<table>
<thead>
<tr>
<th>Title of Airspace Change Proposal</th>
<th>RNAV1 Procedures on the Runway 26 Brookmans Park Departure Routes</th>
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<tr>
<td>Change Sponsor</td>
<td>London Luton Airport</td>
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<td>SARG Project Leader</td>
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<td>Case Study commencement date</td>
<td>1 September 2014</td>
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<td>Case Study report as at</td>
<td>9 March 2015</td>
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<td>Report Reference</td>
<td>SARG/ERCD/AG/Luton R26 RNAV SID ACP</td>
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**Instructions**

In providing a response for each question, please ensure that the ‘Status’ column is completed using the following options:

- **Yes**
- **No**
- **Partially**
- **N/A**

To aid the SARG Project Leader’s efficient Project Management it may be useful that each question is also highlighted accordingly to illustrate what is resolved (Green), not resolved (Amber) or not compliant (Red) as part of the SARG Project Leader’s efficient project management.
1. Introduction

This report describes the environmental considerations relevant to London Luton Airport’s (LLA) plans to implement a RNAV1 Standard Instrument Departure (SID) from Runway 26 (R26).

The Airspace Change Proposal (ACP) has been submitted by the sponsor, LLA.

This assessment is based upon information presented in the proposal document entitled “RNAV1 Procedures on the Runway 26 Brookmans Park Departure Routes – Formal Submission, August 2014”, plus associated supporting material, consultation material and subsequent information received as the result of queries raised with the sponsor following submission of the ACP.

2. Guidance to the CAA

2.1 Is the proposal consistent with Government policy and/or guidance from Government to the CAA?

Guidance issued to the Civil Aviation Authority\(^1\) sets out a framework for the environmental objectives that the CAA must consider when assessing airspace change proposals. In addition to these objectives, there may be other legitimate operational objectives, such as the overriding need to maintain an acceptable level of air safety, the desire for sustainable development or to enhance the overall efficiency of the UK airspace network, which need to be considered alongside these environmental objectives. The Government looks to the CAA to determine the most appropriate balance between these competing characteristics.

Flights over National Parks and AONBs are not prohibited by legislation\(^2\) as a general prohibition against over-flights would be impractical. Government policy focuses on minimising the over-flight of more densely populated areas below 7,000 feet (amsl), but balances this with CO\(_2\) emissions between 4,000 and 7,000 feet (amsl). However, where it is practical to avoid over-flight of National Parks and AONBs below 7,000 feet (amsl), the Guidance asks that the CAA encourages this.

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\(^1\) DfT, Guidance to the Civil Aviation Authority on Environmental Objectives Relating to the Exercise of its Air Navigation Functions, January 2014

\(^2\) National Parks and Access to the Countryside Act 1949, National Parks (Scotland) Act 2000, and “Duties on relevant authorities to have regard to the purposes of National Parks, Areas of Outstanding Natural Beauty (AONBs) and the Norfolk and Suffolk Broads Guidance Note”, DEFRA 2005.
3. **Rationale for the Proposed Change**

3.1 Does the rationale for the ACP include environmental reasons?

The rationale for the change is primarily to improve track-keeping and therefore avoid the overlying densely populated areas as far as possible. Minimising the overflight of densely populated areas should result in a reduction in the number of people affected by aircraft noise, but equally the concentration of traffic that should result from flying an RNAV SID may also result in some people being overflown more frequently and therefore experiencing an increase in noise.

4. **Nature of the Proposed Change**

4.1 Is it clear how the proposed change will operate, and therefore what the likely environmental impacts will be?

Current traffic pattern
St Albans is beyond the end of the current NPR, so it is not surprising that current traffic pattern is dispersed at that location, due to ATC tactical vectoring.

Trials
Trials were undertaken in the period March-June 2013, to collect information about two possible options for new RNAV SIDs, one flown at 210 knots and the other at 220 knots.

The submission explains - “Two RNAV1 options were trialled, one with a speed restriction along the second turn of 210 knots, and the other with a speed restriction of 220 knots. Following feedback received throughout the trial and during the consultation period, it was determined that at 210 knots aircraft fly with the flaps extended which causes an increase in airframe noise, fuel usage and wear on the flaps. At this speed aircraft are put in an awkward configuration that constitutes a non-standard procedure, which increases crew workload at a critical time of flight in busy airspace.” The feedback referred to here is presumably from aircraft operators rather than local residents, and it is worth noting two points:

- Based on the noise monitoring undertaken during the trials (discussed further in 5.1 below), there is no strong evidence to suggest that the 220kts option is less noisy than the 210kts option;
- Based on the DfT’s current Air Navigation Guidance, minimising CO2 emissions below 4,000ft is not the priority environment impact.

The submitted proposal cites three reasons for choosing 220kts rather than 210kts, based on the trial data:

- It will reduce the number of people overflown along this departure route. However, so does the 210kts trial, to a comparable level though ostensibly not as good as 220kts option.
• It will reduce the level of noise from aircraft that is currently experienced in areas of high population density, particularly Hemel Hempstead. However, based on the noise monitoring measurements, the 220kts trial results for Hemel Hempstead were drawn from too low a sample. For that location, the 210kts trial was just as good.
• It will reduce the amount of fuel burnt by aircraft using this departure route thereby minimising carbon emission. However, CO₂ emissions is not a priority impact below 4,000ft, and the modelled results for CO₂ emissions do not show a significant difference between the two trial options.

