Cardiff Airport RNAV Replications:

Framework Briefing, Record of Agreement
25th September 2014 – CAA House

Version 1.0
November 2014

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<th>Action</th>
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<td>CAA SARG</td>
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CAA, Attendees:
(SARG Case Officer)
(ERCD)
(SARG consultation specialist)
(SARG PD regulation)

Cardiff Airport Attendees:
(not present, contactable)

NATS Attendees:
(Airspace Change Assurance)
(Procedure Design Team leader)
(Procedure Design)
(Cardiff Airport ATC)

NATS CC:
(Lead Consultant)
(Consultant)

**Publication History**

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Introduction

This note is a record of the Framework Briefing for the Cardiff Airport (CWL) RNAV replication Airspace Change Proposal (ACP). CWL is the sponsor of this ACP. It was agreed that the CAA Safety and Airspace Regulation Group (SARG) would assess the proposed airspace change process for the RNAV replication of conventional procedures as outlined within this document.

Acceptance of this note by SARG represents, in principle, an agreement that the process undertaken thus far, and the proposed process herein, meets the requirements of the CAP725 airspace change process and the Guidance on RNAV Replication. The latter document being applied to arrival routes (STAR and ILS) as per the Bristol Airport RNAV STAR ACP (2014), detailing guidance material on the reduced consultation requirements of an RNAV inbound track replication.

Should any of the elements of this document change significantly as the plans/processes develop, NATS will provide the rationale for change to SARG and seek further agreement in principle for the revisions.
Background
The Cardiff Airport RNAV project plans to replicate the promulgated ILS paths for runways 12 and 30 as well as the turns onto the final approach, as shown in the accompanying presentation (included as Annex B: Framework Briefing Presentation).

The benefits of the Cardiff Airport RNAV replication project are summarised below:

1. The introduction of RNAV1 replications of the extant ILSs and turn on to final approach at Cardiff Airport is in line with the CAA Future Airspace Strategy, which recommends the transition to performance based navigation (PBN) technologies.

2. RNAV1 enables aircraft to control their position with far greater accuracy than conventional forms of navigation.

3. The aircraft’s position is known with greater certainty, and when operating under “own navigation” ATC have greater certainty that aircraft are conforming to the defined RNAV routes within close tolerances.

4. Due to the increased accuracy of RNAV1, it’s use results in improved track-keeping, with traffic being more concentrated close to the route centreline. This is in accordance with the Department for Transport’s recommendations for minimizing the impact of over-flying aircraft on populations.

The change is supported by the airlines for the following reasons. Procedures designed to PBN specifications allow airlines to use their FMS equipment to its full capability to assure predictable flights paths. More predictable flight planning & improved standardisation of flight profiles is possible in accordance with standard operational procedures. There is reduced need for tactical intervention from ATC. In congested airspace, this aids efficiency, expedition and safety.

Safety Benefit
The overall ATS provided will remain “at least as safe as” prior to the implementation of this airspace development. The Project will aim to deliver safety benefits where possible.

Capacity
Capacity is not a driver for this project and no capacity gains are claimed.

Environment
There are no environmental benefits claimed, or significant impacts anticipated. Whilst concentration of traffic is likely to result from this change it is expected that it will not affect the Leq contours or SEL footprints. The full Environmental Requirements checklist is towards the rear of this document, Annex A: Environmental Requirements

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1 The CAA acceptance of no environmental analysis was predicated on the assurance by the sponsor that the environmental impact caused by concentration of traffic would not significantly impact the Leq contours or SEL footprints.
SARG/DfT and Environmental Design Aims

An outline of the generic design aims as relating to the SARG/DfT requirements that NATS considers for all ACPs was provided, including those relating specifically to environmental aspects. These are listed below. Those which can be applied to the Cardiff Airport RNAV replication ACP are highlighted in **bold**.

**SARG/DfT design aims:**

1. **To design routes based on RNAV1.**
2. **To ensure that designs are compatible with Government policy (Air Transport White Paper/Review).**
3. Runway development: where applicable accommodate future growth due to proposed runway expansion projects

**Environmental design aims:**

Where practical, within operational and safety constraints, and in this case within the constraints of replicating the conventional procedures:

1. **Enable CDAs**
2. Minimise track mileage
3. **Allow more efficient flight profiles (i.e. clear climbs/descents on separated tracks)**
4. Minimise population over-flown
5. **Minimise exposure of new populations to noise and visual impacts**
6. Minimise low level over-flight of AONBs, National Parks and other tranquil areas

These aims are aspirational in so much that it may not be possible to achieve all aims within one design. The final design will, where possible, reflect a balance between competing requirements within the boundaries of existing aircraft tracks (e.g. avoiding population, which may be possible through small changes of the RNAV route within the overall current aircraft track concentrations). Cardiff airport and NATS will seek to demonstrate this balanced approach to achieving all the design aims within the consultation documents and ACP.
RNAV procedure replication

This project is being progressed under the guidelines as described in the CAA Policy Statement for PBN SID Replications as applied to the Bristol Airport RNAV ACP wherein inbound traffic concentrations were used to generate the nominal path for RNAV replication.

