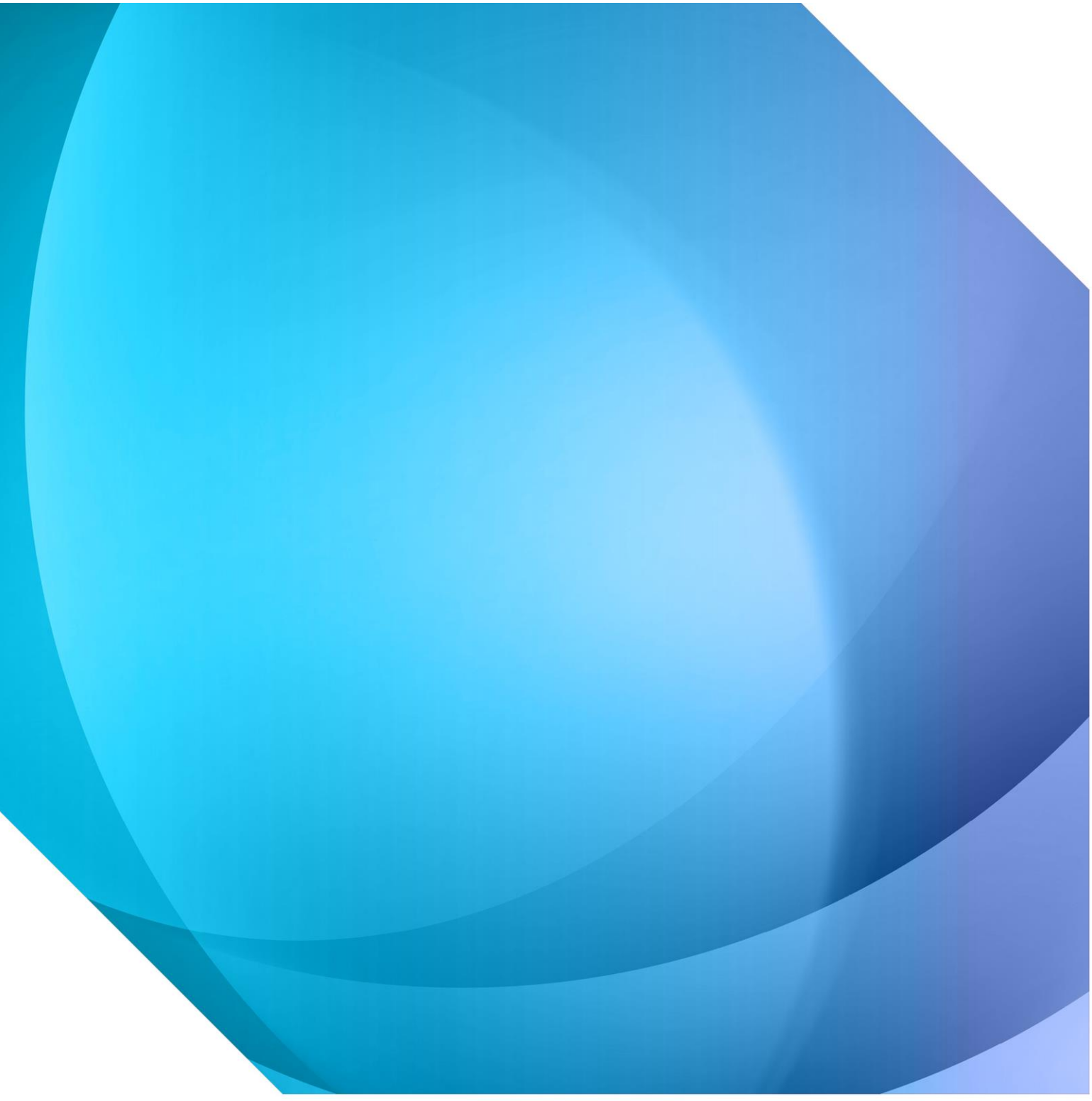
Safety and Airspace Regulation Group

Report of the CAA's Post Implementation Review of London Luton Airport's Airspace Change Proposal - Runway 26 Brookmans Park RNAV-1 Standard Instrument Departure Procedures

CAP 1882



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The latest version of this document is available in electronic format at www.caa.co.uk

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References

1) CAP 725 – Airspace Change Process Guidance Document (last updated 15 March 2016).
2) CAP 1616 – Airspace design: Guidance on the regulatory process for changing airspace design including community engagement requirements (last updated 30 November 2018).
3) Department for Transport's Guidance to the Civil Aviation Authority on Environmental Objectives Relating to the Exercise of its Air Navigation Functions (2014)[1]

[1] https://www.gov.uk/government/publications/air-navigation-guidance

Executive Summary

1. The CAA's airspace change process is a seven-stage process that is set out in detail in CAP 725. Under this process, in 2014 London Luton Airport Operations Limited (LLAOL) submitted a proposal to the CAA to replicate the Runway 26 conventional Standard Instrument Departure (SID) procedures via Brookmans Park with a new RNAV-1[2] SID. The airspace change was approved by the CAA on 16 April 2015 and was implemented on 20 August 2015. The proposal was **not** an enabler for any increase in traffic levels or overall capacity at the airport, nor did it enable any increase in traffic in the early morning/late evening periods.

2. Stage 7 of this process is a Post Implementation Review (PIR) that normally begins one year after implementation of the change as soon after data is received from the sponsor commensurate with ongoing CAA workload at that time. The sponsor provided PIR data to the CAA on 30 October 2017. The CAA commenced the PIR of the implemented change in April 2019. The content and outcome of this review process by the CAA is discussed in detail in this report including its annexes.

3. On 2 January 2018, the CAA introduced a new process for making a decision whether or not to approve proposals to change airspace design (CAP1616). However, as this Airspace Change Proposal (ACP) was fully implemented prior to the introduction of that document, and the PIR data received by the CAA prior to its introduction, this review has been undertaken in accordance with CAP725 metrics and the Department for Transport's Guidance to the Civil Aviation Authority on Environmental Objectives Relating to the Exercise of its Air Navigation Functions (2014). Nevertheless, due to the fact that the review work had not commenced before CAP1616 became effective, the CAA decided to adopt some principles from the CAP1616 process where it was possible to do so. This entailed the publication of data received from the sponsor, and an invitation

[2] Performance-based navigation (of which RNAV-1 is a type) is satellite aviation guidance; in comparison to ground-based navigation aids (such as those used by conventional SIDs) performance based navigational technology will allow aircraft to fly much more accurate and flexible tracks. Satellite guidance will also allow the UK's complicated and busy airspace to be redesigned, increasing capacity and efficiency while maintaining or enhancing safety performance. A route structure optimised for satellite guidance with aircraft flying a pre-programmed trajectory will also reduce the need for tactical intervention by air traffic controllers to instruct pilots to change direction, bringing down the cost of air traffic control, and optimise the climb and departure profiles of aircraft (which is the most expeditious routeing of aircraft so far as airlines are concerned, and which also burns the least fuel and overall causes the least noise.

to interested stakeholders to provide comment on the data received and the impact of the change. We have therefore included a review of feedback received from stakeholders and members of the public who provided feedback directly to the CAA and by using SurveyMonkey to facilitate the feedback process.

4. During the review process, the CAA considered PIR data provided by LLAOL in respect of the changes to the Runway 26 Brookmans Park RNAV-1 SIDs. As a result of our review, the CAA has reached the following conclusions:

Operational conclusions

5. As a result of the implementation of the amended RNAV-1 SIDs in Feb 2017 to address issues affecting some operators with Boeing aircraft, there have been no adverse impacts on any aspects of service delivery and specifically, there have been no adverse impacts on safety and airspace efficiency.

6. Generally, since Feb 2017, the flyability of the SIDs by the various airlines is as expected and the main core of flight tracks in the dispersion tracks plots provided to the CAA by LLAOL would support this conclusion.

7. While Luton provided monthly airline track dispersion plots to the CAA, there was no evidence provided by LLAOL to indicate that these airlines were engaged with, to explain particular flight tracks on the inside and the outside of the second turn (at waypoint GWS06) north of Hemel Hempstead which result in flight outside the 2km wide NPR monitoring swathe. Whilst the excursions are within routine RNAV-1 track keeping performance parameters, given that the sponsor introduced a 2km wide monitoring swathe, the excursions outside the NPR monitoring swathe are not a matter for the CAA to address. Therefore, it is recommended that LLAOL engages with the various airlines to see whether track adherence improvements within the NPR swathe can be achieved as necessary.

Complaints conclusion

8. We have analysed the enquiries/complaints received by the change sponsor and the CAA as part of this Review. As a result of our analysis, we have concluded that the correspondence received is consistent with the traffic patterns we were expecting and observed when carrying out our aircraft track analysis of the trial data, and do not give rise to any unforeseen impacts of the proposal.

9. We have analysed the SurveyMonkey data received by the CAA from stakeholders and members of the public as part of this Review. We have

concluded that the feedback received is consistent with the anticipated impacts of this airspace change proposal. A detailed analysis of the responses is provided at Annex E together with a summary of the main themes of the feedback.

Environmental conclusions

10. Following the implementation and operation of the RNAV-1 SIDs via Brookmans Park and a review of the PIR data by the CAA, the CAA has concluded that the impacts are as expected, and as portrayed in the CAA decision of 13 August 2015. The CAA has, however, noted that some radar vectoring is occurring before the St Albans to Harpenden railway line (this is dealt with in Recommendation 2 and further analysis below).