For both of the trial options, the sponsor states in the submission that “Above 4,000ft aircraft would be routinely kept within the NPR corridor until crossing the railway line between St. Albans and Harpenden, however this would be at the discretion of ATC for operational/safety reasons.” There is therefore an expectation that the concentrations exhibited by the trials will continue to be demonstrated once a new RNAV SID is implemented, namely that traffic will be concentrated at least as far as St Albans, and for this reason the NPR swathes are illustrated as extending further east than the current NPR that currently terminates soon after passing Redbourn. Typically aircraft will be at least at 6,000ft as they reach the railway.

The sponsor proposes a possible change to the width of the swathe for the Noise Preferential Route (NPR) but this would happen some time after implementing the RNAV SID. “The width of the current NPR swathe is 3 km (1.5km either side of the SID centreline) and it is proposed that following a period of familiarisation, the swathe width would be reduced from 3 km to 2 km for aircraft flying the new RNAV1 SIDs. The familiarisation period will be a maximum of 6 months.”

The submission explains that for the RNAV SID, “The daytime vectoring altitude would also be raised from 3,000 ft to 4,000 ft to ensure aircraft fly within the swathe for longer.” The sponsor has subsequently confirmed that it is working with NATS on also increasing the vectoring altitude to 4,000ft for the remaining conventional SID, and instigating a similar instruction to keep traffic on the conventional SID until the railway line, but these changes are not being proposed as part of this submission. In the event that the RNAV SIDs are implemented, two NPR swathes will be in operation: One for the conventional SIDs, and one for the RNAV SIDs.

The submission also explains:
• “Over 90% of aircraft currently using London Luton Airport are anticipated to be able to utilise the RNAV1 SIDs if they come into operation, and this percentage is expected to rise over the coming years.” Conventional SIDs would remain on this route for any aircraft that are not equipped to fly RNAV departures. Currently this equates to 10% of the traffic at the airport, and this portion of the fleet would continue to reflect the existing dispersion pattern and profile if the proposal is approved. This portion would reduce over time as more aircraft became suitably equipped to fly the RNAV SID.
These routes would be used 24 hours a day, 7 days a week at the discretion of Air Traffic Control (ATC) and would not be subject to any seasonal variation. The hours of operation will therefore remain unchanged, and if RNAV1 is introduced this will not increase or decrease aircraft capacity along this route or any other route."

In terms of the noise monitoring undertaken during the trials, the submission explains that “During the trials there was an unanticipated increase in noise levels recorded in south Luton, and this increase was attributed to aircraft making a later first turn during the trial as an unintended consequence of the trialled RNAV1 route design. The proposed RNAV1 SIDs address this to ensure the first turn is initiated as per the current route design, at approximately 1,000ft depending on weather conditions (i.e. at 1030ft QNH), ensuring that noise levels remain unaltered in south Luton. Apart from this small alteration, the proposed SIDs are identical to that flown during the 220 knots RNAV1 trial, and this alteration is not anticipated to affect the route flown passed the first turn.” Accepting this modification to the trialled design, it should be noted that this means this aspect of the SID as proposed has not been trialled. For that reason we should request post-implementation monitoring (preferably by BAP, the sponsor’s noise consultants) at this location, to assess noise levels and compare them with pre-implementation levels to ensure there has been no significant change.

The sponsor advises that “In the event that RNAV1 procedures are adopted along the Runway 26 BPK departure routes, and following a period of familiarisation, where clear track-keeping infringements occur (i.e. not safety or weather related) then a penalty system would be introduced in conjunction with our Flight Operations Committee and London Luton Airport Consultative Committee (LLACC).” It is not apparent if this would be the same familiarisation period as the NPR swathe, i.e. 6 months, or whether any penalty system would be public. Progress of this penalty system, and any penalties issued should be requested as part of the post-implementation review.

Vertical profiles
“Vertical dispersion of aircraft throughout the trial was also monitored through the Airport’s Noise and Track Monitoring System. The proposed RNAV1 route design is not anticipated to alter or affect the rate at which aircraft climb.” There are gate-penetration diagrams in Appendices 2.1a and 2.1b of the proposal, but there are no vertical profiles portrayed, either as part of the noise analysis or the CO₂ emissions analysis. The gate penetration diagrams, which are based on actual tracks from conventional traffic and trial traffic support this expectation that vertical profiles will be no different. However, it was noted that this appeared at odds with the results of the swathe population counts undertaken as part of the noise assessment. On the face of it, because the population counts had endeavoured to identify the population numbers beneath defined altitude bands (i.e. the numbers of residents beneath aircraft at 2,000ft, 3,000ft, 4,000ft etc), it was apparent that the analysis had used different vertical profiles for both the conventional traffic and each of the trials – based upon the population counts it appeared that conventional traffic had the shallowest average profile, and the 210kts trail had the steepest.
Further investigation with the sponsor and their noise consultants revealed that whilst the profiles used for the altitude-banded population counts was based on an average profile derived from actual radar tracks, some slow-climbing tracks had not been included in the analysis meaning that the resulting average profiles are steeper than should be the case. This means that the population counts within each band do not reflect a more realistic average. It was agreed with the sponsor that based upon the gate penetration diagrams it was reasonable to conclude that vertical profiles for the trials would be similar to that for conventional traffic (or at least no worse), and therefore no weight would be attributed to the population counts within each altitude band. However, the total population counts within the swathes (i.e. ignoring the altitude bands) would still be accurate and could be used as consideration of the expected impact. On that basis, it was agreed that there would be no benefit in re-performing the assessment of population counts within swathes in order to more accurately determine the populations within individual altitude bands.

