR.

What will the environmental impact be?

Noise

How has the impact of noise been measured?

We commissioned the CAA to produce independent modelling of the impact of aircraft noise. This was undertaken by producing two sets of Noise Contours. The first, known as Leq. takes the noise levels of aircraft, and combines them with the number of aircraft over a peak summer daytime period to provide an average noise level. Sound Exposure Level (SEL) noise footprints have also been produced. SEL footprints show the extent of noise energy generated from a single aircraft event - for example an aircraft either taking off or landing. These are based on individual noise events for the noisiest and most common aircraft types operating at night during 2016.

When commissioning the Leq noise contours, we followed the guidance set out in CAP 725 where 57 dB(A) is deemed to represent the onset of significant community annoyance. However, we recognise that the government is currently reviewing its policy on annoyance in relation to aircraft noise and as part of this review it is likely that the threshold of what is assumed to be the onset of significant community annoyance will decrease. In the interests of best practice and to reflect current government thinking, we have therefore commissioned Noise Contours that are mapped down to 54 dB(A) and the results are presented in this document.

The CAA has modelled four scenarios as follows:

1. A base case: this produces noise contours for 2016 and is based on both the current flightpaths *and* for the proposed flightpaths, assuming they had been in operation at the time

2. The year of implementation: This looks forward to 2018 and produces noise contours using both the current flightpaths *and* the proposed flightpaths assuming they are in operation. Given that this is looking forward in time, these contours are created using forecasted aircraft movement data.

3. A future case: This also looks forward, but in this case to 2023, to produces noise contours using both the current flightpaths *and* the proposed flightpaths assuming they are in operation. Again these were created using forecast data.

4. SEL Footprints for the noisiest and most common aircraft types operating at night in 2016.

Forecast data is created by anticipating which destinations airlines are likely to fly to in any given future year and the likely frequency of these flights. Forecasts also anticipate which aircraft types are likely to be in operation at these times, as differing aircraft types can have significantly different noise footprints.

Both the L_{eq} contours and SEL footprints have been produced to provide details of the area they include (in km_2), and the population and number of households contained within in that area. Both population and household data tables have been generated to the nearest 100 and are quoted as such below. Full results are shown in Appendix H.

What were the results of the noise study?

The aircraft noise study concludes that in all scenarios modelled (2016, 2018 & 2023) there is a modest increase in the population exposed to aircraft noise when comparing the proposed flightpaths to the existing flightpaths. This is attributable to the removal of the Whitegate SID leading to an increased usage of the proposed TRENT SID. These changes are discussed in further detail below.

The results of the noise study show that noise will increase over time as a result of passenger growth and an increase in air transport movements at the Airport. This is likely to occur regardless of any changes made to flightpaths.

It is also important to take into account individual communities when considering changes to noise impact as a result of this airspace change. In each of the sections below there is a description of changes to noise contours resulting from this airspace change proposal and where possible which communities will be impacted. The information below is a summary and has been produced to assist the reader in identifying affected areas, but please refer to Appendix H for full results, tables and maps.

2016 noise contours – summary of results

The 2016 scenario shows that overall the proposed airspace change produces no difference in the number of households or in the population within noise contours between 72 and 63 dB(A). In the 60 to 54 dB(A) noise contours, the proposed flightpaths result in a slight reduction in the population count of 100, with no changes to the number of households. Results for the 57 to 54 dB(A) noise contour show a population increase of 900 and an increase in the number of households of 500.

A change of shape in the contours is observed towards the North, where there is a marginal shift to the north east of the airfield. This results in a change to the 57 dB(A) noise contour bringing in some properties located near to the Old Clock Garage on Newport Road, Castle Bromwich. There is also a change to the 54 dB(A) noise contour, incorporating some properties located just to the east of Spitfire Island, at the intersection of the Chester Road and the A47 Fort Parkway and the entrance to the Castle Vale estate.

2018 noise contours – summary of results

The 2018 scenario shows that overall the proposed airspace change produces no difference in the number of households or in the population within noise contours between 72 and 63 dB(A). However, there is a population increase in the 60 dB(A) contour of 100 and an increase in the number of households of 100. In the 57 dB(A) contour there is a population increase of 500 and a household increase of 200. In the 54 dB(A) contour there is also a population increase of 800 and a household increase of 300.

Again, there is a marginal shift in the noise contours towards the north east of the airfield. This has led to a very modest change to the 60 dB(A) noise contour incorporating some properties located near to Rivermead Park, Cole Hall Lane. There is also a change to the 57 dB(A) noise contour incorporating properties located just to the north of the Old Clock Garage on Newport Road, Castle Bromwich. Again, there is a change to the 54 dB(A) noise contour to include some properties located just to the east of Spitfire Island, at the intersection of the Chester Road and the A47 Fort Parkway and the entrance to the Castle Vale estate.

2023 noise contours – summary of results

The 2023 scenario shows that overall the proposed airspace change produces no difference in the number of households or in the population within noise contours between 72 and 63 dB(A). However, there is a population increase in the 60 dB(A) contour of 300 and an increase in the number of households of 100. In the 57 dB(A) contour there is a population increase of 400 and a household increase of 200. In the 54 dB(A) contour there is a reduction of the total population located within the contour of 300 whilst the total number of households remains the same.

Again, there is a marginal shift in the noise contours towards the north east of the airfield. This has led to a very modest change to the 60 dB(A) noise contour to incorporate some properties located near to Rivermead Park, Cole Hall Lane. There is also a change to the 57 dB(A) noise contour which incorporates some properties located just to the north of the Old Clock Garage on Newport Road, Castle Bromwich.

A reduction of the population within the 54 dB(A) contour observed when comparing the proposed flightpaths to the existing flightpaths is due to an increased utilisation of the proposed MOSUN flightpath. An increase in the use of this flightpath is anticipated when the airspace it feeds aircraft into becomes permanently available by 2023. The early part of the track of this procedure is similar to that of the Whitegate flightpath, which it is proposed to remove altogether. These changes have caused the contours to move slightly west when compared to 2016 and 2018.

For full information please review the noise contour maps found in Appendix H.

Sound Exposure Level (SEL) Footprints – summary of results

SEL footprints show the extent of noise energy generated from a single aircraft event - for example an aircraft either taking off or landing. SEL footprints have been produced for both the proposed new flightpaths and the existing flightpaths. SEL footprints are typically used in order to assess the impact of night noise.

R-NAV footprints were produced for the aircraft type most frequently operated at Birmingham (Airbus 321 with IAE V2500 engines) and the noisiest (Airbus 321 with CFM56 engines).

Footprints were produced for the base year (2016) at the 90 dB(A) level, which government research identifies as the level at which the onset of possible sleep disturbance is likely to occur.

The table below gives a summary of the results of the SEL footprints at the 90dB(A) level. For full information please refer to Appendix H for full results tables and maps.

90 dB(A) SEL Footprints - Proposed flightpaths compared to current

Southbound Most Frequent: Airbus 321 with IAE V2500 engines
No change

Southbound Noisiest: Airbus 321 with CFM56 engines
Increase in Population 100. Increase in Households 100

TRENT Most Frequent: Airbus 321 with IAE V2500 engines
Decrease in Population of 300. Decrease in Households 100

TRENT Noisiest: Airbus 321 with CFM56 engines
Decrease in Population of 100 Decrease in Households 100

MOSUN Most Frequent: Airbus 321 with IAE V2500 engines
Decrease in Population of 100 Decrease in Households 100

MOSUN Noisiest: Airbus 321 with CFM56 engines
Increase in Population 100 Increase in Households 100

Carbon Assessment

Birmingham Airport commissioned NATS to undertake an assessment of the impact of the Airspace Change Proposal on CO_2 emissions.

Using the NATS Fuel Burn Model (known as KERMIT), details of the number of aircraft movements and the types of aircraft operating them were modelled for both the current flightpaths and (using the forecast data) the proposed flightpaths. This produced fuel burn and CO_2 figures for each of the flightpaths under three forecast scenarios, allowing the results for both the current and the proposed flightpaths to be compared. The three forecast scenarios were:

- a base case – 2016, using actual data, to show the current situation
- the year of implementation – 2018, using the forecast data
- a future case – 2023, using forecast data

The table below summarises the annual estimated fuel burn and CO_2 emissions for the flightpaths collectively, with and without this airspace change proposal. The results are broken down by individual flightpaths on page 26.