11. The main core of departures along the Brookmans Park RNAV-1 SID has reduced direct overflight of the densely populated areas of Hemel Hempstead, Redbourn and the southern areas of St Albans (south of the A1057). However, as a consequential effect of moving the RNAV-1 SID from densely populated areas, the main core of departures has moved closer to Redbourn, Harpenden and South Harpenden, whilst managing not to directly overfly these areas.

Confirmation of Runway 26 Brookmans Park SIDs Implementation

12. In respect of the change proposal to introduce Runway 26 RNAV-1 SIDs via Brookmans Park, the CAA confirms that no modification of the RNAV-1 departure designs is required by LLAOL. Upon publication of this CAP 1882, the process in respect of this change is concluded and the change is confirmed.

Recommendations

13. Notwithstanding the confirmation above, we would however, recommend:

14. LLAOL continue to engage with airlines and work collaboratively to identify whether track-keeping improvements within the NPR monitoring swathe can be achieved as necessary, particularly for the worst-performing airlines (as highlighted in Annex C).

15. LLAOL engage further with NATS LTC Operations to determine whether any improvements can be realised. LLAOL and NATS TC Ops should agree that such arrangements are adequately formalised and adhered to, if any enhancements to the existing operational procedures are possible and achievable.

The PIR Report

16. This report, and its annexes and attachments, provide a summary of the information the CAA has reviewed and taken into account before reaching these conclusions. However, all the information the CAA has taken into account is published on our airspace change portal (specifically in the website location for CAP 725 changes).

17. The General Data Protection Regulation (GDPR) came into force in the United Kingdom in May 2018 through the Data Protection Act 2018 and controls how the personal information of individuals is used by organisations, businesses or the government. The CAA is registered as a Data Controller with the Information Commissioner's Office (ICO) to process personal information for the purposes of carrying out regulatory duties. Personal information can be anything that identifies and relates to a living person, for example their name and contact details. The CAA only collects and uses personal information for the reason it was intended and will not share any of the information held about any individuals who have responded to this post-implementation review using SurveyMonkey, with any third party, unless written consent has been given, or if otherwise this is permitted by law. Responses from individuals, where referred to within this report and where published on our airspace change portal, have been anonymised. Further information on how the CAA uses and looks after personal information can be found by viewing the CAA's privacy notice here.

Scope and Background of the PIR

What is a Post Implementation Review

18. The CAA's approach to decision-making in relation to proposals to approve changes to airspace is explained in its Guidance on the Application of the Airspace Change Process, CAP 725. This detailed Guidance provides that the seventh and last stage of the process is a review of the implementation of the decision, particularly from an operational perspective, known as a Post Implementation Review (PIR).

19. The Guidance states that the purpose of a PIR is to determine whether the anticipated impacts and benefits in the original proposal and published decision are as expected, and where there are differences, what steps (if any) are required to be taken.

20. If the impacts are not as predicted, the CAA will require the change sponsor to investigate why, so the CAA can determine whether further action is needed to change the airspace structure or to revise flight procedures to meet the terms of the original decision.

21. A PIR is therefore focused on the effects of a particular airspace change proposal. It is not a review of the decision on the airspace change proposal, and neither is it a re-run of the original decision process.

Background to our conclusions in this PIR Decision

22. On 16 April 2015, the CAA approved the changes to the London Luton Airport Runway 26 Brookmans Park SIDs. In our Decision document published in August 2015, we provided factual information and background to the change. Such detail is not represented in this PIR although objectives and anticipated impacts are re-produced for ease of reference. We recommend readers of this report read the Decision Letter in conjunction with this document. In making our Decision, we set out a number of conditions that our approval was predicated upon.

Conditions attached to the CAA's decision to approve the change

Conditions

23. Following some observation concerning noise over South Luton during the trials of Spring 2013, the altitude at which aircraft may turn after departure was revised back to 1030ft AMSL which was concurrent with the conventional SID design (in the trial it was rounded up to 1100ft AMSL).

24. In accordance with the CAA decision (paragraph 5.7.5) the following condition was placed on the sponsor:

    The sponsor was advised to monitor the first turn track keeping performance and provide feedback to the CAA after implementation.

25. The sponsor has met this condition and has provided feedback as requested. Details of the noise monitoring conducted by the sponsor are covered later in this report together with the CAA review of that feedback.

Relevant events since the change

26. There has been an increase in Air Transport Movements (ATMs) at London Luton Airport since the ACP, which, we believe has contributed to an increase in complaints. Whilst we did not specifically ask the Airport for details of ATMs in the package of PIR requirements provided to LLAOL in January 2017, in view of the increase in numbers of complaints, we have summarised the changes to ATMs since the introduction of the RNAV-1 SIDs; these details are included at paragraph 53. However, we would advise interested parties that the airspace change proposal was not an enabler for an increase in traffic. Any increase in traffic is subject to planning approval by the appropriate planning authority.

Data collected for the purpose of the PIR

Sources of Information

27. The PIR requirements were confirmed to LLAOL on 19 January 2017; for completeness, these are shown at Annex A.

28. Due to the fact that the review work had not commenced before CAP1616 became effective, the CAA decided to adopt some principles from the CAP1616 Stage 7 process where it was possible to do so. This entailed the publication of data received from the sponsor, and an invitation to interested stakeholders to provide comment on the data received and the impact of the change. We have therefore included a review of feedback

received from stakeholders and members of the public who provided feedback via the CAA Survey Monkey process. Our review of this feedback is provided later in this report. The data received from LLAOL was published on the CAA website.

29. During the review process, the CAA considered:

- A comparative assessment of pre-implementation and post-implementation traffic patterns (i.e. pre-change traffic patterns using the previous conventional SIDs and the post-change traffic patterns using the RNAV-1 SIDs).
- A review of feedback from the airport operators regarding the flyability of the SIDs regarding the ability of aircraft to adhere to the trajectory of the SID in both lateral and vertical dimensions terms (this was in the main focused on the initial design issue before a minor modification was implemented in February 2017).
- Feedback from LLAOL and NATS concerning the radar vectoring initiatives in support of the raised Noise Preferential Route (NPR) vectoring altitude restrictions.
- A review of complaints made and feedback received during the post-implementation period (i.e. from 20 August 2015 to 30 September 2017).
- A LLAOL assessment of whether the objectives of the change proposal have been achieved. Note: this was not provided with the original PIR data but subsequently requested by the CAA and provided on 2 May 2019. The details will be added to the CAA website with the publication of this report.
- Feedback from LADACAN.
- Feedback from St Albans City & District Council.
- SurveyMonkey feedback.

30. LLAOL provided all of the PIR data requested by CAA.

Objectives and Anticipated Impacts

The original proposal and its objectives

31. The proposal was designed to introduce an RNAV1 SID replication of Runway 26 BPK SIDs to replicate the flight profiles of existing conventional SIDs to DETLING and MATCH. The aim was to

- replicate as closely as possible the existing nominal track over the ground of the conventional SIDs up to the turn towards BPK which occurs after passing between the villages of Markyate and Flamstead;
- to correct the excursion from the 3 KM wide NPR swathe (which has resulted in aircraft flying over the northern part of Hemel Hempstead - an issue for a considerable number of years);
- then enable the departures to fly the original and intended track towards BPK after the turn which would result in aircraft flying between Hemel Hempstead and Redbourn;
- to maintain the nominal vertical profiles of the conventional SID.

32. The sponsor also proposed to raise the daytime upper limit of the NPR from 3000ft to 4000ft, after which aircraft, in accordance with the terms of the conventional SID, may be radar vectored by air traffic control (ATC) for operational reasons (either for separation against other traffic or to provide a more expeditious flight path towards their destination). However, to enable aircraft to remain on track to BPK for as long as possible without deviating away from the nominal and intended track, the sponsor proposed to introduce a restriction on how soon aircraft could be vectored by stipulating that in normal circumstances, aircraft could not be vectored until after passing the railway line between Harpenden and St Albans.

33. In support of the proposed vectoring restriction the sponsor also proposed to introduce an NPR compliance monitoring swathe for the RNAV-1 departures with a width of 2km wide as far as the railway line (after which vectoring would be permitted and normally be expected). Until such time as the conventional SIDs is withdrawn, there would therefore effectively be 2 published NPR swathes at Luton for this routeing. The location of NPR's and their associated compliance monitoring swathes are a matter for the airport operator at Luton and did not form part of the CAA decision.

Anticipated Impacts

34. **Impact on Flamstead.** Flamstead is located on the inside of the turn to BPK within the eastern half of the 3km wide NPR swathe for the conventional SID. Over time, conventional SIDs had progressively flown wider turns than the conventional SID design could accommodate with modern aircraft capabilities, and the departures had drifted further way from Flamstead during the turn. Impact on Flamstead was carefully considered as it was apparent that residents were concerned that aircraft would fly closer to Flamstead under the proposed SID. As the traditional NPR swathe extended over Flamstead, departures from Luton had always been close to the village as they turned towards BPK. The CAA stated that this would continue with the proposed new SID design.

35. **Impact on Sandridge.** Sandridge is a village north of St Albans which is situated precisely under the centreline of the conventional SID. The RNAV SID was also aligned overhead Sandridge. Whilst the ACP stated overflight around Sandridge is normally around 6000ft (the SID design has a technical cap at 5000ft but a higher altitude is frequently experienced), the main concerns from residents in Sandridge were the anticipated impact of concentration of aircraft that could be anticipated from an RNAV-1 SID. The CAA considered that Sandridge was on the route prior to the change, and that traffic was routinely vectored prior to Sandridge. The CAA anticipated that with the proposed RNAV-1 SID, this would continue to be the case and that the typical altitude attained by Sandridge will continue to be 6000ft. The CAA therefore concluded that it was reasonable to accept the replicated design as proposed as the impact was anticipated to be similar to what was experienced with the conventional SID. It should also be noted that the change proposal was not an enabler for an increase in capacity at London Luton Airport, nor did it enable any increase in aircraft movements in the early morning / late evening periods.