4.2 Have alternative options been considered, and have the environmental impact of each alternative been assessed? Partially

An initial trial in 2011 that placed a 220kts speed restriction on the second turn of the conventional SID showed an improvement in track compliance and concentration yet was discounted on “environmental grounds”. These “grounds” were the amount of negative feedback received from residents in Flamstead and Redbourn, saying that the noise had increased significantly as a result. For that reason the sponsor felt that whilst aircraft were able to follow the route centreline (namely the conventional SID) more effectively the centreline wasn’t in the best place. Whilst recognising that discounting the option of a speed restriction on the existing SID was in response to local feedback about the noise impact, the volume of complaints per se does not represent “environmental grounds”. The volume of complaints are not a robust or objective measure of an environmental impact.

The two options of a 210kts RNAV SID and a 220kts RNAV SID have been subject to an equivalent environmental assessment.

5. Noise

5.1 Has the noise impact been adequately assessed? Yes

The noise assessment was undertaken by noise consultants, Bickerdike Allen Partners (BAP) on behalf of the sponsor. The assessment sets out the results from two trials, one with aircraft restricted to 210kts and the other at 220kts whilst flying the second turn of the RNAV SID. The report explains that:

- “The initial portion of the NPRs to Clacton and Dover are identical. This report therefore considers them as a single track, which could lead to either the Clacton or Dover navigation reporting point.”
“The results for the most common aircraft at Luton, now and in the future, do not show large changes; all differences are generally less than 3 dB(A). The exception arises for the trial route when measured at Hemel Hempstead, but unfortunately this relates to a too small sample of results for the 220 knot trial, specifically 11, and only applies to the maximum noise level in relation to the 210 knot trial.”

The second point above highlights that for the noise monitoring undertaken during the trials, there were no significant differences between 210 and 220 knots at the locations where monitoring was undertaken. If we discount any of the monitoring results where the difference between the current traffic and the trial traffic is less than 1 dBA, and also those where the sample size was too small, then the notable observed results of the two trials in comparison with current traffic are summarised in the table below:

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<tr>
<td>210kts trial</td>
<td>One increase (South Luton, +1.4 dBA)</td>
<td>One increase (South Luton, +2.3 dBA)</td>
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<tr>
<td></td>
<td>Two reductions (Flamstead, -1.2 dBA &amp; Hemel Hempstead, -2.2 dBA)</td>
<td>Two reductions (Flamstead, -2.0 dBA &amp; Hemel Hempstead, -3.9 dBA)</td>
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<tr>
<td>220kts trial</td>
<td>Two increases (Slip End, +1.1 dBA &amp; St Albans, +1.6 dBA)</td>
<td>Two increases (Slip End, +1.2 dBA &amp; St Albans, +1.2 dBA)</td>
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The largest difference and the only significant difference is the reduction for Hemel Hempstead. Whilst the table above highlights the result for the 210kts trial at Hemel Hempstead, the 220kts trial showed similar reductions at that location but from a sample size that is too small to give the same weight to the outcome.

Section 2.4 of the submission says “In the event that RNAV1 procedures are adopted the greatest change would be a reduction in noise levels in Hemel Hempstead.” Based on the noise monitoring results, this is a fair assertion, but doesn’t indicate a preference for either 210kts or 220kts.

Qualitatively, when comparing the design of the existing conventional SID with that of the new RNAV SID, based on the diagrams provided:

- The new SID has a second turn that is further away from the south-west portion of Flamstead than the current SID;
- The new SID is further away from Redbourn than the current SID;
- The new SID is closer to Hemel Hempstead than the current SID;
- The distance from Markyate is broadly unchanged, as is the distance from Harpenden.

However, it should be borne in mind that current traffic patterns do not show good compliance with the current SID.
Safety & Airspace Regulation Group

Annex E

Title: Airspace Change Proposal Environmental Assessment

So, on the same qualitative basis, comparing the actual traffic pattern from the conventional SID with the actual pattern demonstrated by the trials from the RNAV SIDs:

- The traffic pattern from the trials becomes more concentrated once flights are south of Flamstead, at the start of the second turn. Prior to that point, concentration of the trials is comparable with current patterns;
- The trial traffic is closer to the south-west outskirts of Flamstead due to a tighter second turn;
- Fewer flights over Redbourn and Hemel Hempstead due to the concentration of trial traffic after the second turn;
- Fewer flights over the northern edge of St Albans due to concentration of traffic. However, it should also be noted that the current traffic pattern disperses flights across a wider area, north of St Albans; the trials show a concentration of traffic that skirts the north of St Albans – this could result in more aircraft being closer to St Albans despite fewer overflights of St Albans.

The sponsor explains that for both of the trial options, an expected benefit will be that they “reduce the number of people directly overflown, thereby minimising noise impacts.” It should be noted that being overflown is not an exact measure of who will experience noise impacts. Depending on how “overflown” is defined and measured, the noise impact may in fact extend to residents that are not defined as “overflown”. This aspect is discussed further below under “Swathe population counts”.

Leq Contours

Summer daytime LAeq,16 hours noise exposure contours have been produced using the FAA’s Integrated Noise Model (INM), version 7.0d. The results show no difference in the Leq contours (57 and above) in terms of population or households, both for the current (2013) scenario and the forecast scenario (2028). Visually there are very minor differences. For the 2028 contours the report explains – “For these contours the aircraft mix differs from that flown in 2013 due to the assumed introduction of some re-engined narrow bodied single aisle transports, i.e. Airbus A319neo, A320neo and A321neo, and Boeing 737 MAX 8.”