Estimated fuel burn and CO_2 emissions

		With Airspace Change		Without Airspace Change	
Year	Total Movements (Departures from Runway 33)	Total CO_2 (Tonnes)	Total Fuel (Tonnes)	Total CO_2 (Tonnes)	Total Fuel (Tonnes)
2016	9'941	36,727	11,549	38,081	11,975
2018	10,867	41,056	12,911	42,227	13,279
2023	12,037	39,264	12,347	40,540	12,748

There is predicted to be an increase in CO_2 emissions between 2016 and 2018. This is directly attributable to the predicted overall increase in air transport movements as the Airport grows, rather than a direct result of this airspace change proposal. In fact, as the above table shows, overall there is a modest measurable reduction in CO_2 emissions with this airspace change proposal if one assumes the same growth were to occur whether it was implemented or not. This is attributable to the fact that the new flightpaths for the Westcott, TRENT and Whitegate flightpaths are shorter than the existing ones, resulting in a reduction in aircraft track miles flown. In some scenarios they also allow for the aircraft to climb to a higher altitude than the restrictions on the current SIDs. Aircraft operate more efficiently at higher altitudes, burning burn less fuel and in turn releasing less CO_2.

In 2023, despite there being an increase in the number of aircraft forecast to operate at the Airport, the total CO_2 emissions decreases. This is when compared to both the current flightpaths and with the proposed flightpaths, with the latter giving the greatest CO_2 decrease.

Fuel burn and CO_2 emissions for each flightpath and aircraft type have been combined with traffic count data to calculate an annual estimated change in emissions for the new flightpaths. The tables below show a summary of total changes to fuel burn and CO_2 emissions for each traffic sample year, followed by a more detailed breakdown of the same data by flightpath.

Overall changes in fuel burn and CO_2 emissions by year with this airspace change

Year	Total Movements (Departures from Runway 33)	Total CO_2 Change (Tonnes)	Total Fuel Change (Tonnes)
2016	9,941	-1,354	-426
2018	10,867	-1,171	-368
2023	12,037	-1,276	-401

Overall Results by SID and by Year

SID	Year	Total Movements	Total CO_2 Change (Tonnes)	Total Fuel Change (Tonnes)
ADMEX	2016	3264	-24.3	-7.6
	2018	3902	-58.5	-18.4
	2023	3335	-59.3	-18.7
WESTCOTT	2016	41	-48.9	-15.4
	2018	0	0	0
	2023	0	0	0
MOSUN	2016	507	0	0
	2018	591	0	0
	2023	1936	0	0
TRENT	2016	896	-163.9	-51.5
(BIMBA)	2018	885	-178.3	-56.1
	2023	990	-189.2	-59.5
WHITEGATE	2016	1617	-1063.8	-334.5
(BIMBA)	2018	1515	-881.6	-277.2
	2023	1654	-971.6	-305.5
UNGAP	2016	3616	-52.7	-16.6
	2018	3974	-52.8	-16.6
	2023	4122	-55.7	-17.5

The analysis shows that each of the new SIDs proposed for Departures from Runway 33 has the potential to reduce fuel burn and therefore CO_2 emissions. There is one exception, which is the proposed MOSUN SID, where there is no anticipated difference between the current procedure and the proposed SID which is formalising the procedure..

Local Air Quality

In the early stages of an aircraft's departure from the Airport, the proposed flightpaths will precisely replicate the existing ones. The point at which any change occurs is above 1000 feet attitude; therefore it is assumed that there will be no change to local air quality as a result of the proposed changes to flightpaths. Further to this the introduction of the new SIDs will not lead to any changes in fleet mix or traffic volumes.

Furthermore the CAA's guidance document for airspace change, CAP 725, requires an Air Quality Assessment to be carried only where there is a possibility of pollutants breaching legal limits at a local level and acknowledges that it is unlikely that these limits will be approached or breached for any but the UK's largest airports. Birmingham Airport monitors its Air Quality impact 365 days a year by means of an Air Quality Monitoring Station located on the airfield and the results consistently show that it operates well within the limits set by government for NO_2 and PM_{10}. Air quality under the flightpath is also monitored by dedicated Air Quality Monitoring Stations managed by Birmingham City Council (BCC).

Tranquillity and Visual Intrusion

Tranquillity can be defined as a 'state of calm or quietude', and CAA guidance recommends that when airspace changes are required, consideration is given to issues of tranquillity. The measurement of tranquillity is not well developed, but the Council for the Protection of Rural England did commission research and produced tranquillity maps in 2006.

We have undertaken a desk top study to consider the effects of both the current and the proposed flightpaths, to an altitude of 7,000 feet, on Sites of Special Scientific Interest (SSSI), Areas of Outstanding Natural Beauty (AONB) and National Parks. The study found that either beneath, or adjacent to, the existing flightpaths there are currently five SSSIs including one which is also a National Nature Reserve (Sutton Park). The introduction of the proposed flightpaths would reduce the number of SSSIs affected to two and would also mean the National Nature Reserve was no longer beneath a flightpath. This results from the removal of the Whitegate flightpath which currently overflies the SSSIs at Sutton Park, Hay Head Quarry and Daw End Railway Cutting.

The two remaining SSSIs that would lie beneath the proposed new flightpaths are Edgbaston Pool and Whitacre Heath, both of which are already overflown by aircraft operations today.

There are no Areas of Outstanding Natural Beauty (AONB) or National Parks within or adjacent to either the existing or the proposed flightpaths (to 7000 feet).

At a wider scale, the proposed flightpaths further out from the Airport (where aircraft are significantly higher and therefore less likely to disturb tranquillity or create visual intrusion) substantially replicate the existing routes.

The proposed changes would not, it is believed, have a significant effect on tranquillity or visual intrusion. Indeed, it may be argued that that the proposed changes would improve Tranquillity and reduce Visual Intrusion through the removal of the SSSIs referred to above from beneath the flightpath.

Conclusions

Due to the imminent changes to both the physical infrastructure that current departure routes are predicated upon, as well the changes to the wider airspace infrastructure to the north of Birmingham Airport, new departure procedures from runway 33 need to be developed. The regulations governing the design of departure procedures, and the process required for implementation of the new procedures are specified by the CAA. It is the CAA's Policy that all new SID procedures should be phased out and replaced by PBN procedures, with RNAV-1 as the navigation standard.

We are proposing that the existing flightpaths for aircraft departing from runway 33 are, where possible, replicated using RNAV-1 criteria. However, when we considered the existing Whitegate flightpath, it became clear that due to the planned restructuring of airspace resulting from the Prestwick Lower Airspace Systemisation (PLAS) project, we would not be able to achieve replication. Instead we propose to route traffic previously using this procedure on to the proposed new TRENT flightpath.

All of the new departure procedures have been designed in a way to ensure that they are safe, flyable and meet the ICAO and CAA standards for flight procedure design using RNAV-1 criteria.

Forecast scenarios show that, overall, there will be an increase in the noise impact. However, this is mostly attributable to the growth in air traffic which is likely to occur whether or not the new flightpaths are implemented. When analysing noise impact with and without this airspace change we see a modest increase in the number of people affected by noise as a result of the proposed new flightpaths

The proposed new flightpaths show a benefit in terms of a reduction in fuel burn and CO_2 emissions, though there is also a modest forecast reduction in CO_2 emissions if growth were to occur without the new flightpaths in place.

Overall, within the constraints we have detailed, the new routes match the existing arrangements as closely as possible. They minimise, as far as possible, both the number of new people affected by the changes and the environmental impact.

Consultation Process

The Purpose

The purpose of this consultation process is to provide stakeholders the opportunity to comment on the proposals to establish new flightpaths from Runway 33 at Birmingham Airport.