36. **Impact of Hemel Hempstead.** The overflight of Hemel Hempstead experienced by aircraft flying the conventional SID was anticipated to be avoided with the RNAV-1 SID design. The CAA was satisfied that the proposed RNAV-1 SID design would reduce overflight of this area as demonstrated in the consultation document. The CAA also noted that unless and until the conventional SID was withdrawn, it would still be likely that non RNAV-1 approved flights may still fly routeings as did prior to the change.

37. **Impact on St Albans.** Whilst St Albans suffered from some overflight because of the track keeping issues of the conventional SID with some departures flying outside the NPR swathe, flights were further south than

they should have been (this arose from the 'ballooning' effect around the turn to Brookmans Park due to a lack of any form of speed restriction other than not above 250kts below FL 100). With the RNAV-1 SID design, the CAA anticipated that the RNAV designs would provide some environmental (in noise terms) benefit to St Albans.

38. **Impact on Harpenden.** The proposed RNAV-1 SID (via its design, including speed restrictions), aimed to increase the proportion of aircraft keeping to the nominal track of the existing SID. Whilst the CAA understood that some Harpenden respondents to the consultation believed this would mean more noise, for the reasons contained in the CAA's environmental analysis, the CAA believed that the noise impact on Harpenden would not be significant.

39. The CAA considered that the proposal would address the track-keeping problems which existed at Luton for a long time prior to the airspace change. Aircraft had affected some populated areas of Hemel Hempstead and St Albans by flying wide turns outside the extant NPR swathe which the design sought to address and resolve. The CAA was therefore satisfied that the objective of this proposal resulted in environmental benefits being realised. Whilst there would be an element of concentration of departures as demonstrated in the consultation document, which should bring departures back into the original swathe of the NPR, the implementation was in line with Government guidance to concentrate traffic, and whilst some people would experience more concentration, others would see less overflight. The CAA considered that there would be no negative impacts for local air quality, tranquillity, visual intrusion or biodiversity. The CAA considered that the design would result in an overall reduction in the number of people overflown and would reduce the noise impact in more areas than would be adversely affected.

CAA Assessment

40. The CAA considered the information provided by LLAOL in accordance with the PIR requirements as highlighted in Annex A. In order to review the outcomes of the change the CAA conducted a review of and considered:

- An assessment of the implementation of the change from LLAOL provided on 2 May 2019 – See Annex B;
- A comparative assessment of track dispersion and track density plots for pre-implementation and post-implementation traffic patterns (i.e. pre-change traffic patterns using the previous conventional SIDs and the post-change traffic patterns using the RNAV SIDs);
- A comparative assessment of track dispersion plots in altitude bands up to 7000ft amsl for pre-implementation and post-implementation traffic patterns (i.e. pre-change traffic patterns using the previous conventional SIDs and the post-change traffic patterns using the RNAV SIDs);
- Daily track dispersion plots achieved for the first three months of operation of the modified SID design (February to April 2017).
- Track dispersion plots achieved by aircraft type and the most frequent airline operators.
- A gate analysis provided by LLAOL to determine the average altitude attained on the ground at three locations: Childwickbury; where the nominal track of the SID crosses the St Albans to Harpenden railway line; and Sandridge; this also assisted the CAA to consider noise impacts.
- Details of any ATC operational issues from London Terminal Control Swanwick.
- A review of feedback from the airport operators regarding the flyability of the SIDs regarding the ability of aircraft to adhere to the trajectory of the SID in both lateral and vertical dimensions terms.

- An LLAOL report on noise monitoring at South Luton (Annex F).
- An LLAOL report on noise monitoring at Sandridge (Annex G).
- The NPR swathe penalty system in operation at London Luton airport.
- Complaints made and feedback received during the post-implementation period (i.e. from 20 August 2015 to 30 September 2017) to both the change sponsor and the CAA;
- Following the publication of all PIR data received from the change sponsor which was published on the CAA interim airspace change portal in 2018, the CAA reviewed feedback provided to the CAA by interested parties on PIR data and any impacts experienced from the implementation of the RNAV-1 SIDs (this feedback was collated by the CAA using a SurveyMonkey analysis in 2018).
- Feedback from Hertfordshire Council.
- A report submitted by St Albans City & District Council to the CAA.
- A report submitted by LADACAN to the change sponsor and the CAA.
- A report submitted by Harpenden Sky to the CAA.
- Feedback from St Albans Quieter Skies.
- Representation from the Childwickbury Studfarm.

Operational Assessment

41. The CAA examined the track data plots presented by the sponsor and reviewed the evidence provided by the sponsor with regard to the set of PIR reporting requirements as highlighted at Annex A. We completed an analysis of the RNAV-1 SID procedure and compiled a report which is at Annex C which included comments from the CAA Instrument Flight Procedures regulator on whether the departing aircraft were flying the SID correctly. We also took account of feedback from operators provided by LLAOL which primarily concerned flyability issues with some Boeing aircraft types during the first few months of operation in 2016. It should be noted that once a particular operational issue had been identified, which was associated with the use of a flyover waypoint at GWS01, these particular aircraft types were not permitted to fly the procedure until an amendment to the SIDs was introduced on 2 February 2017.

Safety

42. The CAA is satisfied that the implementation of the proposal has not adversely affected the safety of the operation provided at London Luton airport and allied surrounding airspace within which the SIDs are located and which was already tolerably safe.

43. The issue concerning the flyability of the SID by some Boeing aircraft, was addressed by the sponsor. Initially, the sponsor quickly resolved the impact of the issue by not allowing these aircraft types to fly the RNAV-1 SIDs until the cause of the issue was known and a solution could be found and validated.

44. This action avoided the unintentional overflight of GWS06 (to the east of Great Gaddeson) and any subsequent overflight of Hemel Hempstead. The issue was therefore addressed with the amendment to the SIDs in 02 Feb 2017 as described in paragraph 47.

Airspace efficiency

45. In the absence of any information being provided to the CAA to the contrary, the CAA is content that the permanent implementation of the RNAV-1 SIDs from Runway 26 at London Luton airport has neither increased nor reduced the efficiency of integrating traffic through the controlled airspace to the south of Luton airport.

Operational Feedback

Flyability

46. In May 2016 LLAOL advised the CAA of two issues they had identified with the RNAV MATCH 1Y SID:

    Some operators are missing the second turn completely and flying extended track miles to the South West before turning above the south of Hemel Hempstead. Some aircraft are turning early flying shorter track miles outside the NPR, this accounts for roughly 15% of operators in the Match/Detling route.

47. LLAOL advised the CAA at this time, that as a temporary solution, LLAOL had stopped the operators identified with the above issues from flying the RNAV SIDs. These operators reverted to flying the conventional SIDs and this would continue until an explanation for the RNAV SID issues had been identified.

48. LLAOL in conjunction with the aircraft manufacturer and database providers, found the issues were related to the coding of GWS01 as a

Flyover waypoint and a solution to re-code the waypoint as a Flyby waypoint was proposed. The amended RNAV SID was assessed and validated in full flight simulators to ensure it not only fixed the original issues highlighted above but to also ensure it did not introduce any issues with the other aircraft types operating from Luton.

49. Following the successful assessment and validation in October 2016 of the RNAV SID, the CAA advised LLAOL the amendments to the MATCH/DET 1Y SIDs were approved and these SIDs could be submitted for promulgation as the MATCH/DET 2Y to the AIP via the AIS process. The MATCH/DET 2Y became effective via the AIP on 2 February 2017.

50. Generally, since February 2017, the flyability of the SIDs by the various airlines is as expected and the main core of flight tracks in the dispersion tracks plots provided to the CAA by LLAOL would support this conclusion.

51. Some departure flight tracks from the monthly track dispersion plots can be seen at GWS01 and GWS06 where aircraft in the turn by various operators have deviated from the NPR monitoring swathe, both on the inside and outside of the turns. While some isolated tracks may be attributed to ATC radar vectoring it is unclear if all arise from vectoring. It is recommended LLAOL engages with the various operators to see if further track adherence improvements can be achieved to the MATCH/DET 2Y SIDs where the track adherence is generally good.

52. While Luton provided monthly track dispersion plots by airline, there is no evidence provided by LLAOL these airlines were engaged with to explain their flight tracks. However track data from May 2017 does indicate there are deviations from the NPR monitoring swathe which have been investigated; however, there is still some overflight of Hemel Hempstead which is unexplained and we would recommend LLAOL will need to engage with the airlines to understand why all flight tracks outside the NPR monitoring swathe are continuing to occur.

Air Navigation Service provision

53. In the absence of any information being provided to the CAA to the contrary, the Runway 26 RNAV-1 departure procedure has not caused any impacts on service provision which is provided by the LTC on departure. Departing traffic is handled in the same manner as the conventional SIDs prior to the change with the exception that, (quote from the ACP document page 12):

“whilst ATC will still be permitted to tactically vector aircraft (i.e. given a specific heading towards their final destination) for operational or safety

reasons, aircraft will generally track within the swathe until crossing the railway line between St. Albans and Harpenden (GWE16). The RNAV1 NPR is therefore illustrated as stretching further east than the current NPR that currently terminates soon after passing Redbourn. The night time vectoring altitude will be maintained at 4,000 ft, and similarly aircraft will only be tactically vectored at night once they have passed the railway line.