The 2028 contours are larger than the 2013 contours as a result of traffic growth. The rate of growth is forecast by the sponsor to be the same regardless of whether or not the proposed change is implemented. The report explains that for the contours - “In both tables the results for the 210 knot and 220 knot trial routes are identical and so the results have only been presented once.” With no difference in Leq contours, we are unable to use this metric as part of the basis for our decision on whether or not the proposal offers an environmental benefit.
SEL Footprints
SEL footprints were modelled for both the most common type of aircraft and the noisiest type of aircraft operating at the airport.

The submission states:
• “With regard to the 90 dB(A) SEL footprints for either aircraft type, the population exposed is the same irrespective of the route flown. With regard to the lower level 80 dB(A) SEL footprints for the most common aircraft, the Airbus A320, there are no significant differences in population exposure across the routes.” in fact the results show no difference at all.
• “With regard to the 80 dB(A) SEL footprints for the noisiest aircraft, the Airbus A300, there are small differences between the exposure using the actual current route and the trial routes, specifically around 2% greater exposure for this aircraft using the trial routes.” As noted above, there are no differences in the 80dBA footprint for the most frequent aircraft (A320) but for the noisiest it equates to an approximate increase of 600 people for the 220kts option and 900 people for the 210kts option. This increase appears to result from both trial footprints being slightly further east than the current footprint thereby encompassing a greater part of Flamstead.

So, the only difference shown by the SEL footprints is that for the 80dBA footprint for noisiest aircraft type (A300) which show relatively small increases for both 210kts and 220kts.

Swathe population counts
Whilst the SID design for both the 210kts and 220kts options is the same, the population counts are based upon swathes that are centred around a centreline that is based on actual traffic patterns, and therefore the centrelines are not exactly aligned. The 220kts centreline has a marginally tighter second turn than the 210kts centreline. The sponsor has confirmed that this is correct.

The noise report attempts to quantify the number of people “overflown” using two different methods. (There is currently no generally accepted definition of what “overflown” means and therefore how it should be measured). It explains that - “In both cases the swathes are an area centred on the actual tracks flown, from the end of the runway to the location where the current and trial routes meet in the vicinity of the railway line from Harpenden to St. Albans, approximately 1.6 km west of Sandridge. In this area many of the aircraft can be vectored off any route, as the release height of 4,000 ft is likely to have been achieved.”
• “The first method of defining the swathes was to assume their width to be 3 km (i.e. a deviation of 1.5 km on each side of the centre track) for the current route and 2 km for the trial routes, based on advice from the airport. It has been assumed that the outer edges of the swathes begin to deviate from the centre track at the end of the runway, and deviate at an angle of 20 degrees until reaching the maximum deviation. The trial routes were also assessed with a 3 km width as a sensitivity study.”
“The second method was to base the swathe boundaries on the observed radar track density plots available from the airport’s noise and track keeping system.” Namely, these are hand-drawn boundaries that attempt to encompass the observed tracks.

It is important to bear in mind that a boundary that defines a population “overflown” will not necessarily represent the boundary for any noise impact. An aircraft that flies within such a swathe may still cause noise on the ground beyond the swathe boundary.

It is also important to note that the narrower 2km swathe may not be implemented by the sponsor. It is not a definite characteristic of the new SID, but one that the sponsor may implement at a later date for monitoring compliance on the basis that RNAV SIDs should result in a narrower, more concentrated traffic pattern.

Table 6 in the sponsor’s Noise Assessment illustrates how the anticipated benefit in terms of “being overflown” is delivered for those residents furthest from the airport (when the aircraft are higher and quieter) rather than those nearer the airport (when the aircraft are lower and noisier). The population counts for those closest to the airport (<3,000ft) are broadly similar for both current traffic and the trials; for altitude bands above 3,000ft, the differences for the trials compared with current traffic is more apparent. However, as noted in Section 4.1 above (“Vertical profiles”), the accuracy of the altitude bands used by the noise consultant is questionable and so has been agreed with the sponsor that these bands are not robust enough to be used for comparisons.

The Noise Assessment report concludes:
- “The detailed noise monitoring, noise contour production, and SEL footprints, all show no significantly greater impacts of the trial routes as opposed to the current route. The greatest measured change is a reduced impact for Hemel Hempstead.
- The population in the swathe between take off and the typical vectoring location in the vicinity of the railway line to the west of Sandridge will be greatly reduced if one of the trial routes is adopted.”

In broad terms these conclusions are reasonable. Using the standard metrics ($L_{eq}$ contours, SEL footprints) there is no significant difference between the current situation and either trial. Using the noise monitoring results, as summarised in the table earlier in this report (Section 5.1 above), the 210kts trial shows some marginal benefits over the 220kts trial (but that is partly due to some of the sample sizes for the 220kts trial being too small). Resorting to population counts within swathes as the indicator is not ideal, but in the absence of a better indicator that shows a material difference between the current traffic and the trial traffic, the population counts do support that either of the RNAV options for the SID will offer an overall improvement in the total number of people affected by noise.
The question then becomes – which swathe count is best to use to assess the impact of the proposal? As noted above, whilst the sponsor may implement a 2km swathe to better reflect the expected greater concentration of traffic using an RNAV SID if one of the RNAV options is approved, this aspect is not part of the proposal and so there is a chance it may never occur. For this reason, I suggest that the 2km should not be used as a measure for this proposal – but it is included in the summary of impacts at Appendix 1 of this report and shows that the 220kts trial swathe includes fewer people than the 210kts swathe. There is no 2km comparator for the conventional track.