The Process

As the Change Sponsor for this airspace change, BAL will manage the public consultation process. This proposal and public consultation process has been developed in line with the CAA document - *Guidance on the Application of the Airspace Change Process (CAP 725).*

The consultation process will take place over 14 weeks. It will commence on **Monday 3rd July** and will end on **Monday 6th November 2017.**

All feedback will be given appropriate consideration before the formal proposal is prepared for submission to the CAA for approval.

The Scope

This consultation is focused around those communities which might be affected by the changes to flightpaths. The Airport Consultative Committee and the Airspace Change Focus Group, as well as parish councils, local authorities and Members of Parliament will also be involved. Other stakeholders include airlines and others within the aviation industry, the business community, environmental and heritage groups. A full list of consultees and all the consultation material is available on our web site at:

https://www.birminghamairport.co.uk/flightpaths

In addition, we are inviting all those with an interest to visit one of a series of Airport consultation events, which will be held at local community venues. Please visit our website for the latest schedule.

How to respond

We welcome your comments on the proposed new flightpaths. Our preferred option is that you submit your feedback by completing the feedback form available at:

https://www.birminghamairport.co.uk/flightpaths

You may also write to obtain a form for completion by hand to:
Airspace Change Process
Birmingham Airport
Diamond House
Birmingham, B26 3QJ
We will post a form and a reply-paid envelope to you.

Alternatively, please e-mail us at:
airspaceR33@birminghamairport.co.uk

Please be aware that copies of all consultation responses will be a matter of public record and will be submitted to the CAA.

Any comments regarding the process as set out in CAA's guidance for the ACP (CAP725) should be directed to the CAA at:

Airspace Regulator
Safety and Airspace Regulation Group
CAA House
45-49 Kingsway
London WC2B 6TE
Email: airspace.policy@caa.co.uk

Appendix A

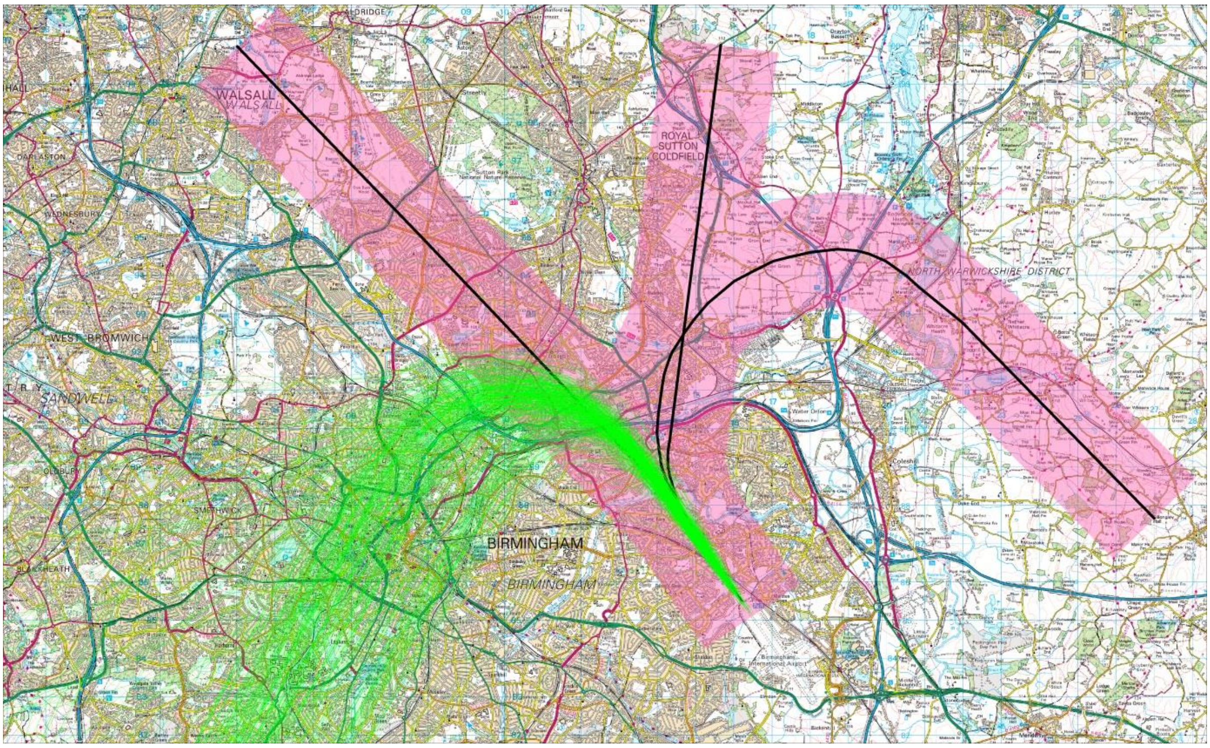
Glossary of Key Terms

ACC	Airport Consultative Committee
ACFG	Airspace Change Focus Group
ACP	Airspace Change Proposal
ATC	Air Traffic Control
ATM	Air Transport Movement
CAA	Civil Aviation Authority (the specialist regulatory agency for the aviation industry in the UK)
CAP 725	Airspace Change Process Guidance document produced by the CAA providing a framework for consideration of airspace changes.
SARG	Safety and Airspace Regulation Group (SARG) The division of the CAA which is responsible for the planning and regulation of all UK airspace.
ICAO	International Civil Aviation Organisation
KT	Knot 1.1 mph
NATS	National Air Traffic Services (Air Traffic Service provider)
NM	Nautical Mile
NO_2	Nitrogen Dioxide – an air pollutant
NPR	Noise Preferential Route. The route established by the airport operator in the vicinity of aerodromes where it is desirable that aircraft avoid overflying noise-sensitive areas as far as is practicable.
NTK	Noise and Track-Keeping System used by Airports to monitor noise and track-keeping performance.
Noise Contour	Aircraft noise maps, which show lines joining points of equal noise, illustrate the impact of aircraft noise around airports.
PANS-OPS	A document published by ICAO specifying the design criteria to be used for the safe design of IFPs.
PBN	Performance Based Navigation. Navigation by means of global navigation satellite systems and computerised on-board systems.

PM10	Particulate matter with a diameter of 10 microns or less – an air pollutant
RNAV	Area Navigation
Runway 15	The Runway description at Birmingham Airport when aircraft are taking off to the South and arriving from the North
Runway 33	The Runway description at Birmingham Airport when aircraft are taking off to the North and arriving from the South
SEL	Sound Exposure Level. Measurement of the extent of noise energy generated from a single aircraft event - for example an aircraft either taking off or landing.
SID	Standard Instrument Departure procedure. The route linking the runway to the en route "Airways" system which incorporates local and en route ATC requirements and NPRs
UK AIP	UK Aeronautical Information Publication, a manual containing information relating to all UK airports including flight procedures, noise abatement procedures and SID charts