Having viewed the track data, we do however note that some vectoring is evident before the railway line – this is covered later in our analysis.

Air Transport Movements

54. The CAA has examined publicly available noise monitoring reports, which, LLAOL publish on their website: Luton Noise and have extracted ATM statistics. The ATM statistics illustrate that ATMs have risen considerably since 2014 (i.e. the year before the change was implemented).

55. In Table 1, the annual ATM for Rwy 26 SIDs are shown together with the average number of daily departures[3]. For completeness, these include the Compton and Olney SIDs which share the same route as the Brookmans Park SIDs just beyond the A5 between Markyate and Flamstead, after which the Compton and Olney SIDs diverge to the west.

Table 1 – Annual Air Transport SID Movements for London Luton Airport

Note 1: These details have been extracted from Luton quarterly and annual reports.

Route / Period	2014	2015	2016	2017	Remarks
Via Brookmans Park					
BPK Day 07-2300	16,353	19,684	22,151	24,717	
BPK Night 23-0700	778	1,731	1,949	2,421	
BPK Total	17,131	21,415	24,100	27,138	10007 increase in 3 years

[3] Figures in monitoring reports illustrated all Runway 26 and 08 departures. A breakdown for SIDs from Runway 26 was obtained separately from LLAOL, hence the increase given that Runway 26 is used more frequently.

Route / Period	2014	2015	2016	2017	Remarks
Average daily departures Rwy 26 and Rwy 08	47	59	66	74	
Average daily departures **Rwy 26 only**	68	80	90	91 See Note 2	Updated figures supplied by e mail from LLAOL.
Daily range	0-90	0-106	0-118	0-121	
Via Compton					
CPT Day	12,029	12,266	13,467	17,175	
CPT Night	648	1,966	1,915	2,487	
CPT Total	12,677	14,232	15,382	19,662	
Average daily departures Rwy 26 and Rwy 08	35	39	42	54	
Daily range	0-76	0-98	0-90	0-98	
Via Olney					
OLNEY Day	4,861	4,929	5,108	5,612	
OLNEY Night	161	389	428	691	
OLNEY Total	5,022	5,318	5,536	6,303	
Average daily departures	14	15	15	17	

Route / Period	2014	2015	2016	2017	Remarks
Rwy 26 and Rwy 08					
Daily range	0-33	0-35	0-35	0-36	
Combined ATM before BPK traffic turns after the A5 between Markyate and Flamstead					
Total BPK/CPT/OLNEY	34,830	40,965	45,018	53,103	
Total average daily departures **Rwy 26 and 08**	96	113	123	145	No figures available for Rwy 26 only
Daily range	0-199	0- 239	0-243	0-255	

Note 2: The daily average of 91 departures per day from Runway 26 is an increase from the forecast as shown in the Airspace Change Proposal which indicated an average of 70 flights per day.

From the monitoring reports, the percentage of the westerly / easterly runway split for these years is below:

2017	79 / 21%.
2016	70 / 30%.
2015	72 / 28%.
2014	68 / 32%.

From the monitoring reports, the busiest day for London Luton airport in recent years is shown below; these figures are for arrivals and departures:

2017	4 June	475 arrs & deps.
2016	9 September	463 arrs & deps.
2015	22 May	425 arrs & deps.
2014	23 May	401 arrs & deps.

SID Utilisation

56. From the traffic sample diagrams provided, the number of departures for the SIDs via Brookmans Park are highlighted in Table 2. The utilisation of RNAV-1 SIDs is approximately 98% in February 2017, and thereafter approximately 99%.

Table 2 -RNAV-1 and non-RNAV-1 (i.e. conventional SID) operations via Brookmans Park.

Period	**Number of RNAV-1 Deps**	**Number of Non-RNAV-1 Deps**	**% flying outside NPR swathe below 4000ft**	**Remarks**
Jul 16	*	*	Not provided	* 3,020 combined.
Aug 16	*	*	Not provided	* 2,466 combined.
Sep 16	*	*	Not provided	* 1,171 combined ton 14 Sep. * 1,475 combined from 15 Sep.
Oct 16	*	*	Not provided	* 588 combined.
Nov 16	1,036	166	Not provided	
Feb 17	1,523	27	Not provided	
Mar 17	2,141	20	Not provided	Only 1912 RNAV shown
Apr 17	2,225	16	Not provided	
May 17	1,511	10	0.5%	Presentation format change from May onwards
Jun 17	2,451	15	1.4%	
Jul 17	2,606	35	0.6%	
Aug 17	2,605	23	0.5%	
Sep 17	2,511	11	1.0%	

Period	Number of RNAV-1 Deps	Number of Non-RNAV-1 Deps	% flying outside NPR swathe below 4000ft	Remarks

From May 2017, the rationale for flight outside the 2km wide NPR swathe are highlighted in each of the monthly track dispersion and density plot diagrams; the reasons provided by LLAOL indicate excursions occurred because of strong winds, flight crew error, and ATC vectoring of aircraft due to weather or other traffic. However, with this data there were no explanations provided to the CAA by LLAOL, and therefore the CAA was unable to determine whether or not there was any valid justification or aircraft technical issues contributing to tracks flown outside the monitoring swathe.

Environmental Assessment Review

57. This section provides a review of the environmental impact of London Luton Airport's Runway 26 Brookmans Park RNAV-1 Airspace Change Proposal (ACP) and for the CAA, as the independent regulator, to assess whether the change has delivered the anticipated environmental impacts and environmental benefits set out in the original airspace change proposal and decision.

58. In the Airspace Change Proposal submission London Luton Airport (the Sponsor) concluded that the ACP would:

- Reduce the number of people overflown along the Brookmans Park departure route;
- Reduce the level of aircraft noise that is currently experienced in areas of high population density, particularly in the area of Hemel Hempstead; and
- Improve track keeping accuracy and therefore reduce the amount of fuel burnt by aircraft using this departure route and thereby minimise carbon emission.

Environmental Assessment Methodology

59. The ACP and this post implementation environmental review has been undertaken in accordance with the Department for Transport's Guidance to the Civil Aviation Authority on Environmental Objectives Relating to the

Exercise of its Air Navigation Functions (2014)[4] (hereafter referred to as the "Guidance"). and the CAA's Guidance on the Application of the Airspace Change Process (CAP725)[5], Stage 7 of which details the Operational Review process and subsequent Post Implementation Review.

The relevant Government guidelines for this assessment are set out in the Guidance; the 'Guidelines' state:

- "The Government's overall policy on aviation noise is to limit, and where possible reduce, the number of people in the UK significantly affected by aircraft noise" [emphasis added] (paragraph 3.2);
- "The Government's policy has for many years been that the best environmental outcome was derived from the concentration of departures on the least number of practical routes designed to specifically minimise the number of people overflown at low levels" (paragraph 7.2);
- In determining whether or not someone is "significantly affected" by aircraft noise, the Aviation Policy Framework[6] states that the Government will continue to treat the 57dB $L_{Aeq\ 16\text{-}hour}$ contour as the "average level of daytime aircraft noise marking the approximate onset of significant community annoyance". However, it also makes clear that not all people within this contour will experience significant adverse effects from aircraft noise. Nor does it mean that no-one outside of this contour will consider themselves annoyed by aircraft noise; and
- The Government also consider that aircraft flying above 4,000 feet are much less likely to affect the key noise metrics used for determining significant community annoyance, as once the aircraft climb above that height, their noise impact reduces (paragraph 4.1).

Scope of Environmental Assessment

60. This environmental assessment reviews the environmental impact of the introduction of RNAV-1 on the Runway 26 Brookmans Park (BPK) Standard Instrument Departure (SID)[7] route only. It should be noted that the BPK Conventional SID will remain extant until all operators are RNAV equipped and approved for RNAV-1 operations. (Note: the decision to remove the conventional SID is a matter for LLAOL to determine). The

[4] https://www.gov.uk/government/publications/air-navigation-guidance

[5] https://publicapps.caa.co.uk/modalapplication.aspx?appid=11&mode=detail&id=395

[6] Secretary of State for Transport. Aviation Policy Framework. March 2013

[7] The SID is given a name to identify the direction to where the aircraft will fly the initial route to immediately after take-off.

environmental impacts of the conventional SID are outside the scope of this assessment.

Scoped out of Assessment

61. The Sponsor introduced an additional Noise Preferential Route (NPR) alongside the ACP. This NPR is contained within a corridor extending 1 km either side of the NPR centreline and is designed to follow the new RNAV-1 SID.

62. The change proposal stated that whilst ATC will still be permitted to tactically vector aircraft away from the NPR swathe for operational or safety reasons, aircraft will generally track within the swathe until crossing the railway line between St. Albans and Harpenden (GWE16). The RNAV-1 NPR is therefore illustrated as stretching further east than the current NPR that currently terminates soon after passing Redbourn. The night time vectoring altitude will be maintained at 4,000 ft, and similarly aircraft will only be tactically vectored at night once they have passed the railway line.

63. It should be noted that the updated NPR means there are effectively two published NPR swathes for the BPK routeing until the conventional SID is withdrawn; the original NPR, which, follows the conventional SID and has a width of 3km, and the updated NPR, which, has a width of 2km and follows the RNAV-1 SID. The location of NPRs and their associated compliance monitoring swathes are a matter for the airport operator and outside the scope of this assessment.