The hand drawn swathes have been discounted as being too subjective and very dependent upon the sample of tracks used to portray the traffic dispersion.

This leaves the 3km as the best indicator of being “overflowed” that is available for this proposal. Both RNAV options have fewer people within their 3km swathes than a similar swathe based upon the current mean track – for the 210kts option it is approximately 4,000 fewer people and for the 220kts option it is approximately 6,000 fewer people. Therefore, in terms of the number of people overflowed, both RNAV options offer a benefit, and the 220kts option offers a greater reduction than the 210kts option.

5.2 Has the noise impact been adequately presented in the consultation and the submitted proposal?  
Yes – the noise impacts have been adequately presented in both the consultation and proposal documents.

It is noted that Section 2.4 of the submission also says “A population assessment was also carried out to determine the number of people currently impacted by aircraft along this route, and the number that would be impacted if RNAV1 procedures were adopted. Full details are in Appendix 2.2 of the submission, however the assessment concluded that the number of people would be greatly reduced if RNAV1 procedures were adopted.” This equates “overflowed” with being impacted by noise – as outlined in 5.1 above, they are not necessarily the same thing.

Noise below 7,000ft
The DfT’s Air Navigation Guidance was updated in January 2014 and explains that noise remains a consideration for traffic up to 7,000ft. The submission has considered the noise from aircraft up to the point that it would normally be tactically vectored by ATC. In this case, that is a geographic location (the railway line) rather than an altitude. The gate analysis provided by the sponsor shows that there will be some aircraft that are likely to be below 7,000ft when they reach the railway line and are then able to be vectored. Noise impact of this traffic (i.e. beyond the railway yet below 7,000ft) was not presented in the consultation or submission. Whilst the actual noise levels from such traffic will be low, the pattern of traffic in that area (namely just beyond the railway line) will clearly be different if an RNAV SID is implemented. The track diagrams submitted with the submission show that currently, beyond the railway, traffic is dispersed (Figure 2.3 in the submission)
whereas the dispersion created during the two RNAV trials (Figures 2.4) shows a much more concentrated pattern, notably over Sandridge. Recognising that the actual noise impact of this expected change in traffic pattern at this location is very unlikely to be significant, it is still recommended to ensure that the sponsor’s proposal to monitor the noise levels at this location (see Section 14.2 below) is undertaken and considered as part of the CAA’s post-implementation review.

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<td>6.1</td>
<td>Has the impact on CO₂ emissions been adequately assessed?</td>
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On the subject of CO₂ Emissions the submission explains – “Track data from both trials has been used to determine the impact on fuel burn and associated CO₂ emissions. This assessment was undertaken using KERMIT, NATS bespoke fuel burn model, and provides an estimate based on the aircraft’s height, speed, type and phase of flight (cruise/climb/descent) up until the point at which the route crosses the railway line from Harpenden to St. Albans. This endpoint was chosen because if an RNAV1 procedure is adopted it will be ensured that aircraft track within the swathe until crossing this point (subject to ATC vectoring earlier due to safety or operational reasons). KERMIT refers to the BADA (Base of Aircraft Data) database (version 3.10) to determine aircraft performance (e.g. mean fuel flow) for an aircraft type at a particular flight level, phase and speed.”

The submission also states - “The results demonstrate that both RNAV1 routes reduce the amount of fuel burnt and CO₂ emitted compared to the current route due to a small reduction in track miles and savings are greatest on the RNAV1 220 knots route. Based on total aircraft movements in 2013, if the RNAV1 220 knots route is adopted, 290 tonnes of fuel and 885 tonnes of CO₂ would be saved annually.” In fact the sponsor’s total annual estimated CO₂ reductions for both of the RNAV options once rounding is taken account of are:

- 630 tonnes of CO₂ for 210kts
- 915 tonnes of CO₂ for 220kts

In either case the total CO₂ reduction is not large, and CO₂ emissions are not the priority environmental impact below 4,000ft.

The submission states that “The RNAV 210 knots route uses more fuel because this speed restriction makes it necessary to increase the use of flaps through the initial turns.” Whilst the increased use of flaps may be true, it is not the reason for the difference between modelled CO₂ emissions for the 210kts trial and the 220kts trial. The difference is due to the slightly longer track mileage assumed for the 210kts flights in the calculation. The KERMIT model is not granular enough to differentiate on the basis of flaps being used or not.
6.2 Has the impact on CO₂ emissions impact been adequately presented in the consultation and the submitted proposal?  
Yes

The consultation presents the assessment results for the two trial options, on a per-flight basis, and for the 220kts trial an annual total reduction of 912 tonnes of CO₂ is forecast.

The proposal includes more detail on the CO₂ assessment, providing annual estimated reductions for both trials for 2013, 2018 and 2030.

On the basis that the reductions are the result of an anticipated small reduction in track mileage, that the overall reductions in CO₂ are relatively modest and that the priority impact for this proposal is noise, then the impact upon CO₂ emission has been adequately presented in both the consultation and proposal.