In accordance with the above guidance it is the intention of this project to:

1. Design RNAV procedures which replicate the existing centre of inbound traffic concentrations as closely as possible.
2. Design RNAV procedures which replicate as closely as practicable the nominal ILS descent profiles for both runways (as defined by the current FAFs).\(^2\)
3. Design RNAV procedures which replicate the nominal centreline of the missed approach procedures as closely as is practicable.

The procedure design will endeavour to keep aircraft paths and trajectories as close as possible to the centre of the current day swathes of trajectories. The objective being that, to casual observers on the ground, it will not be apparent that a change has taken place.

**Current ILS Procedures:**

- Runway 12 = 2200ft FAF for Cat A/B/C & D
- Runway 30 = 1600ft FAF for Cat A/B
  = 2200ft FAF for Cat C/D

**Proposed Replication Procedures:**

The following RNAV routes, as presented in slide 8 for runway 30 and slide 13 for runway 12 (Annex B: Framework Briefing Presentation), were agreed –

- Runway 12 = T-bar with 90° joins
  = 2200ft FAF
  = 2500ft IF
  = 2500ft IAF
- Runway 30 = T-bar with 90° join from the south and 100° join from the north
  = 1600ft FAF
  = 2000ft IF
  = 2000ft IAF (North & South)
  = 3500ft IAF (Straight in)

**Missed Approach** *(refer to slide 15, Annex B: Framework Briefing Presentation)*

The current (nominal path) missed approach procedure for Runway 12 as reproduced by NATS PDG (Nominal Option 1, slide 15) will be replicated as closely as possible. Two RNAV based solutions are available:

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\(^2\) It was agreed that for Runway 30 a combined FAF of 1600ft for Cat A/B & C/D aircraft would be acceptable, subject to production of Pans Ops compliant designs
1. Fly-by waypoints (Nominal Option 2) considered more conventional, slightly wider than the Nominal Option 1 but considered acceptable as replication due to the small number of aircraft completing a missed approach in its entirety without tactical intervention.

2. Fly-by followed by fly-over waypoints (nominal Option 3), considered a new but acceptable method of replication, modelling the nominal path more closely.

SARG expressed the view to which NATS agreed that either was acceptable and could be taken forward as the solution but both should be progressed to flyability trials so that the less conventional Option 3 would at least be available for future use. The chosen option will be agreed with SARG as the proposal develops.

Options for Runway 30 will be presented to SARG as the proposal develops and it is expected that the same options for replication as presented for runway 12 will be acceptable.

NATS PDG will take responsibility for ensuring that these routes are Pans Ops compliant, will present a safety case and will oversee the issue of flyability. This will be discussed with SARG as the proposal develops.

**Flight Validation**

The LPV approach is likely to be validated by Cardiff airport flight checker.

Flight Validation will be conducted by either Easyjet, Thompson, BA or Virgin.

The A320 aircraft type (or equivalent) was deemed suitable to cover the types seen at Cardiff airport. In order to mitigate the issue of safety case approval being sought after ACP approval, it was agreed that NATS PDG would plan to submit the safety case to SARG prior to submission of the ACP.

It is intended for the extant conventional approaches to remain in place for the foreseeable future, thereby providing an alternative for those aircraft which are not currently RNAV1 equipped. The RNAV1 capability of the aircraft fleet operating from Cardiff will determine how long the conventional approaches will remain in place.
Stakeholder Engagement

Stakeholder Identification for Formal Consultation

The consultation exercise is planned to be of fourteen weeks duration (two weeks added to allow for the Christmas break), and will include the following stakeholders:

- **The Cardiff Airport Consultative Committee** includes representation from interested parties within the airport (ABTA, Tourist Board etc.) and the following local government organisations:
  - Vale of Glamorgan Council
  - Rhonda Council
  - Cardiff City Council
  - Bridge End Council
  - Llanharfan Community Council
  - Caerphilly Council
  - Bristol City Council (special invite)

  The ACC will be asked to suggest other potential consultees (Parish councils etc. if not represented).

- **Appropriate Airlines** will be engaged with as part of the formal consultation with several being approached as part of the pre-consultation exercise. The airlines will include:
  - Thompson, Thomas Cook, British Airways, City Jet, KLM, Easyjet and Ryanair

- **The MoD** will be consulted as part of the pre-consultation and formal consultation exercise.