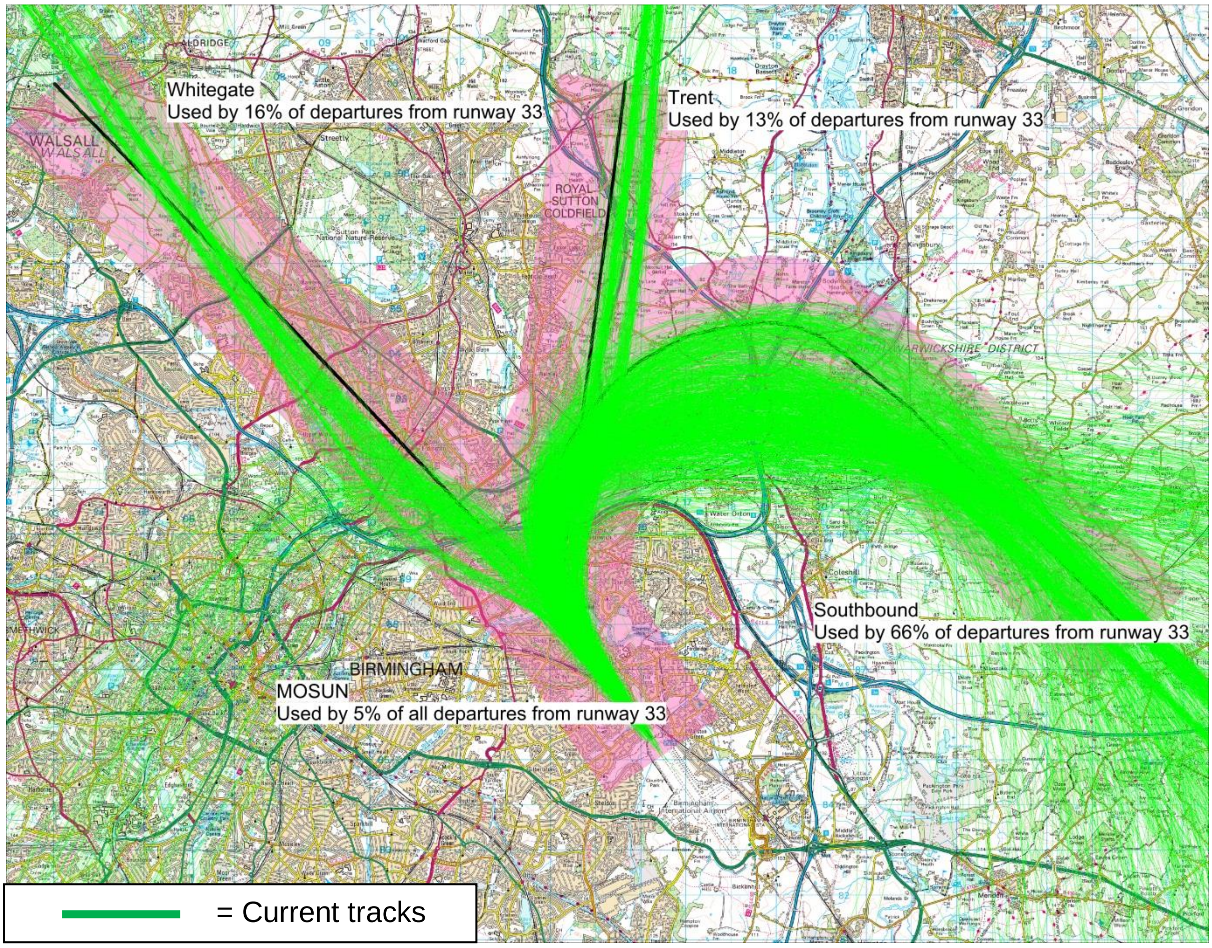
Appendix B

Current SID and Noise Preferential Routes (NPRs) at Birmingham Airport



High Resolution Image available here

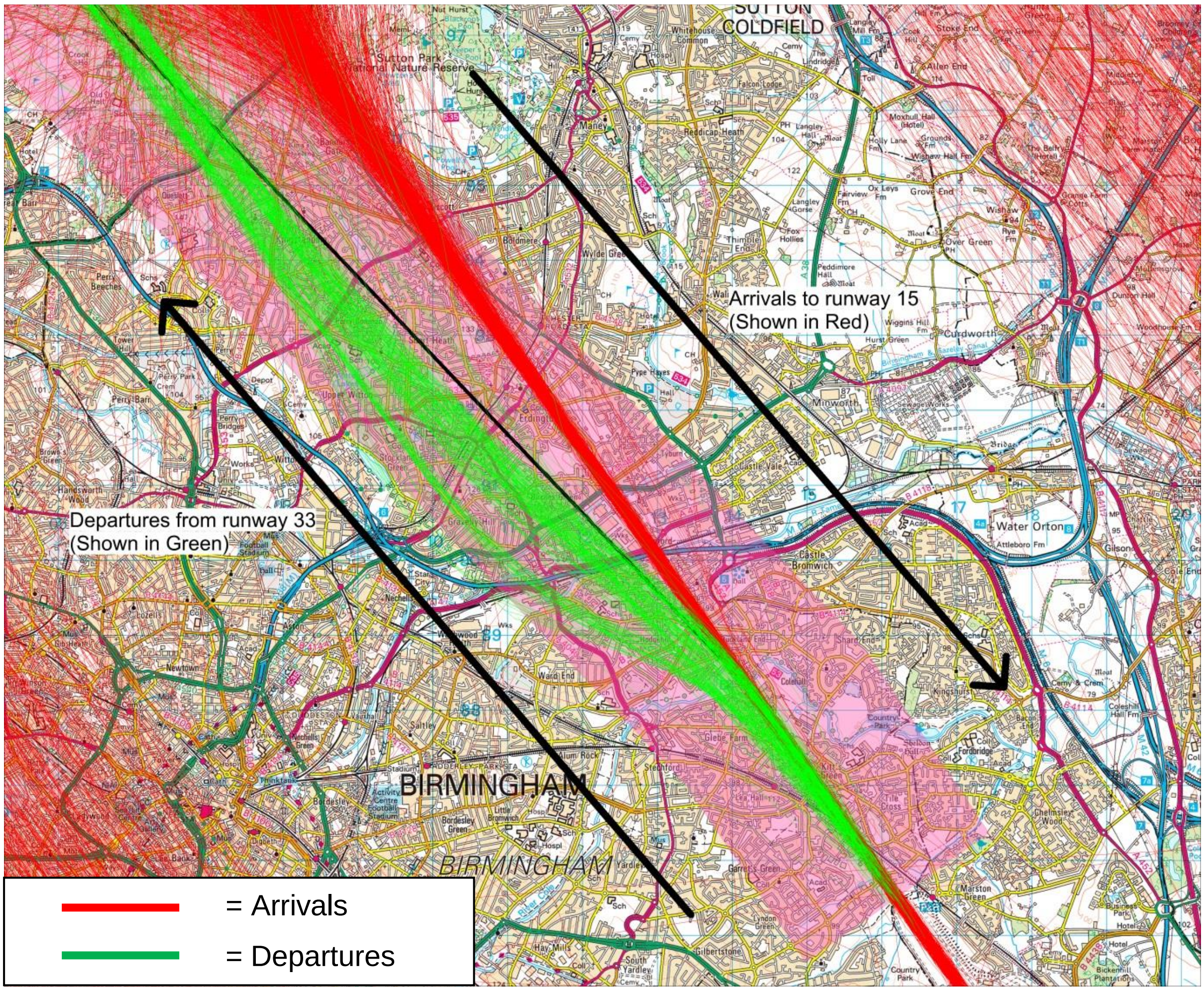
Usage of current SIDs and Noise Preferential Routes (NPRs)



Based on track data from Runway 33 for May 2017 and percentage of usage for 2016.