Wizz Air consultation response.
Wizz Air included an estimation of its expected fuel saving if the 220kt SID was chosen over the 210kts SID in its consultation response. There are a number of points worth highlighting in the reply:

- The fuel saving is attributed to the 210kts option requiring a greater use of the aircraft’s flaps in the initial turns than would be the case for aircraft flying the 220kts option. There no indication that the reduction in fuel burn is due to a reduction in track mileage;
- It is not apparent what model was used to estimate the fuel burn;
- The estimate from Wizz Air is that the annual benefit for the airline of the 220kts trial over the 210kts trial is 55.5 tonnes of fuel and 176Kgs of CO₂. One of these results is incorrectly stated – they should either both be in tonnes, or both be in kilogrammes.
- This compares with a total estimated annual fuel saving of between 200-300 tonnes from the sponsor.
- The airline states that “extended flight with flaps increases air frame noise, negating some of the stated noise abatement benefits of Option 3”. Whilst it is claiming that the 210kts options is potentially noisier, it has not given any estimate of that. Based upon the noise monitoring undertaken by the sponsor (see Section 5.1 above) it is not apparent that the 210kts trial produced greater noise levels than the 220kts trial.

7. Local Air Quality

7.1 Has the impact on Local Air Quality been adequately assessed?  
Yes

There is no anticipated change to traffic volumes, nor any material changes to location of aircraft below 1,000ft.
Equally, there is no Air Quality Management Area close to the airport or beneath the initial flight path. For these reasons, the proposal is very unlikely to have any impact upon LAQ and on that basis no assessment has been undertaken. This is reasonable based on the circumstances of this proposal.

7.2 Has the impact on Local Air Quality been adequately presented in the consultation and the submitted proposal? **Yes**
Both the consultation and the proposal consider the impact upon LAQ but conclude that no impact is likely and that no assessment is necessary. As noted in 7.1 above, this is an adequate and reasonable approach for addressing the LAQ impact for this proposal.

8. Tranquility  
8.1 Has the impact on tranquility been adequately considered? **Yes**
Yes – this is covered further under Section 12.1 below, but in short the sponsor has adequately considered the possible impact upon tranquility.

8.2 Has the impact on tranquility been adequately presented in the consultation and the submitted proposal? **Yes**
Both the consultation and proposal comment upon both tranquillity and visual intrusion, with particular reference to the Chilterns AONB.

9. Visual Intrusion  
9.1 Has the impact of visual intrusion been adequately considered? **Yes**
Yes - this is covered further under Section 12.1 below, but in short the sponsor has adequately considered the possible impact of visual intrusion.

9.2 Has the impact of visual intrusion been adequately presented in the consultation and the submitted proposal? **Yes**
Yes – see Section 8.2 above.

10. Biodiversity  
10.1 Has the impact upon biodiversity been adequately considered? **Yes**
Whilst no explicit statement on biodiversity has been made in the consultation or proposal, based upon the characteristics of this proposal there is unlikely to be any impact upon biodiversity as a result of implementation of this proposal, and so the apparent omission is acceptable.
10.2 Has the impact upon biodiversity been adequately presented in the consultation and the submitted proposal? Yes

As noted in 10.1 above, the omission of an explicit statement on biodiversity is acceptable.

11. Continuous Descent Approaches

11.1 Has the implementation of, or greater use of, CDAs been considered? N/A

CDAs are not relevant for this proposal which only considers new SIDs.

12. Impacts Upon National Parks and/or AONBs

12.1 Does the proposed change have an impact upon any National Parks or Areas of Outstanding Natural Beauty (AONBs)? Yes

The statutory purposes of National Parks are to conserve and enhance their natural beauty, wildlife, and cultural heritage and to promote opportunities for the understanding and enjoyment of their special qualities by the public. The statutory purpose of AONBs is to conserve and enhance the natural beauty of their area. In exercising or performing any functions in relation to, or so as to affect, land in National Parks and AONBs, the CAA is required to have regard to these statutory purposes under s.19 and Schedule 2 of the Civil Aviation Act 1982. This duty was re-stated in the revised Air Navigation Guidance issued in 2014.

This duty was also reiterated in the Aviation Policy Framework (March 2013) which stated “the CAA has legal duties to have regard to the purposes of National Parks and Areas of Outstanding Natural Beauty and must therefore take these into account when assessing airspace changes.”

Whilst recognising this duty it is also true that flights over National Parks and AONBs are not prohibited by this legislation as a general prohibition against over-flights would be impractical.

With regards to tranquillity and visual intrusion, current traffic overflies a portion of the Chilterns AONB to the south-west of Luton. If implemented, either of the RNAV SID options will place traffic in a similar pattern over the same part of the AONB at similar heights to

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S.11(A) of The National Parks and Access to the Countryside Act 1949 (in England and Wales), National Parks (Scotland) Act 2000, and “Duties on relevant authorities to have regard to the purposes of National Parks, Areas of Outstanding Natural Beauty (AONBs) and the Norfolk and Suffolk Broads Guidance Note”, DEFRA 2005.
current traffic. Therefore, it is reasonable to conclude that, as the RNAV SID is not an enabler for an increase in traffic, the implementation will not worsen any current impacts upon tranquility of visual intrusion.

13. Traffic Forecasts

13.1 Have traffic forecasts been provided, are they reasonable, and have these been used to reflect the future impact of the proposal?

Traffic forecasts have been provided, which include specific forecasts for the numbers of departures that are expected to use the Brookmans Park departure route. These appear reasonable and have been used for both the forecast impacts for noise and CO2 emissions.

14. Consultation

14.1 If undertaken, has evidence of non-aviation stakeholder consultation been provided?

Yes, evidence of non-aviation stakeholder has been provided. Consultees included local parish councils, local NGOs and local MPs.