- **NATMAC** will be consulted

- **Local Newspaper(s)** will be provided a press release or notification of the proposed change with details of how to access the consultation on the Cardiff Airport website.

- If sufficient requests are received a hard copy will be made available in a local library

A chaser email will be sent four weeks from conclusion of the consultation

Consultation Documents

The consultation document is planned to comprise one document for all stakeholders. Electronic versions will be circulated, and will be available to download from the Cardiff Airport website to facilitate further distribution to additional stakeholders as required. If sufficient requests are received a hard copy will be made available in a local library.

The consultation document will be produced in English & Welsh.

SARG will be given the opportunity to review and comment on the consultation material prior to publication.
Response to Consultation Feedback

Stakeholders’ responses to the consultation exercise will be acknowledged with a standard reply, as soon as received. All issues raised will be collated and documented along with Cardiff Airport’s response. Once the consultation period has closed, a document detailing all responses will be made available for download via the Cardiff Airport website.

All responses to the consultation exercise will be provided to SARG as part of the ACP documentation set.

Environmental Analysis

The aim of this proposal is to change aircraft behaviours and flight profiles as little as possible. Hence it is expected that there will be little requirement for analysis. SARG suggested that each possible environmental impact be considered and an explanation of the effect or a statement of little or no effect should be made. It was further suggested that any generic benefits claimed will need to be clearly identified as such.

As the proposal is expected to increase the concentration of traffic around any implemented RNAV centreline, SARG requested that the likely adverse effects on those living under the centre line must be explicitly mentioned whilst also including the likely benefit to some local residents along the current aircraft tracks. It was also discussed that the process of concentration would take a protracted period of time before aircraft and ATC move towards full RNAV capability and this will also be emphasised.

It was agreed with SARG that the sponsor does not intend to perform noise, CO2 or Local Air Quality analysis for this change, however the documentation will explain why no analysis is being undertaken for these impacts. Namely that with the aim of the change to be as little noticeable change as possible, no impact would be shown by such analysis. The reason for this ‘no impact’ view will also be explained.

Tranquillity and visual intrusion will be discussed in terms of location of the proposed routes to AONBs and the current tracks.

NATS agreed to the inclusion of the latest noise contours available.

Information to enable an assessment of the environmental impact of the change will be presented in the consultation documents and ACP. In order to enable stakeholders to establish the potential impact of the changes on their area, this information will include:

1. Maps showing current inbound traffic concentrations.
2. Maps showing conventional nominal centre lines of the extant procedures.
3. Maps showing RNAV nominal centre lines of the proposed procedures.
4. Maps showing predicted trajectories for different aircraft types following the new RNAV arrivals.

NATS agreed that the inclusion of CDA data would be considered however pointed out that low level radar coverage makes current and future CDA compliance difficult if not impossible to monitor. Claims regarding specific CDA performance will not be made.

The CAA environmental checklist is included as Annex A: Environmental Requirements. This details which analyses are expected to be delivered with the ACP.
Timescales and Next Steps

Consultation will be of fourteen weeks duration.

The implementation date, as presented, was September 2015 however during subsequent discussions NATS has agreed to look at an implementation date of December 2015 with a view to bringing implementation forward to September 2015 if possible. This is yet to be finalised.

The consultation is planned to commence 15th December 2014, however in line with the comment above a start date is yet to be finalised with SARG.

The ACP is planned to be delivered at the end of March 2015, however in line with the comment above a date is yet to be finalised with SARG.

It is expected that SARG will use a 16 + 1 week decision period.

It is expected that a double AIRAC cycle will be required in line with current policy on promulgation of RNAV routes and replications.

Documentation for both the consultation and the ACP will be made available to SARG as they progress.
**Issues to be addressed**

An explanation of the buffer zone between Cardiff and Bristol airports will be required, detailing how it works today and how it would work in an RNAV environment.
Annex A: Environmental Requirements

This section details the proposal to fulfil the required elements of an Environmental Assessment to be submitted for the Cardiff Airport airspace development based upon CAP 725 – Appendix B (30 March 2007).

The requirements in this section are grouped by the degree of compliance expected from airspace change sponsors in following this guidance:

1. **Must** – change sponsors are to meet the requirements in full when this term is used.
2. **Should** – change sponsors are to meet these requirements unless there is sufficient reason which must be agreed in writing with the SARG case officer and the circumstances recorded in the formal airspace change documentation.
3. **May** – change sponsors decide whether this guidance is appropriate to the circumstances of the airspace change.