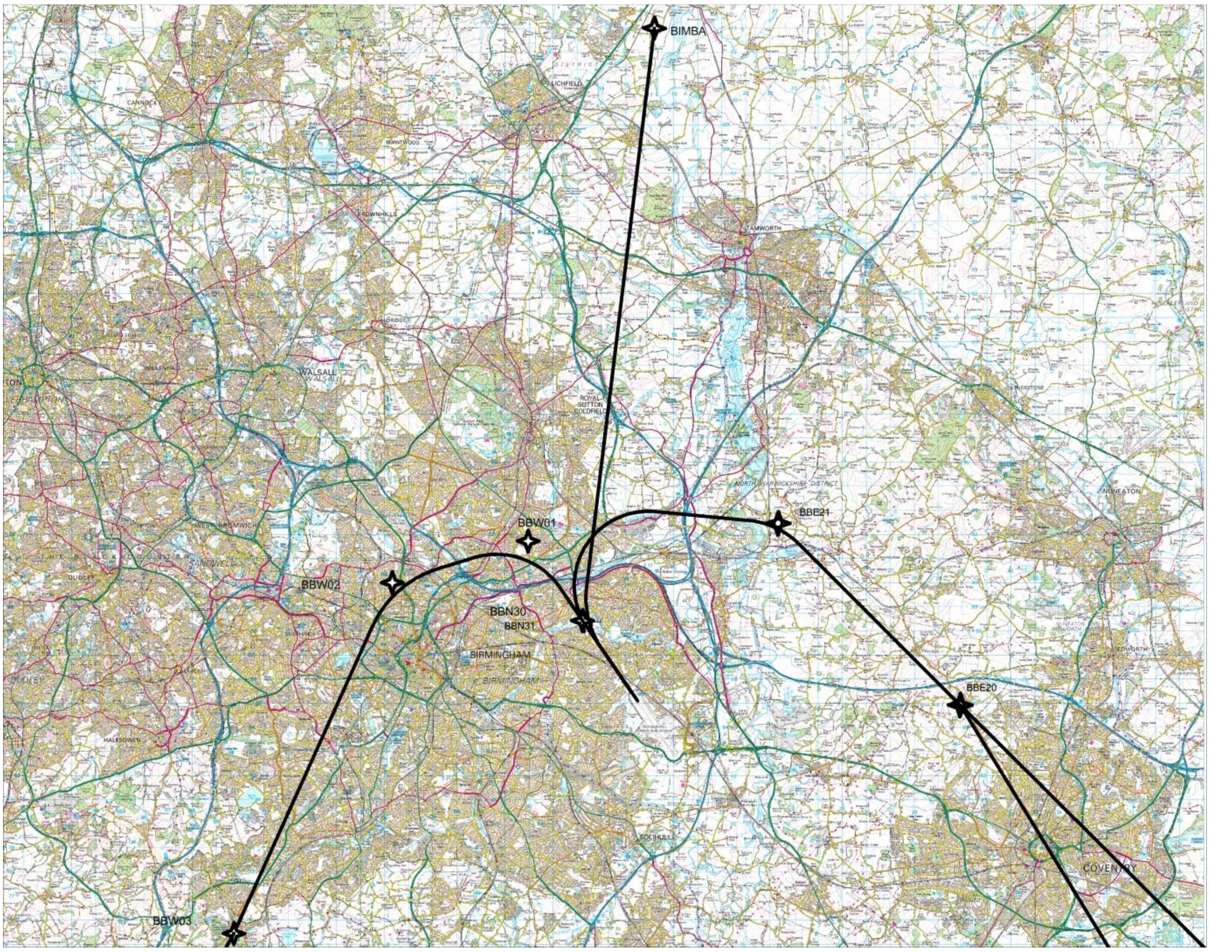
High Resolution Image available here

Current Whitegate SID showing proximity of departure and arrival routes



High Resolution Image available here

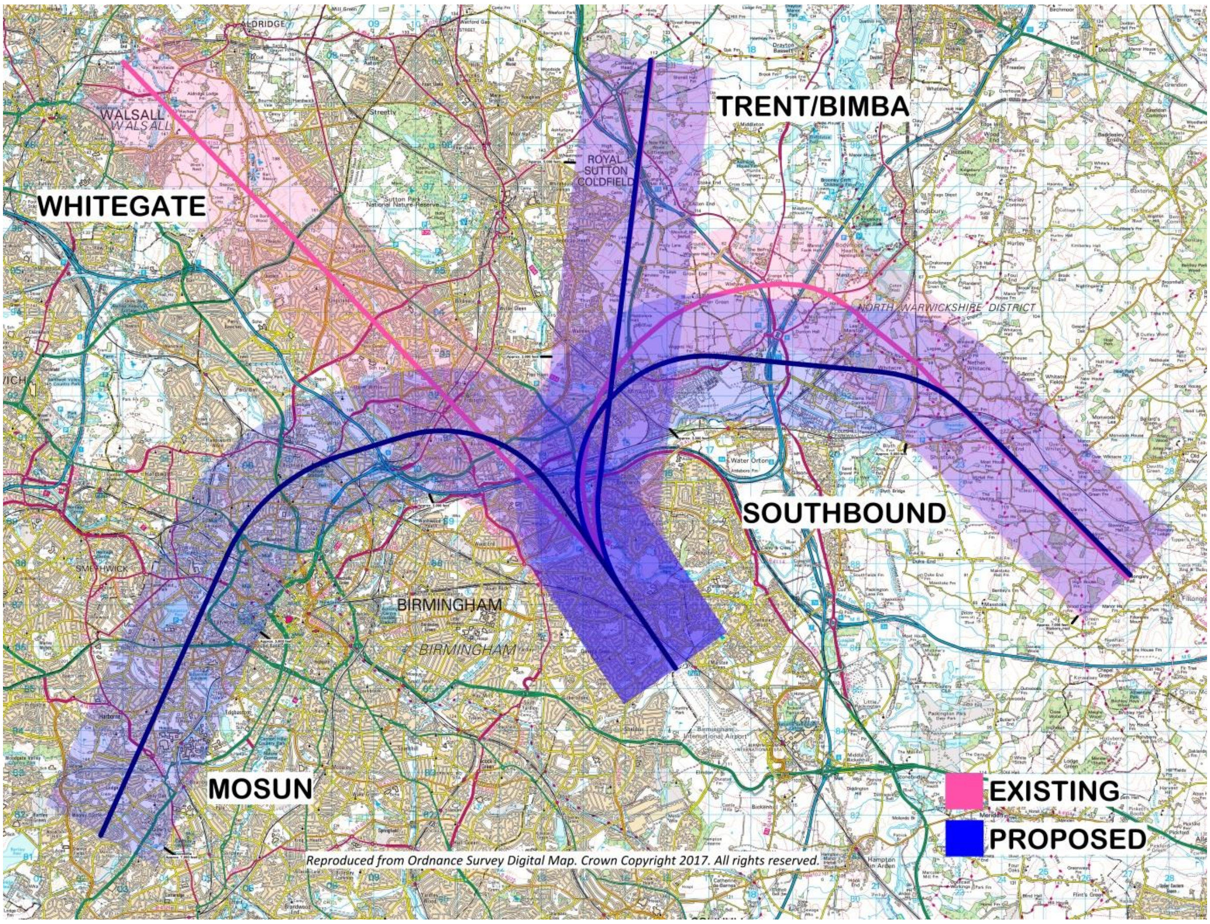
Current SID s showing extended centrelines