14.2 Has account been taken of the results of the environmental factors raised by consultees or has evidence been provided to indicate why this has not been possible?

Yes, the consultation feedback report shows that environmental factors have been considered.

Sandridge

One theme was - The proposed route flies directly over Sandridge. Why can the route not be directed slightly north at this point to avoid this village and fly between Sandridge and Wheathampstead? The sponsor’s response in the consultation feedback is - “There is no change proposed in the location of the SIDs past Sandridge, and aircraft are often in excess of 6,000 feet along this section of the route. Should RNAV1 procedures be adopted however, noise monitoring will be undertaken in Sandridge to determine whether the concentration of aircraft passed this location is perceivable, and the data provided as part of the review process with the CAA.” Whilst the suggestion of post-implementation monitoring is positive, it is reasonable to conclude already that traffic at Sandridge, if it is at 6,000ft, will be perceivable at least by some residents and so the need for post-implementation monitoring to determine this seems unnecessary. It is also unclear what the next course of action will be if the noise monitoring concludes that aircraft are perceivable.

This was clarified with the sponsor who has explained that:
- Aircraft will start to be vectored at the railway line, before reaching Sandridge, and so traffic will be dispersing before they reach Sandridge rather than concentrated directly over the community.
Due to this vectoring, and the fact that the majority of traffic are heading south-east, even if the route were moved further north traffic would still be vectored and likely to be flying over Sandridge.

Moving the route further north of Sandridge would begin to affect the traffic such that it would be moved closer to Harpenden in order to avoid Sandridge.

However, it recommended that the sponsor’s proposal to monitor the impact in Sandridge is taken up and the results reviewed at the post-implementation review.

**NPR Swathe**

Concerns raised by some consultees about moving the NPR and its swathe (as as to align with a new SID) are unfounded. Aircraft are already routinely failing to adhere to the current NPR and so it is not a good reflection of current flight paths or traffic patterns. In order to gauge the effects of the new SID, it is much better to compare current traffic patterns with the dispersion achieved during the trials than to compare the current and new NPR swathes. This comparison shows that moving the NPR per se will not have an impact.

**Other points of note in the consultation feedback**

In its response, NATS confirms it has no objection to the adoption of the RNAV SID based upon either of the two speed options presented.

| 15. | Compliance with CAP 725 | Status |
|----------------------------|--------|
| 15.1 | Have all environmental assessment requirements specified in CAP 725 been met, where applicable? | Yes |
| Yes – where applicable, all requirements have been met. |

| 16. | Other Aspects | Status |
|----------------------------|--------|
| 16.1 | Are there any other aspects of the ACP, that have not already been addressed in this report, that may have a bearing on the environmental impact? | Yes |
| It is important to understand to what extent is the resulting concentration of traffic beyond the second turn is due to the RNAV SID or due to ATC instruction for aircraft to remain on the SID until a later point than they currently do on the conventional SID. If it is solely due to ATC instruction, it will be important to guarantee that this concentration will continue to be achieved if an RNAV SID is implemented. |

| 17. | Recommendations | Status |
|----------------------------|--------|
| 17.1 | Are there any recommendations for the Post-Implementation Review? | Yes |
Safety & Airspace Regulation Group  

**Doc Type:**  

**Annex E**  

**Title:** Airspace Change Proposal Environmental Assessment  

**Version:** 1/2012  

**Page:** 18 of 22

- Compare representative samples of radar tracks with those produced for the consultation and submission, to ensure that tactical vectoring does not occur until the railway line (as per the two trials).
- Monitor noise levels in south Luton (the same location as used for the noise monitoring of the trials), to assess noise levels and compare them with pre-implementation levels to ensure there has been no change.
- An update on progress of the proposed penalty system, and any penalties issued should be requested as part of the post-implementation review.
- A report on the results of the proposed noise monitoring in Sandridge (see 14.2 above) and the an outline of any steps to redesign (or not) the SID in that location as a result of the findings.

<table>
<thead>
<tr>
<th>18.</th>
<th>Government Approval</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>18.1</td>
<td>Is the approval of the Secretary of State for Transport required in respect of the environmental impact of the airspace change proposal?</td>
<td>No</td>
</tr>
</tbody>
</table>

No – there are no significant detrimental environmental impacts, nor is LSA a designated airport.

<table>
<thead>
<tr>
<th>19.</th>
<th>Conclusions</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>19.1</td>
<td>Can an overall environmental benefit be demonstrated (or justified/supported)?</td>
<td>Partially</td>
</tr>
</tbody>
</table>

A summary of the impacts is outlined in Appendix 1 of this report.

Arguably an overall benefit is demonstrated, even if that does not clearly indicate whether the 210kts option or the 220kts option is preferable (hence the “partially” status indicated above). But implementing either of the RNAV options:

- Will be likely to result in fewer people being affected by aircraft noise. Though not an ideal indicator of noise impact (as explained earlier in this report), the population counts within the 3km NPR swathe show a reduction in people “overflown”. This is achieved through a redesigned SID which avoids, as far as possible, the larger communities along the route.
- Will be likely to concentrate traffic along the SID, so that it is not as dispersed as when the conventional SID is being flown. This will mean that whilst some people will be overflown to a lesser extent, those residents beneath the main concentration of traffic will be overflown to a greater extent and may experience more noise as a result.
Will result in a small CO₂ emissions reduction, based largely upon an expected reduction in track mileage for the RNAV SIDs, though there may also be a smaller part of that emissions reduction that is due to less flaps being used for the 220kts option (thereby burning less fuel).