64. We note that London Luton Airport capacity, including annual passenger numbers and night-time aircraft movements, are restricted by Planning Permission 12/01400/FUL, which was granted in June 2014. Latest aircraft movement data (see **Operational Assessment: Air Transport Movements**) for the airport identify that aircraft movements have increased by 30% (24h) between 2014 and 2017. The adoption of RNAV-1 along the Runway 26 BPK departure route does not have any impact on aircraft movements, nor did the airport propose the RNAV-1 SID as a facilitator of growth and therefore, any changes as a result of additional passenger numbers, aircraft load factors and aircraft movements are outside the scope of the environmental assessment.

Environmental Assessment

65. This environmental assessment reviews whether the ACP has delivered the anticipated environmental impacts and environmental benefits set out in the original airspace change proposal and decision.

66. In determining the acceptance of the Airspace Change Proposal, the CAA's Group Director Safety and Airspace Regulation took account of extant guidance provided by the Secretary of State[8] namely the 2014 Guidance and CAA guidance contained within CAP725[9].

67. As part of the ACP decision, it was concluded that the ACP would have a positive overall environmental impact, in particular the ACP would result in an overall reduction in the number of people overflown and provide a noise reduction to a greater number of people than would see increase. In addition, it was concluded that there will be no negative impacts for local air quality, tranquillity, visual intrusion or biodiversity.

68. The conclusion of an overall environmental impact was on the basis that the ACP would improve the Brookmans Park SID track-keeping problems. The track-keeping problem had resulted in aircraft flying wide around the second SID turn towards St Albans, thus affecting areas of Hemel Hempstead and St Albans. In making the decision, the CAA considered that the ACP design would address this issue and therefore concluded that the objective of the proposal resulted in the environmental benefits being realised.

69. Although, an overall positive environmental impact was concluded, it was also identified that RNAV would result in a concentration of departures and therefore, whilst some people would experience more overflight others would see less overflight. However, it was also concluded that RNAV implementation was consistent with Government guidance to concentrate traffic[10].

Environmental Data Used for PIR

70. The ACP came into effect in August 2015 and following a postponement of the PIR due to a minor modification being required, the CAA confirmed with the Sponsor that the following environmental information was required and

[8] Transport Act 2000, Section 70(2)(d)

[9] CAA. CAP725: CAA Guidance on the Application of the Airspace Change Process. March 2016. https://publicapps.caa.co.uk/modalapplication.aspx?appid=11&mode=detail&id=395 [accessed August 2019].

[10] Paragraph 7.2 of The Department for Transport (DfT) *Guidance to the Civil Aviation Authority on the environmental factors it should take into account when exercising its air navigation functions*. January 2014 reiterated that the Government's policy has for many years been that the best environmental outcome was derived from the concentration of departures on the least number of practical routes designed specifically to minimise the number of people over-flown at low levels.

that the data should cover the period from February 2017 to September 2017:

Aircraft track-keeping data:

- Monthly aircraft track dispersion plots and track density plots for the new Runway 26 Brookmans Park RNAV-1 SID and the Runway 26 Brookmans Park Conventional SID;
- Track dispersion plots by key aircraft types (in same format as above);
- Gate analysis of aircraft altitude at the railway line between St Albans and Harpenden and at Sandridge; and
- Details of the track-keeping penalty system for the new NPR and records of any penalties issued.

Noise monitoring data;

- Summary of measured noise levels in South Luton (the same location as used for the noise monitoring of the trials); and
- A report on the results of the noise monitoring survey in Sandridge.

The full set of requirements is listed at Annex A.

Aircraft Track-Keeping

71. This environmental review of track-keeping, reviews the track performance in relation to the Brookmans Park RNAV-1 NPR swathe and is included for information only. This does not form part of the formal PIR assessment, however, we have decided to include this section up to paragraph 77 so that interested parties may understand the NPR penalty system adopted by LLAOL. Queries on NPR adherence should therefore be addressed to LLAOL as the responsibility for establishing the NPR monitoring swathe and the implementation of the subsequent penalty system is a matter for LLAOL and not the responsibility of the CAA.

72. A detailed comparison of pre and post implementation track-keeping is presented at **Annex C** and reviews changes to the position and lateral spread of the track data and assesses whether the Sponsor's intended outcomes of the ACP have been achieved. In addition, the Operational Assessment (see paragraphs 41 to 50**Error! Reference source not found.**) reviews whether aircraft track-keeping is consistent with the design of the RNAV-1 route and as such whether the RNAV-1 SID design has delivered the anticipated impacts and benefits.

73. As discussed in paragraph 61 the Sponsor introduced an updated Noise Preferential Route (NPR) alongside the ACP. This NPR is contained within

a corridor extending 1 km either side of the nominal SID centreline. Under routine circumstances, aircraft should remain within the NPR until reaching an altitude of 4,000ft. Whilst ATC are still permitted to tactically vector aircraft (i.e. given a specific heading towards their final destination) for operational or safety reasons, the ACP stated that aircraft will generally track within the swathe until crossing the railway line between St. Albans and Harpenden (GWE16). The RNAV-1 NPR therefore extended further east than the conventional SID NPR that terminated soon after passing Redbourn. The night time vectoring altitude was to be maintained at 4,000 ft, and similarly aircraft will only be tactically vectored at night once they have passed the railway line.

74. The airport monitors NPR swathe adherence using a Noise and Track Keeping system (NTK). The NTK continuously tracks aircraft arriving at and departing from the airport and compares the departure tracks to the relevant NPR.

75. **Table 3** below shows a summary of aircraft movements between 2014 and 2017, **Table 4** shows the NPR compliance accuracy of aircraft on the BPK RNAV-1 NPR compared with overall NPR compliance at the airport. In addition, **Table 5** shows the number of fines issued and the total monies fined. It can be seen from the tables that overall aircraft movements at the airport increased by around 30% (24h) between 2014 and 2017. The tables also show that movements on the BPK conventional route have significantly decreased as the large majority (c. 98 %) of departures on BPK are now RNAV-1.

76. As a consequence of the implementation of the BPK RNAV-1 departures, adherence to the NPR compliance swathe has declined and therefore the number of penalties issued have increased. However, it should be noted that although NPR adherence has decreased on the RNAV-1 route, the NPR swathe is narrower than that for the conventional route and the NPR swathe is designed to avoid densely populated areas. Therefore, it is considered that the aim of reducing overflight has still been met. However, due to the decrease in NPR adherence, it is recommended that LLAOL continue to engage with airlines and work collaboratively to identify how further track-keeping improvements can be made, particularly for the worst-performing airlines (see Recommendation 1).

Table 3 – Summary of aircraft movements

		2014	2015	2016	2017
Total Departures	Day (07h - 23h)	49,547	52,455	59,446	60,688
	Night (23h - 07h)	2,419	5,751	6,272	7,072
Runway 26 Departures	Day	33,243	36,874	40,726	47,504
	Night	1,587	4,086	4,292	5,599
BPK (conventional)	Day	16,353	13,069	3,022	406
	Night	778	1,215	444	49
BPK (RNAV)	Day	0	6,615	19,129	24,311
	Night	0	516	1,505	2,372

Table 4 – Summary of track-keeping adherence to the NPR monitoring swathe

		2014	2015	2016	2017
Overall	Day	N/A	99.2%	N/A	97.6%
	Night	N/A	96.0%	N/A	95.6%
Runway 26	Day	N/A	98.9%	N/A	97.0%
	Night	N/A	96.0%	N/A	96.4%
BPK (conventional)	Day	N/A	99.3%	N/A	97.5%
	Night	N/A	90.8%	N/A	95.9%
BPK (RNAV)	Day	N/A	97.3%	N/A	95.2% See Note 2
	Night	N/A	95.9%	N/A	93.9%

Note 1: N/A denotes data not made available in 2014 and 2016.

Note 2: The CAA was unable to resolve a discrepancy with data in Table 2.

Table 5 – Summary of track-keeping fines

		2014	2015	2016	2017
Overall	Day	N/A	39 (£29,250)	77 (£57,750)	51 (£38,250)
	Night	N/A	23 (£23,000)	14 (£14,000)	12 (£12,000)
Runway 26	Day	N/A	37 (£27,750)	76 (£57,000)	49 (£36,750)
	Night	N/A	14 (£14,000)	7 (£7,000)	9 (£9,000)
BPK (conventional)	Day	N/A	8 (£6,000)	6 (£4,500)	1 (£750)
	Night	N/A	4 (£4,000)	1 (£1,000)	1 (£1,000)
BPK (RNAV)	Day	N/A	13 (£9,750)	44 (£33,000)	30 (£22,500)
	Night	N/A	5 (£5,000)	2 (£2,000)	4 (£4,000)

Note: N/A denotes data not made available in 2014

Track-Keeping Penalty System

77. LLAOL committed to adding the Brookmans Park RNAV-1 NPR into its track-keeping penalty system. This system fines operators 'where clear track-keeping infringements occur'. The penalty system was to be introduced in conjunction with the Flight Operations Committee and London Luton Airport Consultative Committee (LLACC) and following a period of familiarisation.

78. Following a period of familiarisation, LLAOL added the Brookmans Park RNAV-1 NPR into its track-keeping penalty system in 2015 and this scheme was further amended in April 2018 to become more stringent.

79. To ensure compliance with the NPRs, all airlines are notified of the NPR requirements before commencing their first operations and the track-keeping penalty system is listed within the airports Charges and Conditions of Use[11]. The track-keeping penalty system fines airlines that fail to comply with the scheme and all fines are paid into the airports Community Trust Fund. The original scheme fined airlines £750 during the daytime and £1000 during the night time. The current scheme, introduced in 2018, fines offending airlines £1000 during the daytime and £2000 during the night-time. To provide context a fine of £1000 is around 30% of the landing fees for an Airbus A320[12].