High Resolution Image available here

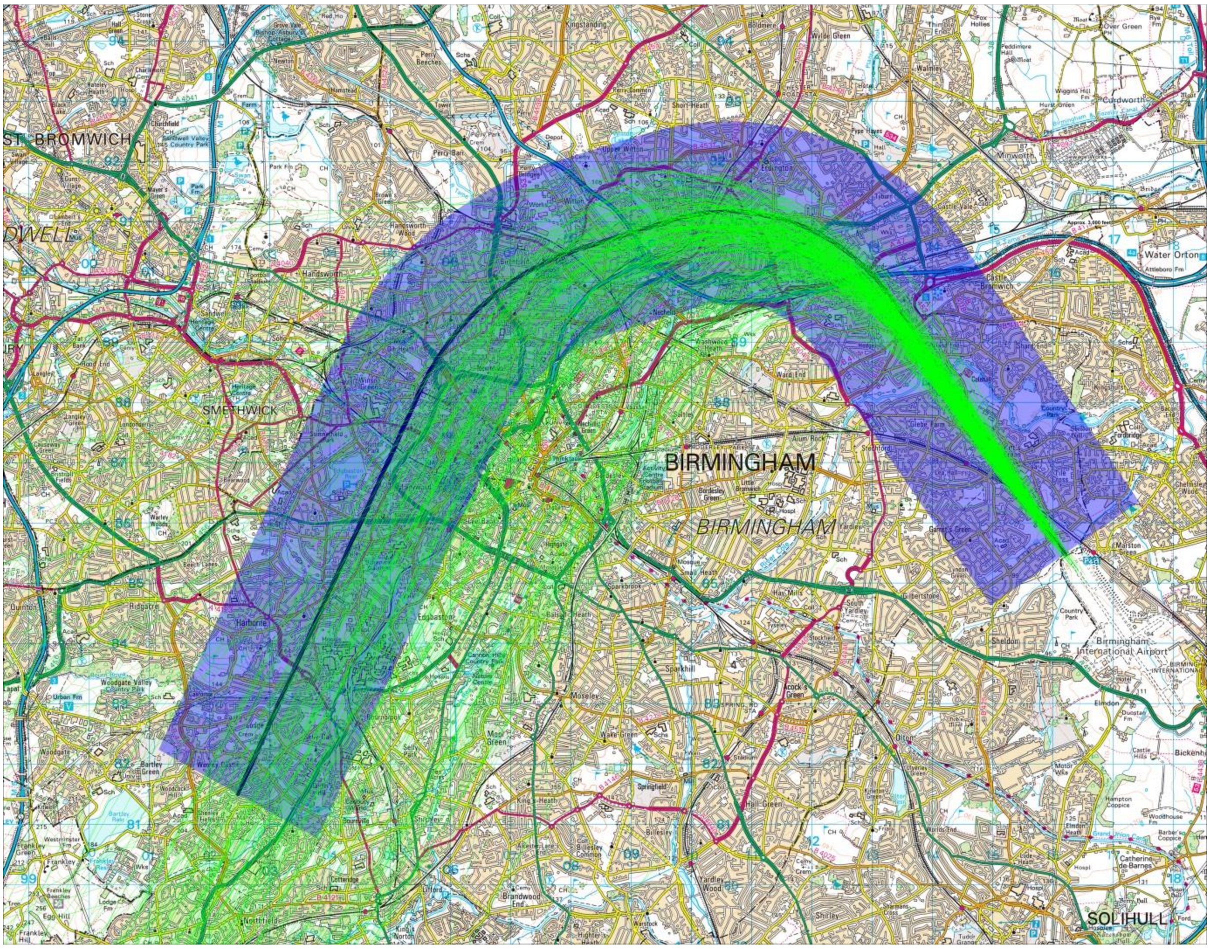
Appendix C

Proposed Routes



High Resolution Image available here

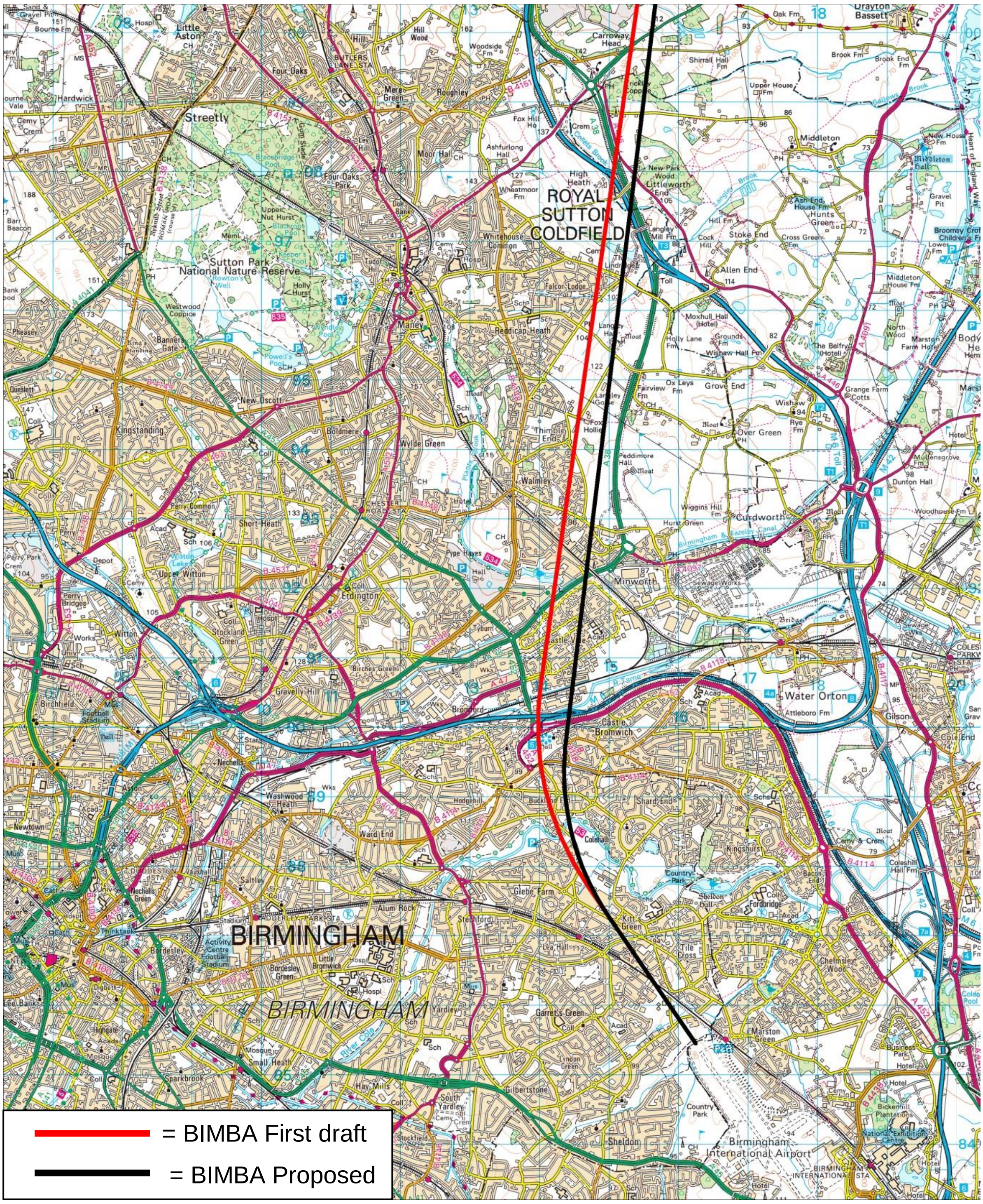
Proposed MOSUN flightpath compared with current flown tracks



High Resolution Image available [here]

Appendix D

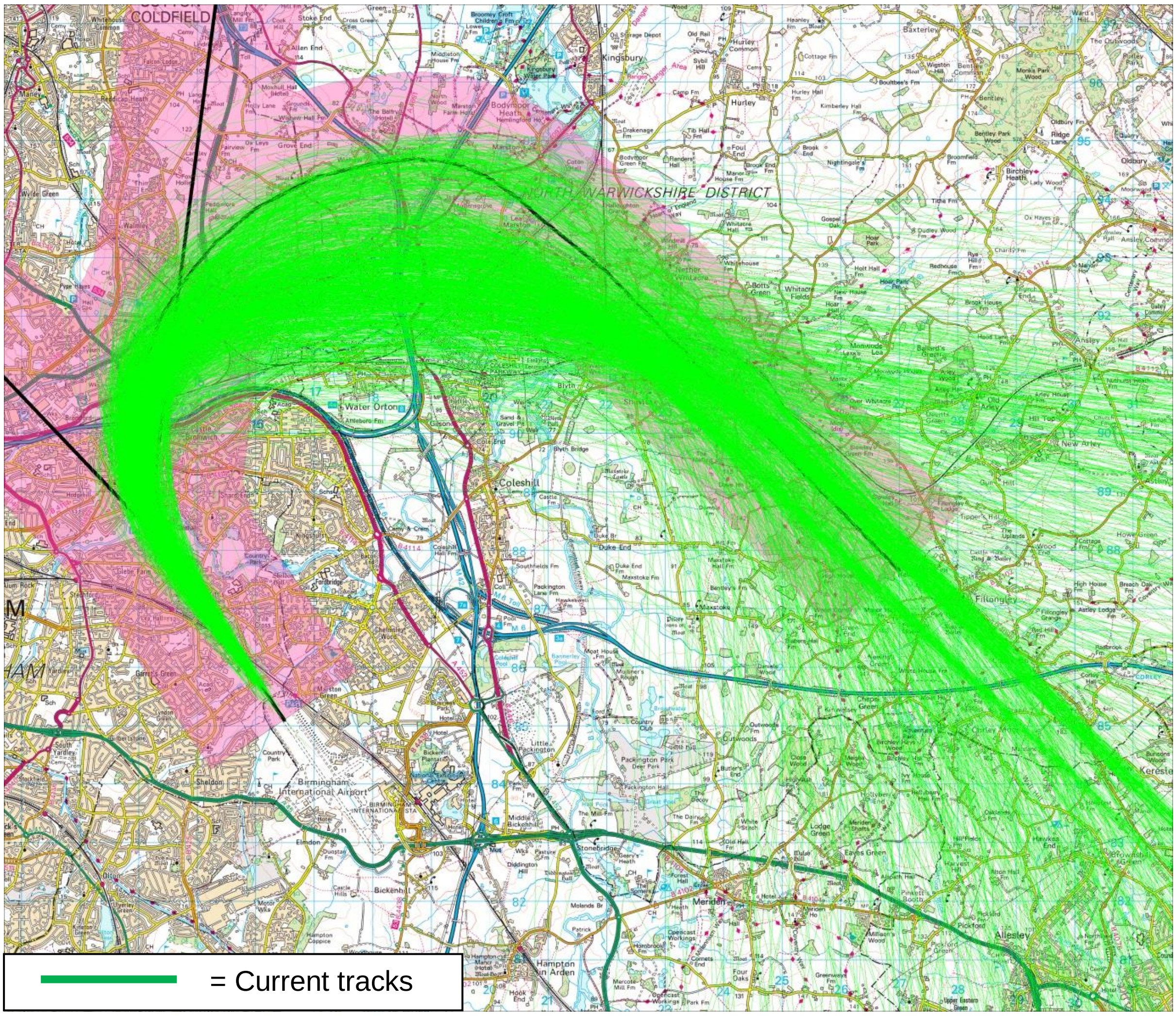
First draft of TRENT/BIMBA SID Vs Proposed TRENT/BIMBA SID