Table A1. Sponsors MUST provide:

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<th>Requirement</th>
<th>Ref.</th>
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<tr>
<td>A technical document containing a comprehensive and complete description of the airspace change including the environmental impact will be required and <strong>must</strong> be produced for all airspace changes.</td>
<td>General</td>
<td>Para 25 B-6</td>
<td>This will be provided for the Cardiff Airport RNAV ACP</td>
</tr>
<tr>
<td>The environmental assessment <strong>must</strong> include a high quality paper diagram of the airspace change in its entirety as well as supplementary diagrams illustrating different parts of the change. This diagram <strong>must</strong> show the extent of the airspace change in relation to known geographical features and centres of population</td>
<td>Airspace Design</td>
<td>Para 28 B-7</td>
<td>This will be provided for the Cardiff Airport RNAV ACP</td>
</tr>
<tr>
<td>The Change Sponsor <strong>must</strong> provide SARG with a complete set of coordinates describing the proposed change in electronic format using World Geodetic System 1984 (WGS 84). In addition, the Sponsor <strong>must</strong> supply these locations in the form of Ordnance Survey (OS) national grid coordinates.</td>
<td>Airspace Design</td>
<td>Para 30 B-7</td>
<td>Procedure designs will be provided to fulfil this requirement.</td>
</tr>
<tr>
<td>This electronic version <strong>must</strong> provide a full description of the horizontal and vertical extent of the zones and areas contained within the airspace change. It <strong>must</strong> also include coordinates in both WGS 84 and OS national grid formats that define the centre lines of routes including airways, standard instrument departures (SID), standard arrival routes (STAR), noise preferential routes (NPR) or any other arrangement that has the effect of concentrating traffic over a particular geographical area.</td>
<td>Airspace Design</td>
<td>Para 30 B-7</td>
<td>This will be provided for the Cardiff Airport RNAV ACP</td>
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<tr>
<td>Change Sponsors <strong>must</strong> provide a description of the vertical distribution of traffic in airways, SIDs, STARS, NPRs and other arrangements that have the effect of concentrating traffic over a particular geographical area</td>
<td>Airspace Design</td>
<td>Para 32 B-7</td>
<td>This will be provided for the Cardiff Airport RNAV ACP</td>
</tr>
<tr>
<td>Change Sponsors <strong>must</strong> include traffic forecasts in their environmental assessment.</td>
<td>Traffic Forecasts</td>
<td>Para 35 B-8</td>
<td>This will be provided for the Cardiff Airport RNAV ACP</td>
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Information on air traffic **must** include the current level of traffic using the present airspace arrangement and a forecast. The forecast will need to indicate the traffic growth on the different routes contained within the airspace change volume.

The sources used for the forecast **must** be documented.

| Change Sponsors **must** produce $L_{eq, \text{16 hours}}$ noise exposure contours for airports where the proposed option entails changes to departure and arrival routes for traffic below 4,000 feet agl based on the published minimum departure and arrival gradients. Under these circumstances, at least three sets of contours **must** be produced: Current situation – these may already be available as part of the airport’s regular environmental reporting or as part of the airport master plan; Situation immediately following the airspace change; and Situation after traffic has increased under the new arrangements (typically five years after implementation although this **should** be discussed with the SARG Project Leader). |
| Contours **must** be portrayed from 57 dBA $L_{eq, \text{16 hours}}$ at 3 dB intervals. |

| SEL footprints **must** be used when the proposed airspace includes changes to the distribution of flights at night below 7,000 feet agl and within 25 km of a runway. Night is defined here as the period between 2300 and 0700 local time. If the noisiest and most frequent night operations are different, then footprints **should** be calculated for each of them. A separate footprint for each of these types **should** be calculated for each arrival and departure route. If SEL footprints are provided, they **should** be calculated at both 90 dBA SEL and 80 dBA SEL. |
| Climate Change Para 102 B-22 n/a for replication |

| Change Sponsors **must** demonstrate how the design and operation of airspace will impact on emissions. The kinds of questions that need to be answered by the sponsor are: Are there options which reduce fuel burn in the vertical dimension, particularly when fuel burn is high e.g. initial climb? Are there options that produce more direct routeing of aircraft, so that fuel burn is minimised? Are there arrangements that ensure that aircraft in cruise operate at their most fuel-efficient altitude, possibly with step-climbs or cruise climbs? |

| Noise Para 44 B-11 Current $L_{eq, \text{16 hours}}$ contours will be provided however as no noticeable change to the contours is expected below 4000ft, predicted contours will not be produced |

| Noise Para 48 B-12 Current $L_{eq, \text{16 hours}}$ contours will be provided however as no noticeable change to the contours is expected below 4000ft, predicted contours will not be produced |