[11] https://www.london-luton.co.uk/LondonLuton/files/6f/6ff811fd-861c-4631-ac18-f6f36ae22147.pdf [accessed August 2019].

[12] This is based on an Airbus A320-214 carrying 180 passengers and departing during the daytime.

First Turn track keeping (immediately after departure when reaching 1030ft amsl)

80. Following observations concerning noise and aircraft flying over South Luton during the Spring 2013 trials, the altitude at which aircraft commence the first turn after departure was revised back from 1100ft AMSL to 1030ft AMSL, which, is consistent with the pre-implementation conventional route. This change was introduced during the implementation of the RNAV-1 SID in 2015[13] and not as part of the minor SID modification in February 2017. However, because this updated procedure had not been trialled and therefore not reported in the formal submission, LLAOL were required to monitor track-keeping performance in South Luton to confirm that the modification had been successful.

81. Pre and post-implementation aircraft track dispersion plots are shown in **Annexes H - K**. These plots show that following implementation of the RNAV-1 SID, there has been improvement in first turn track-keeping and the majority of aircraft now fly within the NPR during the first turn. In addition, when compared with track dispersion plots for the 2014 trial, these plots also show that the SID modification has reduced the number of aircraft flying over South Luton.

82. Therefore, it is considered that the minor design change has been successful in the aim of reducing aircraft overflying of South Luton. However, as discussed it **Annex C** it should be noted that although the majority of departures fly within the NPR, there are several airlines which fly more to the west and therefore, LLAOL are expected to engage with each of these airlines to ascertain why this occurs and seek to improve it (see Recommendation 1).

Aircraft Vectoring

83. As part of the formal submission, LLAOL proposed to raise the upper limit of the NPR from 3000ft to 4000ft.

84. Whilst ATC are still permitted to tactically vector aircraft (i.e. given a specific heading towards their final destination) for operational or safety

[13] The 2014 Decision letter (Section 5.7.5) said "the altitude at which aircraft may turn after departure has been revised back to 1030ft AMSL which is concurrent with the existing design (in the trial it was rounded up to 1100ft AMSL), and hence I have advised the sponsor to monitor the first turn track keeping performance and provide feedback to the CAA after implementation."

reasons[14], the ACP stated that aircraft will generally track within the swathe until crossing the railway line between St. Albans and Harpenden (GWE16). The RNAV-1 NPR therefore extended further east than the conventional SID NPR that terminated soon after passing Redbourn. The night time vectoring altitude was to be maintained at 4,000 ft, and similarly aircraft will only be tactically vectored at night once they have passed the railway line.

85. London Terminal Control ATC were notified of the 4000ft NPR restriction within Section 5.2.1 of the London Terminal Control Centre ATC Manual of Air Traffic Services (LTCC MATS Part II):

"Section 5.2.1 Noise Preferential Routes

In order to alleviate noise pollution in the vicinity of Luton Airport, the minimum altitude at which departures can be vectored off NPRs is 3000ft except"

- *4000ft for all RNAV1 departures*
- *4000ft for conventional departures from Runway 26 via CPT, OLNEY, MATCH or DET'*
- *4000ft for all departures between 2300 and 0700 local"*

"Section 5.2.1.1 Runway 26 CLN and DET Departure Vectoring Restriction

In addition to NPR restrictions as detailed in NTH 5.2.1, the following restrictions also apply to all Luton MATCH and DET departures from Runway 26:

- *Night Time – During the hours of 2300 and 0700 local, TC controllers shall not vector these departures before GWE unless there are over-riding safety reasons. Should it be necessary to vector aircraft before GWE during these hours, the controller shall log the reason with the TC GS North who shall record it in the Handover Log.*
- *Day Time – Where there is no immediate interaction with the Luton departure, the aircraft should be left on the SID and not vectored until the aircraft is east of the vectoring point GWE. Non-Luton*

[14] Operational reasons include, separation against other traffic or to provide a more expeditious flight path towards the final destination

aircraft shall not be delayed through keeping Luton departures on the SID until GWE.

The CAA believes this MATS Part 2 entry may not completely address the original aspiration of LLAOL in regard of vectoring before the railway line, as there is still some vectoring occurring before this location. The CAA believes this has occurred for operational reasons. Whilst recognising the ATC operational constraints of multiple traffic patterns through the Brookmans Park region, the CAA would recommend that LLAOL engage further with NATS LTC Operations to determine whether any improvements can be realised. LLAOL and NATS TC Ops should agree that such arrangements are adequately formalised and adhered to, if any enhancements to the existing operational procedures are possible and achievable.

86. To help inform the efficacy of the vectoring restriction in preventing vectoring from occurring under normal operating conditions, prior to the railway line, LLAOL was asked to provide gate analysis at the railway line and at Sandridge.

87. To check for the occurrence of vectoring before the railway line, LLAOL was required to draw the gate at the centre of the nominal RNAV-1 track and extend the gate 1.5km either side of the nominal track (i.e. a 3km gate). The updated NPR extends 1km either side of the nominal SID centreline and therefore the gate analysis can be used to indicate vectoring by identifying aircraft that are greater than 1km from the nominal SID centreline. The Sponsor also provided monthly post-implementation gate analysis between February 2017 to September 2017.

Railway Line Gate Analysis

88. The gate analysis indicates vectoring is occurring before the railway line and shows that during the monitoring period around 5% of aircraft (representing aircraft plots which are beyond +/- 1000m from the centre point of the Gate) were likely being vectored and of those, the majority were north of the nominal SID centreline and therefore being vectored in the direction of Sandridge. In addition to the gate analysis, vectoring is particularly evident in the accompanying track plots for the Airbus A320 and for operations by Wizz Air.

Sandridge Gate Analysis

89. Similar to that shown in the gate analysis for the railway line, around 5% of all movements are likely being vectored and the majority of aircraft are north of the nominal SID centreline.

90. In addition, to vectoring, the gate analysis presented in the Sandridge Community Noise Report (April to July 2017) [see Annex G] identifies that post-implementation, aircraft are around 250 ft lower than they were pre-implementation, with the average height of aircraft post-implementation being 6,150 ft. Although there is an indication that aircraft are lower, it is however, concluded that this change in height will have a negligible effect on aircraft noise, as demonstrated by the noise monitoring survey results presented in Annex G. It should be noted the decrease in height is not a result of SID design and is likely due to either ATC or airline procedures.

Vectoring Conclusions

91. Whilst the majority of aircraft track on the SID up to the railway line, it can be seen from the gate analysis, track dispersion plots and track density plots, that there are occasions that some ATC vectoring does occur prior to the railway line, and therefore we believe that the intended vectoring restrictions until passing the railway line have not been completely realised; however, resultant track distribution arising from vectoring is no worse than it was before the change; i.e. it is over the area that was previously overflown by aircraft being vectored by ATC. It is therefore recommended that LLAOL engage further with NATS LTC Operations to determine whether any improvements can be realised. LLAOL and NATS TC Ops should agree that such arrangements are adequately formalised and adhered to, if any enhancements to the existing operational procedures are possible and achievable.

Overflight

92. To identify if there are any changes to the number of people overflown following implementation and that assumed within the formal submission, post-implementation RNAV-1 track data was compared with pre-implementation track data and also the RNAV trial data.

93. The analysis undertaken at Annex C identifies that the traffic pattern is generally as expected and therefore similar to that predicted during the trial. The track plots used for the purposes of Annex C show the SID design avoids densely populated areas, particularly during early stages of flight where aircraft are lower and therefore typically noisier. The track density plots (Annex J) identify that here has been a shift in the main core of the traffic pattern away from the densely populated areas of Hemel Hempstead and the southern extremities of St Albans. Although as a consequential effect, this has shifted the core traffic pattern closer to Redbourn, South Harpenden and Harpenden. Although the main core track is closer to Redbourn, South Harpenden and Harpenden, the core track does not

directly overfly these locations and instances of direct overflight are as a result of vectoring as they were before the change.

94. Therefore, it is concluded that the aim of reducing the number of people overflown has been met. We have reached this conclusion by comparing the pre and post implementation track plots.

Aircraft Noise

95. The formal submission included an assessment of aircraft noise and consistent with CAP725, daytime Leq noise exposure contours were portrayed down to 54 dB $L_{Aeq,16hr}$. These Leq contours were produced for 'With ACP' and 'Without ACP' scenarios for both the baseline year (2013) and the situation after traffic has increased under the new arrangements (2028).

96. As discussed in paragraph 57**,** the Aviation Policy Framework[15] states that the Government will continue to treat the 57dB $L_{Aeq\ 16\text{-}hour}$ contour[16] as the "average level of daytime aircraft noise marking the approximate onset of significant community annoyance" and therefore for the purposes of ACPs undertaken before 2018 and under CAP725, the 57dB $L_{Aeq\ 16\text{-}hour}$ noise contour is used as an indication to determine whether or not someone is likely to be "significantly affected" by aircraft noise[17].

97. The noise contours produced for the formal submission showed that there was unlikely to be an increase in the number of people or households exposed to levels of noise greater than 57 dB LAeq,16hr and therefore LAeq noise exposure contours were not used to inform the approval of the ACP and therefore were not requested for the purposes of the PIR.

[15] Secretary of State for Transport. Aviation Policy Framework. March 2013

[16] It should be noted that in *DfT UK Airspace Policy: A framework for balanced decisions: on the design and use of airspace 2017*, it is stated that Sensitivity to aircraft noise has increased, with the same percentage of people being highly annoyed at 54dB LAeq 16hr as there was at 57dB LAeq 16hr.