High Resolution Image available here

Appendix E

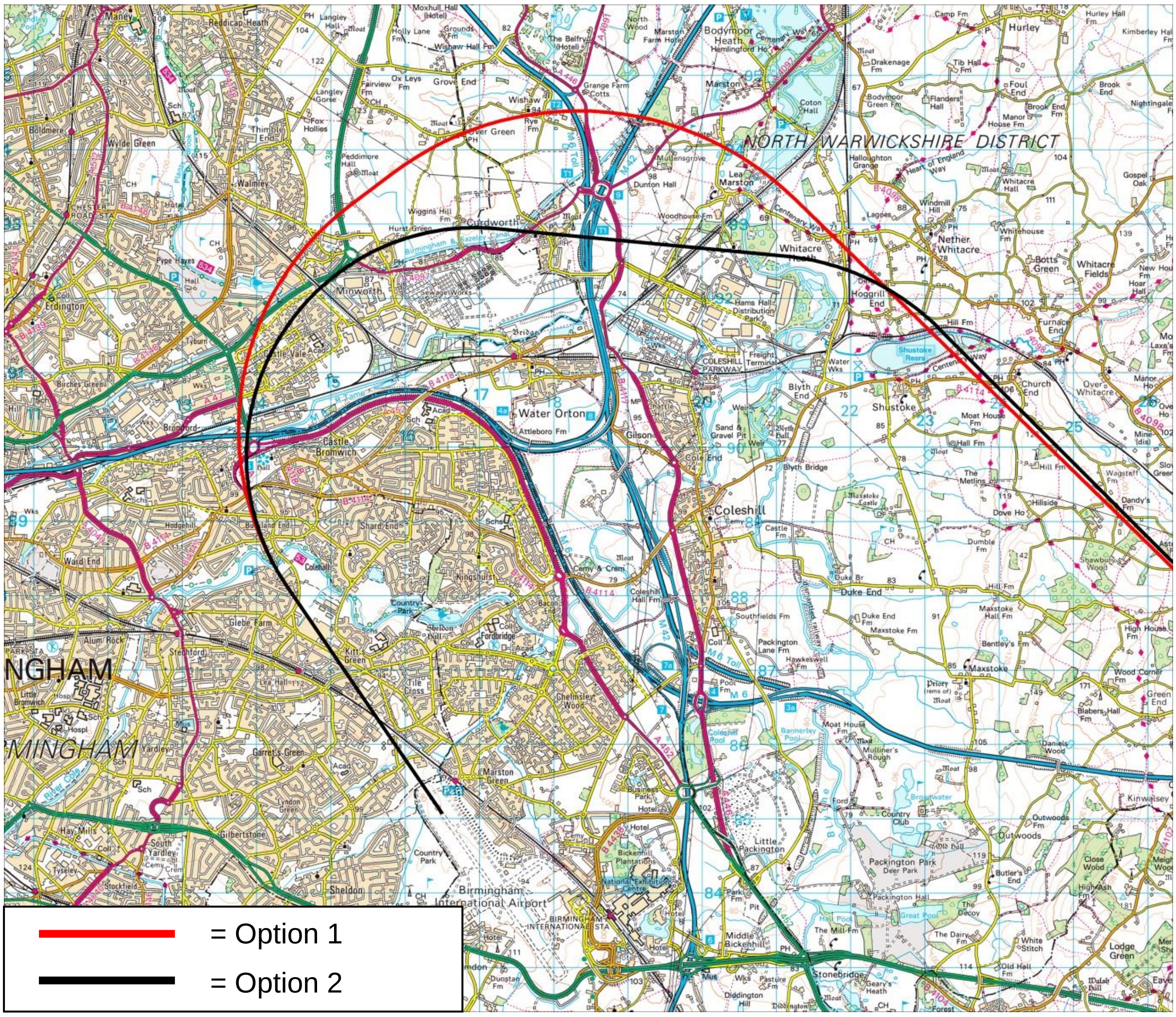
Actual tracks flown compared to existing Southbound NPR