- Will have no expected negative impacts for Local Air Quality, tranquility, visual intrusion or biodiversity.

In terms of choosing between the sponsor’s preferred option of 220kts and the 210kts option, there is conflicting evidence in terms of the noise impacts. On the one hand, the evidence from the noise monitoring suggests that 210kts offers marginal benefits over 220kts. On the other hand, the population counts within the 3km swathes (as an indicator of being “overflowed”) show that 220kts offers a marginal benefit over 210kts.

### Outstanding Issues

<table>
<thead>
<tr>
<th>Serial</th>
<th>Issue</th>
<th>Action Required</th>
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### Additional Compliance Requirements (to be satisfied by Change Sponsor)

<table>
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<th>Requirement</th>
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### Environmental Assessment Sign-off/Approvals

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<th>Name</th>
<th>Signature</th>
<th>Date</th>
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<tr>
<td></td>
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<td>9 March 2015</td>
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<table>
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<th>Environmental Assessment approved by</th>
<th>Name</th>
<th>Signature</th>
<th>Date</th>
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<tr>
<td>Airspace Change Proposal Environmental Assessment</td>
<td>Page 20 of 22</td>
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<td></td>
</tr>
</tbody>
</table>
### Appendix 1

**Luton R26 RNAV SID ACP - Summary of environmental impacts**

<table>
<thead>
<tr>
<th>57 dBA Leq contour (population in 1000s)</th>
<th>Current (no change)</th>
<th>210 knots trial</th>
<th>220 knots trial</th>
<th>Summary of impact - conclusions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>7.1 in 2013</td>
<td>6.9 in 2013</td>
<td>6.9 in 2013</td>
<td>Small decrease in population (200 people in 2013) within 57dBA contour for either RNAV option. No changes within other contours above 57dBA.</td>
</tr>
<tr>
<td>SEL footprint (population in 1000s)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A320 = most frequent aircraft</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A300 = noisiest aircraft</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>80 dBA</td>
<td>17.0 for A320</td>
<td>17.0 for A320</td>
<td>17.0 for A320</td>
<td>No difference for the most frequent aircraft type, but an increase from both of the trial options for the most noisiest aircraft, seemingly due to the footprints encompassing a greater part of Flamstead.</td>
</tr>
<tr>
<td></td>
<td>37.5 for A300</td>
<td>38.4 for A300</td>
<td>38.1 for A300</td>
<td></td>
</tr>
<tr>
<td>90 dBA</td>
<td>1.9 for A320</td>
<td>1.9 for A320</td>
<td>1.9 for A320</td>
<td>90 SEL footprint has a demonstrated relationship with sleep disturbance. Based on this metric, the RNAV options are no different to the current track.</td>
</tr>
<tr>
<td></td>
<td>2.6 for A300</td>
<td>2.6 for A300</td>
<td>2.6 for A300</td>
<td></td>
</tr>
</tbody>
</table>

**Lmax – noise monitoring results**

| (comparison to current traffic) | n/a | Material reduction (3.9dBA) for Hemel Hempstead | Material reduction (3.9dBA) for Hemel Hempstead, but sample size too small. |

**“Overflown” (total population within the swathe, 1000s)**

<table>
<thead>
<tr>
<th>3km NPR swathe</th>
<th>25.6</th>
<th>21.5 (a reduction of 4.1)</th>
<th>19.5 (a reduction of 6.1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2km NPR swathe</td>
<td>Not provided</td>
<td>8.6</td>
<td>7.7</td>
</tr>
</tbody>
</table>

Hand-drawn: N/a | N/a | N/a |

These hand-drawn swathes have not been considered for this assessment as they are too subjective and depend on the representativeness of the traffic sample. However, in general, both RNAV trials demonstrate a much more concentrated dispersion which should mean that, all other
<table>
<thead>
<tr>
<th></th>
<th>Current (no change)</th>
<th>210 knots trial</th>
<th>220 knots trial</th>
<th>Summary of impact - conclusions</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO₂ emissions (comparison to current traffic)</td>
<td>N/a</td>
<td>A reduction of 630 tonnes of CO₂ per year in 2013</td>
<td>A reduction of 915 tonnes of CO₂ per year in 2013</td>
<td>Both RNAV options offer a reduction in CO₂, both of which are relatively modest. The reduction for 220kts is greater due to a slightly shorter track mileage than 210kts. However, much of this benefit is achieved below 4,000ft when the priority environmental impact is noise rather than CO₂ emissions.</td>
</tr>
<tr>
<td>Local Air Quality</td>
<td>N/a</td>
<td>Unlikely to have any impact on LAQ</td>
<td>Unlikely to have any impact on LAQ</td>
<td>Neither of the RNAV options will have any impact, positive or negative, upon Local Air Quality.</td>
</tr>
<tr>
<td>Tranquillity &amp; visual intrusion</td>
<td>Traffic on this departure route currently overflies a small part of the Chilterns AONB.</td>
<td>Unlikely to have any worse impact than current traffic.</td>
<td>Unlikely to have any worse impact than current traffic.</td>
<td>Neither of the RNAV options is likely to have any worse impact on the tranquillity or visual intrusion of the Chilterns AONB.</td>
</tr>
<tr>
<td>Biodiversity</td>
<td>No expected impact on biodiversity.</td>
<td>No expected impact on biodiversity.</td>
<td></td>
<td>Neither option is expected to have any impact upon biodiversity, and at the very least will be no worse than any existing impact that there may be from current traffic.</td>
</tr>
</tbody>
</table>