| Noise Para 56 B-13 Current SEL footprints will not be provided as no noticeable impact to these footprints is expected below 4000ft |

| Traffic Forecasts Para 35 B-8 This will be provided for the Cardiff Airport RNAV ACP |

| Traffic Forecasts Para 35 B-8 This will be provided for the Cardiff Airport RNAV ACP |
Change Sponsors must produce information on local air quality only where there is the possibility of pollutants breaching legal limits following the implementation of an airspace change. The requirement for local air quality modelling will be determined on a case by case basis as discussed with the SARG Project Leader and ERCD. This discussion will include recommendations of the appropriate local air quality model to be used. Concentrations should be portrayed in microgrammes per cubic metre (μg.m⁻³). They should include concentrations from all sources whether related to aviation and the airport or not. Three sets of concentration contours should be produced:

Current situation – these may already be available as part of the airport’s regular environmental reporting or as part of the airport master plan;
Situation immediately following the airspace change; and
Situation after traffic has increased under the new arrangements – typically five years after implementation although this should be discussed with the SARG Project Leader.

### Table A2. Sponsors SHOULD provide:

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<th>NATS proposed offering</th>
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<tr>
<td>In order to ensure that the various areas for environmental assessment by SARG are addressed, Change Sponsors should submit the documentation with the following clearly defined sections:</td>
<td>General</td>
<td>Para 2</td>
<td>B-1</td>
</tr>
<tr>
<td>Description of the airspace change (refer to 28 – 33); Traffic forecasts (refer to 34 – 38); An assessment of the effects on noise (refer to Sections 4 and 5); An assessment of the change in fuel burn/CO₂ (refer to Section 6); An assessment of the effect on local air quality (refer to Section 7); and An economic valuation of environmental impact, if appropriate (refer to Section 9).</td>
<td>General</td>
<td>Para 19</td>
<td>B-4</td>
</tr>
<tr>
<td>Environmental assessment should set out the base case or current situation so that changes can be clearly identified.</td>
<td>General</td>
<td>Para 19</td>
<td>B-4</td>
</tr>
<tr>
<td>Environmental assessment should follow the Basic Principles listed in CAP 725.</td>
<td>General</td>
<td>Para 20</td>
<td>B-4</td>
</tr>
<tr>
<td>The proposal should consider and assess more than one option, then demonstrate why the selected option meets safety and operational requirements and will generate an overall environmental benefit or, if not, why it is being proposed.</td>
<td>Airspace Design</td>
<td>Para 29</td>
<td>B-7</td>
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This will be provided
Current $L_{eq, 16\,\text{hours}}$ contours will be provided
n/a
n/a

These principles have been borne in mind when providing the detailed response to the requirements listed in this set of tables. NATS seeks SARG agreement in principle to this document as confirmation that the NATS interpretation is appropriate.
Change Sponsors should provide indications of the likely lateral dispersion of traffic about the centre line of each route. This should take the form of a statistical measure of variation such as the standard deviation of lateral distance from the centre line for given distances along track in circumstances where the dispersion is variable.

For departing traffic, sponsors should produce profiles of the most frequent type(s) of aircraft operating within the airspace. They should show vertical profiles for the maximum, typical and minimum climb rates achievable by those aircraft.

A vertical profile for the slowest climbing aircraft likely to use the airspace should also be produced.

All profiles should be shown graphically and the underlying data provided in a spreadsheet with all planning assumptions clearly documented.

Change Sponsors should explain how consideration of CDA and LPLD is taken into account within their proposals.

Typically, forecasts should be for five years from the planned implementation date of the airspace change. There may be good reasons for varying this – for example, to use data that has already been made available to the general public at planning inquiries, in airport master plans or other business plans.

Traffic forecasts should contain not only numbers but also types of aircraft. Change Sponsors should provide this information by runway (for arrivals/departures) and/or by route with information on vertical distribution by height/altitude/flight level as appropriate.

The contours should be produced using either the UK Aircraft Noise Contour Model (ANCON) or the US Integrated Noise Model (INM) but ANCON must be used when it is currently in use at the airport for other purposes.

Terrain adjustments should be included in the calculation process (i.e. the height of the air routes relative to the ground are accounted for).

Contours should not be produced at levels below 54 dBA Leq, 16 hours because this corresponds to generally low disturbance to most people.

A table should be produced showing the following data for each 3 dB contour interval: Area (km²); and Population (thousands) – rounded to the nearest hundred.

Airspace Design Para 31 B-7 An illustration of the current day dispersal of the affected traffic streams will be provided in the form of density plots of current radar data. A generic analysis of the statistical track dispersal of aircraft following RNAV routes will be provided.