[17] For ACPs undertaken under CAP1616, noise contours are typically required to be reported down to at least 51dB LAeq16hr for daytime noise and 45dB LAeq8hr for night time noise. This is based on guidance within the UK Air Navigation Guidance 2017 which set a Lowest Observed Adverse Effect Level (LOAEL) of 51dB LAeq16hr for daytime noise and 45dB LAeq8hr for night time noise for the purposes of assessing and comparing the noise impacts of airspace changes. The LOAEL represents the level that an average person will begin to experience observable, or measurable, adverse effects on health and quality of life as a result of noise exposure.

LAeq Noise Exposure

98. Noise contours are sensitive to a number of parameters, including the number of aircraft movements, the type of aircraft, the flight path over the ground (i.e. ground track) and associated vertical climb profile, of these parameters, only the ground track and climb profile are influenced by the ACP.

99. The noise modelling methodology used for the purposes of the ACP assumes the actual flown ground track for all departure and arrivals routes. The ground track is informed by track dispersion diagrams and track density diagrams presented at Annex H - K show that there are minimal changes between the trial and post-implementation. Therefore, it is concluded that if LAeq noise modelling was to be repeated today and updated with the actual flown RNAV-1 ground track, there are unlikely to be any changes in noise exposure from that predicted within the formal submission for the trial.

100. It should be noted that annual airport noise contours produced for the purposes of fulfilling Condition 10 of planning permission 15/00950/VARCON do show a trend of increasing noise exposure. However, these increases in noise exposure are likely due to increases in aircraft movement numbers and changes to aircraft fleet and not the RNAV-1 SID. It should also be noted that the London Luton Airport Round 3 Noise Action Plan (2019-2023)[18] annual period 57 dB LAeq,16hr contour for 2018 extends only as far as Markyate to the southwest of the airport and therefore does not encompass Flamstead, Redbourn, Hemel Hempstead, St Albans and Sandridge. Furthermore, a similar pattern can be observed in the 57dB LAeq, 16hr contours produced for the 2018 London Luton Airport Annual Monitoring Report which do not extend beyond Markyate to the southwest of the airport.[19]

SEL Noise Footprints

101. In addition to 57 dB Leq contours, CAP 725 requires that 90 dB and 80 dB SEL footprints to be produced when the proposed airspace change includes changes to the distribution of flights at night below 7,000 feet agl

[18] London Luton Airport. Noise Action Plan 2019-2023. https://www.london-luton.co.uk/LondonLuton/files/b5/b53019bb-a021-43c1-bf07-620048371966.pdf [accessed May 2019].

[19] London Luton Airport. Annual Monitoring Report 2018. https://www.london-luton.co.uk/LondonLuton/files/0a/0aa9e19e-3ffc-4eb6-87e1-59baee8c78ba.pdf [accessed Jan 2020]

and within 25 km of a runway. If required, the SEL noise footprints should be produced for both the noisiest and most frequent aircraft operations.

102. The SEL footprints are used to represent the extent of noise energy generated from a single aircraft event (for example an aircraft taking off). The 90 dB SEL footprints are based on findings within The Report of a Field Study of Aircraft Noise and Sleep Disturbance[20], which found that for outdoor aircraft noise events below 90 dB SEL, the average person's sleep is unlikely to be disturbed, and between 90 and 100 dB SEL, the chance of an average person being awoken by that aircraft noise event was found to be about 1 in 75.

103. Therefore, because the ACP includes changes to the distribution of flights at night below 7,000 feet agl, 90 dB(A) and 80 dB(A) SEL footprints were required. The SEL footprints were produced for both the most common (Airbus A320) and the noisiest (Airbus A300) aircraft operating at the airport. The formal submission concluded that:

- **90 dB(A) SEL**: There was no difference in the total number of people affected because of this ACP by the 90 dB(A) SEL footprint for both the Airbus A320 and Airbus A300.
- **80 dB(A) SEL (Airbus A300)**: That the Airbus A300 affected an additional 900 (2.4% increase) for the 210 knots design and 600 (1.6% increase) people for the 220 knots design[21].
- **80 dB(A) SEL (Airbus A320)**: There was no discernible change in the numbers of people affected by the noise footprints for the Airbus A320.

104. Due to the negligible change in aircraft night-noise, the SEL footprints were not used to inform the approval of the ACP and therefore were not requested as part of the PIR data request.

Aircraft Noise at key monitoring location

105. To understand if average measured noise levels are at a similar level to that predicted for the trial and before implementation, LLAOL were requested to provided post implementation maximum sound level (LAmax) noise monitoring data at the same locations and for a duration consistent with those used in the ACP submission. The maximum sound level was used as these show the increase for a single aircraft event and are

[20] Department of Transport [since renamed Department for Transport], December 1992

[21] The approved RNAV SID has a maximum speed restriction in the turn of 220 knots

therefore not influenced by changes to aircraft movements and other departure routes. In addition, the Airbus A320 was used as this was the most frequently operating aircraft in 2013 before the change and in 2017 following implementation. It should be noted that no measurements were captured for the noisiest aircraft (Airbus A300) and therefore it is not possible to show any noise monitoring results for this aircraft. Note – see explanation in paragraph 107.

106. **Table 7** compares pre-implementation average A320 LAmax noise levels with post-implementation noise levels. The noise monitoring shows that the introduction of the RNAV-1 SID has resulted in a decrease in aircraft noise in all monitoring locations, with the exception of Slip End. It should be noted that the noise increase in noise in Slip End was predicted and reported in the formal submission. Based on the results of the noise monitoring it is therefore considered that RNAV-1 route reduces the noise in more areas than are adversely affected.

Table 7 - A320 LAmax noise monitoring results

Noise Monitoring location	**Average Airbus A320 Noise Level, dB LAmax – Arithmetic Mean**		
	Pre-implementation (March 2013)	**2014 220 kts RNAV Trial**	**Post-implementation (2017)[1]**
South Luton	78.5	N/A	78.4 (-0.1)
Slip End	72.6	73.8	74.2 (+1.6)
Flamstead	68.1	68.1	65.0 (-3.1)
Redbourn	64.2	63.2	63.0 (-1.2)
Hemel Hempstead	67.2	66.3	64.0 (-3.2)
St Albans	63.9	65.1	63.8 (-0.1)
Sandridge[2]	63.6	N/A	60.5 (-3.1)

Note 1. Noise data reported in LLAOL RNAV assessment letter to CAA 020519

Note 2. Data for Sandridge extracted from Sandridge Community Noise Report (Annex F)

Noise in South Luton

107. During the ACP trial it was noted that there was an unanticipated increase in noise levels recorded in South Luton. This increase in noise levels was attributed to aircraft making a later first turn as an unintended consequence of the trialled RNAV-1 route. Therefore, as discussed in Paragraph 80 the altitude at which aircraft may turn after departure was revised back to 1030ft AMSL which is consistent with the conventional SID design.

108. To understand if average measured noise levels in South Luton are now at a similar level to that before the change, LLAOL were requested to provided post implementation noise monitoring data at the same location and for a duration constituent with those used in the ACP submission.

109. To inform this assessment, the Sponsor undertook a noise monitoring survey in South Luton between 3 March 2017 and 17 March 2017. The noise monitor was located in Ludlow Avenue and directly under the extended Runway 26 centreline, approximately 2.5km from the runway end. During the 2017 survey period a total of 1943 aircraft events were recorded. The most common aircraft types operating during the trial were the Airbus A320 and the Airbus A319 and the noisiest aircraft was the Boeing 737-400. It should be noted that as discussed in paragraph 105, the noisiest aircraft before the change, the A300, was not operating in 2017. In addition, noise levels for the Boeing 737-400 were not reported in the formal submission and therefore it is not possible to make comparisons noise levels for the noisiest aircraft.

110. When compared with average LAmax noise level before the change and presented earlier in **Table 7,** it can be seen that the A320 (the most frequently operating aircraft) has reduced by 0.1 dB from 78.5 dB in 2015 to 78.4 dB in 2017. In addition to Airbus A320 noise monitoring shown in Table 3**, Figure 1** of **Annex F** shows the average LAmax noise level for various aircraft type and **Figure 2** of **Annex F** shows a histogram of LAmax sound levels. The figures show that the average LAmax noise level for the next most frequently operated aircraft, the Airbus A319 was 79 dB and therefore consistent with the average pre-implementation LAmax reported in the formal submission. It is therefore concluded that the minor SID design has been successful in its aims and has not resulted in an increase of aircraft noise in South Luton.