High Resolution Image available here

Appendix F

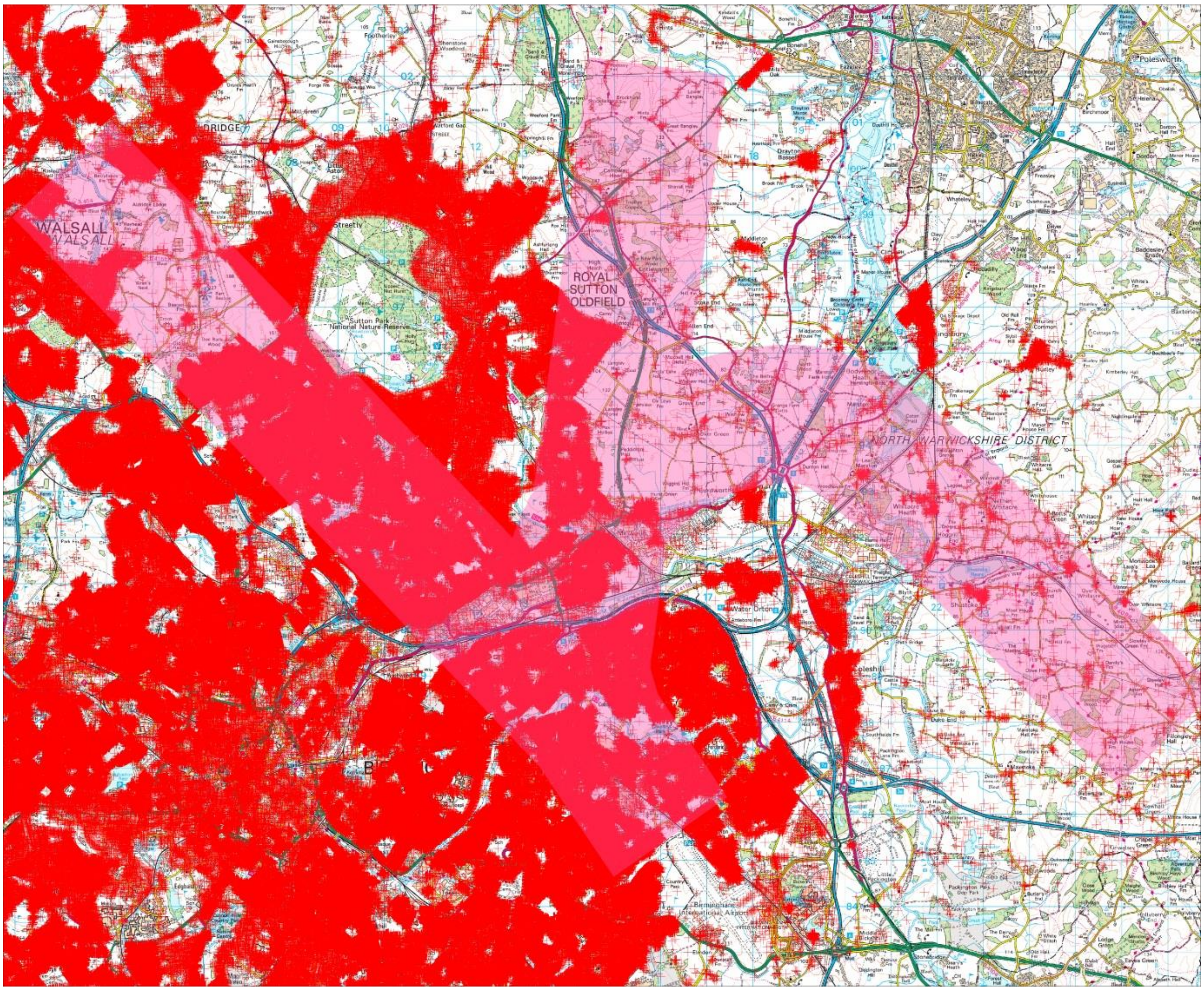
Option 1 & Option 2



High Resolution Image available here

Appendix G

Example Property Count Data and Results



High Resolution Image available here

Current **Property Type**

SID/NPR	Commercial	Military	Residential
MOSUN	24771		135677
WHITEGATE	5306	3902	90265
TRENT	2375	0	46234
ADMEX/UNGAP	2456	0	41435

Total residential properties under all NPRs (removed duplicates): **196,538**

Proposed

SID/NPR	Commercial	Military	Residential
MOSUN	19322		138525
BIMBA	2237		46148
ADMEX/UNGAP Opt 1	2586		42689
ADMEX/UNGAP Opt 2	2512		40924

Total residential properties under all NPRs (removed duplicates): **186,763**

Appendix H

Noise Contour Results

Populations and households are given to the nearest 100 and based on a 2016 update of the 2011 census.

Leq 2016

	Current Procedures			Proposed Option		
Contour Level dB(A)	Area (Km_2)	Population	Households	Area (Km_2)	Population	Households
>54	25.6	43,900	18,300	25.9	44,200	18,500
>57	14.5	21,700	9,000	14.6	22,300	9,300
>60	7.8	8,100	3,400	7.8	8,000	3,400
>63	4.1	2,000	900	4.2	2,000	900
>66	2.3	100	<100	2.3	100	<100
>69	1.3	0	0	1.3	0	0
>72	0.8	0	0	0.8	0	0

Leq 2018

	Current Procedures			Proposed Option		
Contour Level dB(A)	Area (Km_2)	Population	Households	Area (Km_2)	Population	Households
>54	27.6	46,900	19,600	27.9	47,700	19,900
>57	15.8	24,400	10,200	15.9	24,900	10,400
>60	8.5	9,200	3,900	8.6	9,300	4,000
>63	4.6	2,500	1,100	4.6	2,500	1,100
>66	2.6	200	100	2.6	200	100
>69	1.5	0	0	1.5	0	0
>72	0.9	0	0	0.9	0	0

Leq 2023

	Current Procedures			Proposed Option		
Contour Level dB(A)	Area (Km_2)	Population	Households	Area (Km_2)	Population	Households
>54	27.4	46,200	19,200	27.6	45,900	19,200
>57	15.7	24,400	10,100	15.8	24,800	10,300
>60	8.5	8,800	3,800	8.5	9,100	3,900
>63	4.6	2,500	1,100	4.6	2,500	1,100
>66	2.6	200	100	2.6	200	100
>69	1.5	0	0	1.5	0	0
>72	0.9	0	0	0.9	0	0

SEL Footprints

Estimated areas, populations and households within Runway 33 departure SEL footprints for the A321 with EAV321V engines (most frequent type)

Runway 33 SIDs	SEL (dBA)	Area (km2)	Population	Households
Southbound (current)	90	3.3	3,700	1,600
TRENT (current)	90	3.3	3,600	1,500
MOSUN (current)	90	3.3	3,700	1,600
Proposed Southbound	90	3.3	3,700	1,600
Proposed BIMBA (replaces TRENT)	90	3.2	3,300	1,400
Proposed MOSUN	90	3.3	3,600	1,500

Estimated areas, populations and households within Runway 33 departure SEL footprints for A321 with EA321C engines (noisiest type)

Runway 33 SIDs	SEL (dBA)	Area (km2)	Population	Households
Southbound (current)	90	3.9	5,000	2,100
TRENT (current)	90	3.9	5,200	2,300
MOSUN (current)	90	3.9	5,000	2,100
Proposed Southbound	90	3.9	5,100	2,200
Proposed BIMBA (replaces TRENT)	90	3.9	5,100	2,200
Proposed MOSUN	90	3.9	5,100	2,200

Noise Contour Maps

Noisiest SEL Footprint 2016 MOSUN SID vs New MOSUN SID

Noisiest SEL Footprint 2016 Current Southbound vs Proposed Southbound SID

Noisiest SEL Footprint 2016 TRENT vs BIMBA SID

Most Frequent SEL Footprint 2016 MOSUN SID vs New MOSUN SID

Most Frequent SEL Footprint 2016 Current Southbound vs Proposed Southbound

Most Frequent SEL Footprint 2016 TRENT vs BIMBA SID

Birmingham 2016 Leq 16hr Day (Existing)

Birmingham 2016 Leq 16hr Day (Proposed)

Birmingham 2018 Leq 16hr Day (Existing)

Birmingham 2018 Leq 16hr Day (Proposed)

Birmingham 2023 Leq 16hr Day (Existing)

Birmingham 2023 Leq 16hr Day (Proposed)

Appendix I

Focus Group

Although CAP725 does not make the establishment of a Focus Group a mandatory requirement, we recognised the value of early engagement where those with local knowledge could provide us with their views before we began formal consultation, and who might potentially highlight consequences of our proposals which we may have overlooked.

When identifying which communities might be represented on the Focus Group, we used the Airport Noise and Operations Management System (ANOMS) to identify which local authority wards are currently overflown by aircraft at an altitude below 7,000 feet and which are overflown by 30% or more of aircraft on any of the current flightpaths. In addition, we also felt it appropriate to invite those MPs whose constituencies were affected to join in the Focus Group. Consequently, invitations were extended to representatives of the following wards and parliamentary constituencies:

Aston (BCC)
Aldridge Central & South (WMBC)
Castle Bromwich (SMBC)
Curdworth (NWBC)
Edgbaston (BCC)
Edgbaston Parliamentary Const'
Erdington Parliamentary Const'
Harborne (BCC)
Hodge Hill (BCC)
Hodge Hill Parliamentary Const'
Kingstanding (BCC)
Ladywood (BCC)
Ladywood Parliamentary Const'
Lozells & E Handsworth (BCC)
Meriden Parliamentary Const'
Moseley & Kings Heath (BCC)
Nechells (BCC)
North Warks & Bedworth Parliamentary Const'
Perry Barr (BCC)
Perry Barr Parliamentary Const'
Pheasey Park Farm (WMBC)
Selly Oak (BCC)
Shard End (BCC)
Soho (BCC)
Sparkbrook (BCC)
Sutton Coldfield Parliamentary Const'
Selly Oak Parliamentary Const'
Stockland Green (BCC)
Sutton New Hall (BCC)
Sutton Trinity (BCC)
Tyburn (BCC)
Walsall South Parliamentary Const'
Water Orton (NWBC)

BCC=Birmingham City Council; NWBC=North Warwickshire Borough Council; SMBC=Solihull Metropolitan Borough Council WMBC=Walsall Metropolitan Borough Council)

Invitations were also extended to an airline representative and to a member of the Airport Consultative Committee who had been involved in a previous Airspace Change Process to the south of Birmingham Airport and whose experience it was felt might benefit those new to the process. The group was chaired by the independent chair of the Airport Consultative Committee.

A series of meetings and briefings were held to provide ongoing opportunities to input into the process as it developed.

Prepared by

Birmingham Airport Limited
Diamond House
Birmingham Airport
Birmingham B26 3QJ

Telephone +44 (0)871 222 0072*
***Calls will cost 10p per minute from a BT landline. Calls from other operators and mobiles may vary.**
www.birminghamairport.co.uk

Registered at the above address. Registered in England & Wales no. 2078273.