Airspace Design Para 32 B-7 n/a

Airspace Design Para 32 B-7 n/a

Airspace Design Para 32 B-8 Procedure design will illustrate descent profiles and indicative RNAV tracks and descent profiles will be illustrated

Airspace Design Para 33 B-8 This will be discussed

Traffic Forecasts Para 36 B-8 Traffic forecasts for 5 years will be provided.

Traffic Forecasts Para 38 B-9 Traffic numbers by aircraft type will be provided

Noise Para 46 B-12 n/a

Noise Para 47 B-12 n/a

Noise Para 48 B-12 n/a

Noise Para 49 B-12 n/a
It is sometimes useful to include the number of households within each contour, especially if issues of mitigation and compensation are relevant:
This table should show cumulative totals for areas/populations/households. For example, the population for 57 dBA will include residents living in all higher contours.
The source and date of population data used should be noted adjacent to the table. Population data should be based on the latest available national census as a minimum but more recent updated population data is preferred.
The areas calculated should be cumulative and specify total area within each contour including that within the airport perimeter.

### Noise

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<th>Field</th>
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<tr>
<td>Contours for assessment should be provided to SARG in both of the following formats: Electronic files in the form of a comma delimited ASCII text file containing three fields as an ordered set (i.e. coordinates should be in the order that describes the closed curve) defining the contours in Ordnance Survey National Grid in metres: Field Field Name Units 1 Level dB 2 Easting six figure easting OS national grid reference (metres) 3 Northing six figure northing OS national grid reference (metres) Paper version overlaid on a good quality 1:50 000 Ordnance Survey map. However, it may be more appropriate to present contours on 1:25 000 or 1:10 000 Ordnance Survey maps.</td>
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<td>SEL footprints for assessment should be provided to SARG in both of the following formats: Electronic files in the form of a comma delimited ASCII text file containing three fields as an ordered set (i.e. coordinates should be in the order that describes the closed curve) defining the footprints in Ordnance Survey National Grid in metres: Field Field Name Units 1 Level dB 2 Easting six figure easting OS national grid reference (metres) 3 Northing six figure northing OS national grid reference (metres) Paper version overlaid on a good quality 1:50 000 Ordnance Survey map. However, it may be more appropriate to present footprints on 1:25 000 or 1:10 000 Ordnance Survey maps.</td>
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<td>Change Sponsors should estimate the total annual fuel burn/mass of carbon dioxide in metric tonnes emitted for the current situation, the situation immediately following the airspace change and the situation after traffic has increased under the new arrangements – typically five years after implementation. Sponsors should produce estimates for each airspace option considered.</td>
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<td>Change Sponsors should provide the input data for their calculations including any modelling assumptions made. They should state details of the aircraft performance model used including the version numbers of software employed.</td>
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<th>Field</th>
<th>Field Name</th>
<th>Units</th>
<th>Para</th>
<th>Page</th>
<th>B-13</th>
<th>n/a</th>
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<tbody>
<tr>
<td>Noise Para 50</td>
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<td>Noise Para 51</td>
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<td>Noise Para 57</td>
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<td>Climate Para 106</td>
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<td>Climate Para 107</td>
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This will be provided where appropriate.
Where the need to provide additional airspace capacity, reduce delays or mitigate other environmental impact results in an increase in the total annual fuel burn/mass of carbon dioxide in metric tonnes between the current situation and the situation following the airspace change, Sponsors should provide justification.

Contour s for assessment should be provided to SARG in similar formats to those used for noise exposure contours. Where Change Sponsors are required to produce concentration contours they should also produce a table showing the following data for concentrations at 10 μ.m⁻³ intervals:
- Area (km²); and
- Population (thousands) – rounded to the nearest hundred.

The source and date of population data used should be noted adjacent to the table. Population data should be based on the latest available national census as a minimum but more recent updated population data is preferred.

Table A3: Sponsors MAY provide:

<table>
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<th>Requirement</th>
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<th>Page</th>
<th>NATS proposed offering</th>
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<tbody>
<tr>
<td>It is considered unlikely that airspace changes will have a direct impact on animals, livestock and biodiversity. However, Change Sponsors should remain alert to the possibility and may be required to include these topics in their environmental assessment.</td>
<td>General Para 18 B-4</td>
<td>NATS proposes that the nature of this airspace change will not affect flora and fauna.</td>
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</tr>
<tr>
<td>It may be appropriate for Change Sponsors to produce a more general description of the airspace change and the rationale for its proposal in an easy-to-read style for public consumption. If such an additional separate document is produced, it must contain details of the environmental impact of the proposal.</td>
<td>General Para 25 B-6</td>
<td>The consultation document will cover this for the Cardiff Airport RNAV ACP.</td>
<td></td>
</tr>
<tr>
<td>Sponsors may supply the outputs from simulation to demonstrate the lateral dispersion of traffic within the proposed airspace change or bring forward evidence based on actual performance on a similar kind of route. It may be appropriate for Sponsors to explain different aspects of dispersion e.g. dispersion within NPRs when following a departure routeing and when vectoring – where the aircraft will go and their likely frequency</td>
<td>Airspace Design Para 31 B-7</td>
<td>This may be provided for the Cardiff Airport RNAV ACP.</td>
<td></td>
</tr>
<tr>
<td>In planning changes to airspace arrangements, sponsors may have conducted real and/or fast time simulations of air traffic for a number of options.</td>
<td>Traffic Forecasts Para 34 B-8</td>
<td>n/a</td>
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</tr>
<tr>
<td>It may also be appropriate to provide forecasts further into the future than five years: examples are extensive airspace changes or where traffic is forecast to grow slowly in the five-year period but faster thereafter.</td>
<td>Traffic Forecasts Para 36 B-8</td>
<td>Traffic Forecasts for more than 5 years may be provided in the Cardiff Airport RNAV ACP.</td>
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<tr>
<td>It may be appropriate for Change Sponsors to outline the key factors affecting traffic forecasts and their likely impact. In these circumstances, Sponsors should consider generating a range of forecasts based on several scenarios that reflect those uncertainties – this would help prevent iterations in the assessment process.</td>
<td>Traffic Forecasts Para 37 B-8</td>
<td>Low/base/high case forecasts may be provided in the Cardiff Airport RNAV ACP.</td>
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<td>Types of aircraft <strong>may</strong> be given by aircraft type/engine fit using ICAO type designators. If this is not a straightforward exercise, then designation by the UK Aircraft Noise Contour Model (ANCON) types or by seat size categories would be acceptable</td>
<td>Traffic Forecasts</td>
<td>Para 38</td>
<td>ICAO designation will be used where appropriate</td>
</tr>
<tr>
<td>Change Sponsors <strong>may</strong> include the 54 dBA $L_{eq,16\text{ hour}}$ Contour as a sensitivity analysis but this level has no particular relevance in policy making.</td>
<td>Noise</td>
<td>Para 48</td>
<td>n/a</td>
</tr>
<tr>
<td>It is sometimes useful to include the number of households within each contour, especially if issues of mitigation and compensation are relevant: Where Change Sponsors wish to exclude parts of the area within contours, for example, excluding the portion of a contour falling over sea – this <strong>may</strong> be shown additionally and separately from the main table of data; and Sponsors <strong>may</strong> include a count of the number of schools, hospitals and other special buildings within the noise exposure contours.</td>
<td>Noise</td>
<td>Para 50</td>
<td>n/a</td>
</tr>
<tr>
<td>Contours for a general audience <strong>may</strong> be provided overlaid on a more convenient map (e.g. an ordinary road map with a more suitable scale for publication in documents). The underlying map and contours <strong>should</strong> be sufficiently clear for an affected resident to be able to identify the extent of the contours in relation to their home and other geographical features. Hence, the underlying map <strong>must</strong> show key geographical features, e.g. street, rail lines and rivers.</td>
<td>Noise</td>
<td>Para 53</td>
<td>n/a</td>
</tr>
<tr>
<td>SEL footprints <strong>may</strong> be used when the airspace change is relevant to daytime only operations. If SEL footprints are provided, they <strong>should</strong> be calculated at both 90 dBA SEL and 80 dBA SEL.</td>
<td>Noise</td>
<td>Para 56</td>
<td>n/a</td>
</tr>
<tr>
<td>SEL footprints for a general audience <strong>may</strong> be provided overlaid on a more convenient map (e.g. an ordinary road map with a more suitable scale for publication in documents). The underlying map and footprints <strong>should</strong> be sufficiently clear for an affected resident to identify the extent of the footprints in relation to their home or other geographical features. Hence, this underlying map <strong>must</strong> show key geographical features, e.g. streets, rail lines and rivers. Calculations <strong>should</strong> include terrain adjustments as described in the section on $L_{eq}$ contours.</td>
<td>Noise</td>
<td>Para 58</td>
<td>n/a</td>
</tr>
<tr>
<td>Change Sponsors <strong>may</strong> use the percentage highly annoyed measure in the assessment of options in terminal airspace to supplement $L_{eq}$. If they choose to use this method, then the guidance on population data for noise exposure contours set out <strong>should</strong> be followed. Sponsors <strong>should</strong> use the expression and associated results in calculating the number of those highly annoyed. If they wish to use a variant method, then this would need to be supported by appropriate research references.</td>
<td>Noise</td>
<td>Para 65</td>
<td>n/a</td>
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<td>Requirement</td>
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<tr>
<td>Change Sponsors <strong>may</strong> use the $L_{eq}$ metric but, if they choose to do so, they <strong>must</strong> still produce the standard $L_{eq}$ 16 hours contours as previously described. If airspace change sponsors wish to use the $L_{eq}$ metric they <strong>must</strong> do so in a way that is compliant with the technical aspects of the Directive and any supplementary instructions issued by DEFRA. Sponsors <strong>should</strong> note the requirement for noise levels to be calculated as received at 4 metres above ground level. In particular, the guidance on how contours are to be portrayed, as described in the section dealing with $L_{eq}$ contours applies. Calculations <strong>should</strong> include terrain adjustments as described in the section on $L_{eq}$ contours. An exception regarding $L_{eq}$ contours is the production of a table showing numerical data on area, population and households which <strong>should</strong> be presented by band (e.g. 55 dBA to 60 dBA) rather than cumulatively as for UK $L_{eq}$ contours (e.g. &gt;55 dBA). Change Sponsors <strong>should</strong> make it clear where areas/counts are by band or cumulative.</td>
<td>Noise</td>
<td>Para 67 &amp; 69 &amp; 70</td>
<td>B-15 &amp; B-16</td>
</tr>
<tr>
<td>Change Sponsors <strong>may</strong> use the $L_{night}$ metric within their environmental assessment and consultation. If they do so, SEL footprints <strong>must</strong> also be produced. Calculations <strong>should</strong> include terrain adjustments as described in the section on $L_{eq}$ contours.</td>
<td>Noise</td>
<td>Para 73</td>
<td>B-16</td>
</tr>
<tr>
<td>Change Sponsors <strong>may</strong> use difference contours if it is considered that redistribution of noise impact is a potentially important issue.</td>
<td>Noise</td>
<td>Para 78</td>
<td>B-17</td>
</tr>
<tr>
<td>Change Sponsors <strong>may</strong> use PEI as a supplementary assessment metric.</td>
<td>Noise</td>
<td>Para 85</td>
<td>B-19</td>
</tr>
<tr>
<td>Change Sponsors <strong>may</strong> use the AIE metric as a supplementary assessment metric. If the sponsor uses PEI as a supplementary metric then AIE <strong>should</strong> also be calculated as both metrics are complementary.</td>
<td>Noise</td>
<td>Para 87</td>
<td>B-19</td>
</tr>
<tr>
<td>Change Sponsors <strong>may</strong> vary the information displayed in Operations Diagrams providing that the diagram is a fair and accurate representation of the situation portrayed.</td>
<td>Noise</td>
<td>Para 88</td>
<td>B-20</td>
</tr>
<tr>
<td>Change Sponsors <strong>may</strong> use maximum sound levels ($L_{max}$) in presenting aircraft noise footprints for public consumption if they think that this would be helpful. This does not replace the obligation to comply with the requirement to produce sound exposure level (SEL) footprints, where applicable.</td>
<td>Noise</td>
<td>Para 95</td>
<td>B-21</td>
</tr>
<tr>
<td>Change Sponsors <strong>may</strong> produce diagrams portraying maximum sound event levels ($L_{max}$) for specific aircraft types at a number of locations at ground level beneath the airspace under consideration. This may be helpful in describing the impact on individuals. It is usual to include a table showing the sound levels of typical phenomenon e.g. a motor vehicle travelling at 30 mph at a distance of 50 metres.</td>
<td>Noise</td>
<td>Para 96</td>
<td>B-21</td>
</tr>
<tr>
<td>Change Sponsors <strong>may</strong> wish to conduct an economic appraisal of the environmental impact of the airspace change, assessing the economic benefits generated by the change. If undertaken, this <strong>should</strong> be conducted in accordance with the guidance from HM Treasury in the Green Book (HM Treasury, 2003). If Change Sponsors include a calculation of NPV then they <strong>must</strong> show financial discount rates, cash flows and their timings and any other assumptions employed. The discount rate <strong>must</strong> include that recommended in the Green Book currently set at 3.5%. Additionally, other discount rates <strong>may</strong> be used in a sensitivity analysis or because they are representative of realistic commercial considerations.</td>
<td>Economic Valuation</td>
<td>Para 124 &amp; 126</td>
<td>B-27</td>
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</table>
Annex B: Framework Briefing Presentation

Cardiff Airport RNAV (GNSS) Approaches

Framework Briefing

(NATS Airspace)
(NATS Cardiff)
(NATS PDG)
(NATS PDG)