Figure 1 – 2017 average maximum Sound Level by Aircraft Type in South Luton

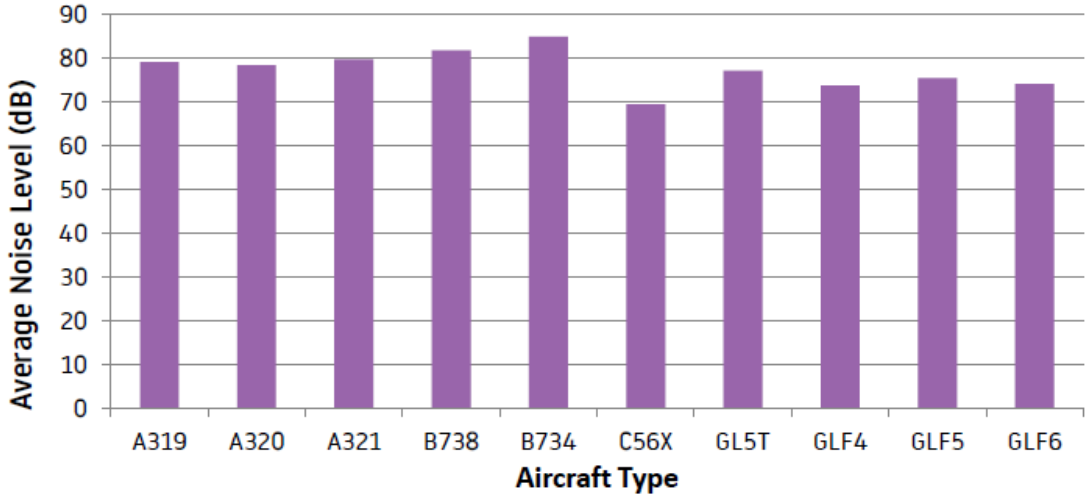
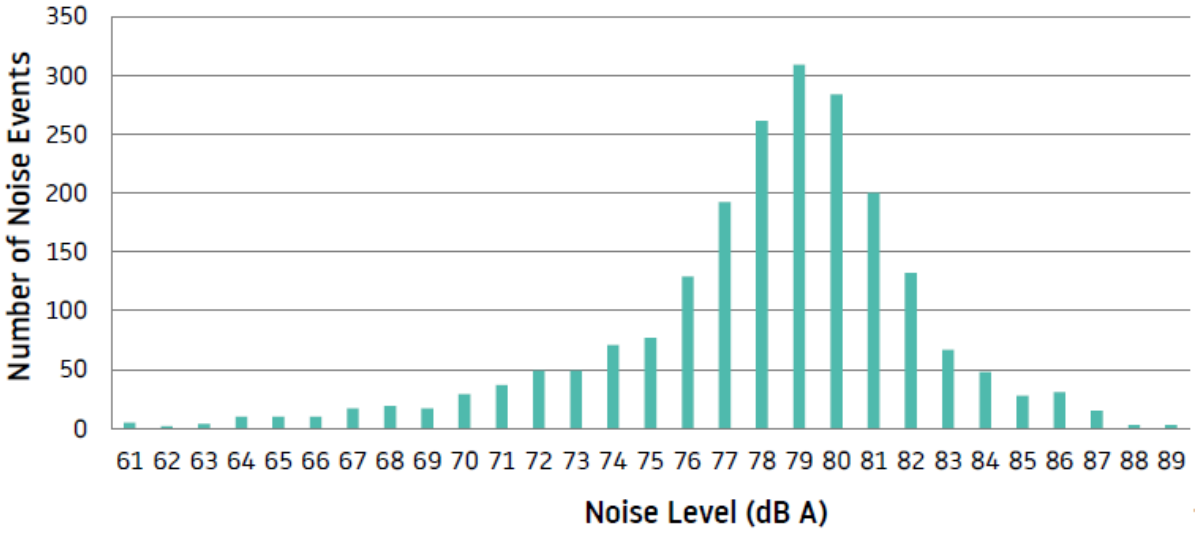


Figure 2 – 2017 Histogram of maximum sound levels in South Luton



Note: Figures 1 and 2 re-produced with permission from LLAOL.

Noise in Sandridge

111. As part of the formal submission, LLAOL proposed to undertake noise monitoring in Sandridge to identify whether the RNAV-1 SID resulted in an increase in noise. LLAOL were therefore required to provide a report on the results of the proposed noise monitoring in Sandridge and an outline of any steps to redesign (or not) the SID in that location because of the findings.

112. To achieve this requirement, LLAOL undertook a noise monitoring survey in Sandridge (see *FLT-RPT-004-17 Sandridge Community Noise Report Version 1.pdf* at Annex G**)**. The survey was undertaken between 30 March 2017 and June 2017. The results from this survey were compared with results of 2014 noise monitoring survey, which was undertaken between 22 July and 19 September 2014. For both surveys, the noise monitor was located at St Helier Road.

113. During the 2017 survey, the noise monitor recorded 4081 aircraft events and during the 2014 survey a total of 1923 aircraft events were recorded.

114. A summary of the noise monitoring report provided by LLAOL is presented in Figures 3 to 6:

- **Figure 3** shows the average LAmax by aircraft type in 2014;
- **Figure 4** shows the average LAmax by aircraft type in 2017;
- **Figure 5** shows a histogram of LAmax sound levels in 2014 and **Figure 6** shows a histogram of LAmax sound levels in 2017.

115. The results provided by LLAOL show that in 2017, the most frequently operating aircraft was the Airbus A320, which is consistent with that used within the formal submission. However, the noisiest aircraft in 2017 was the Boeing 737-400, however, this is because the A300 which was used in the formal submission is no longer operating.

For the A320 the result show that the noise level has reduced by 3.1 dB from 63.6 dB in 2014 to 60.5 dB in 2017 and noise levels for the Boeing 737-400 have reduced by 1.6 dB from 65.6 dB in 2014 to 64.0 dB in 2017. It is therefore concluded that there has been no increase in aircraft noise in Sandridge because of this ACP.

Figure 3 - 2014 average maximum Sound Level by Aircraft Type in Sandridge

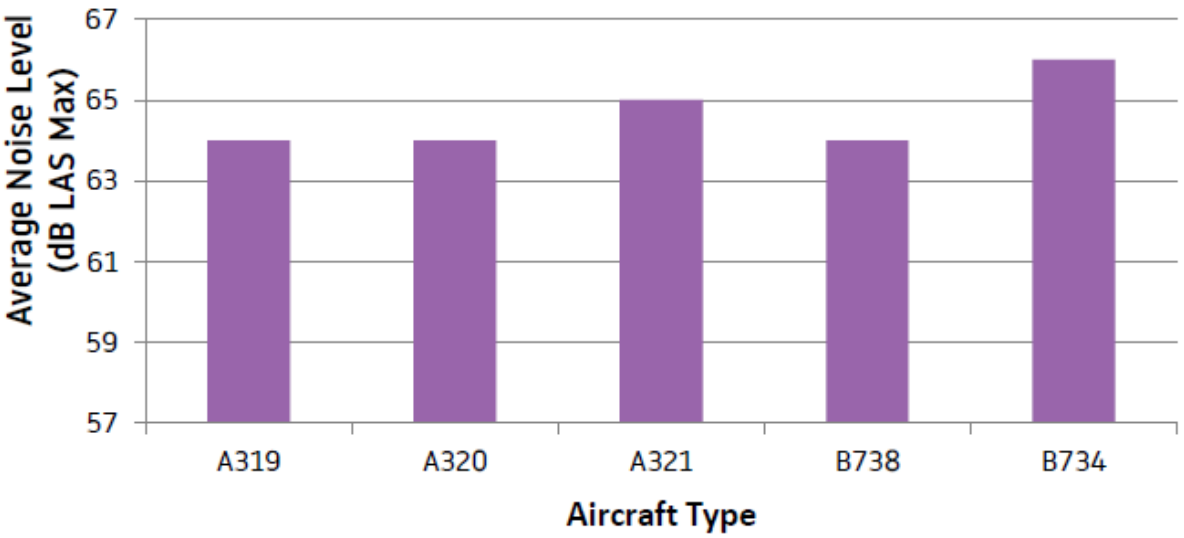


Figure 4 - 2017 average maximum Sound Level by Aircraft Type in Sandridge

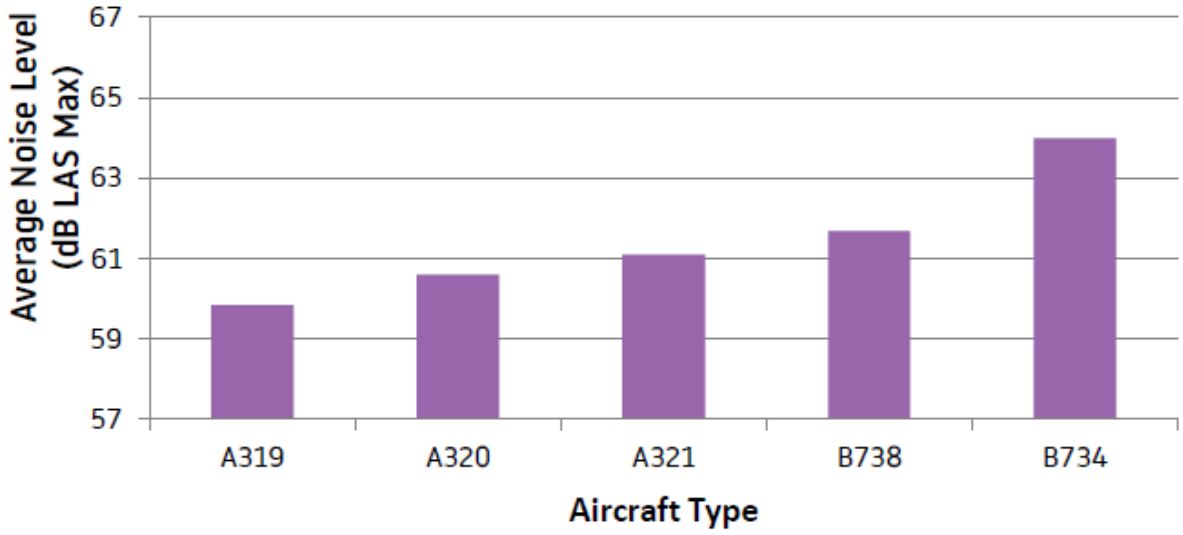


Figure 5 - 2014 Histogram of maximum sound levels in Sandridge

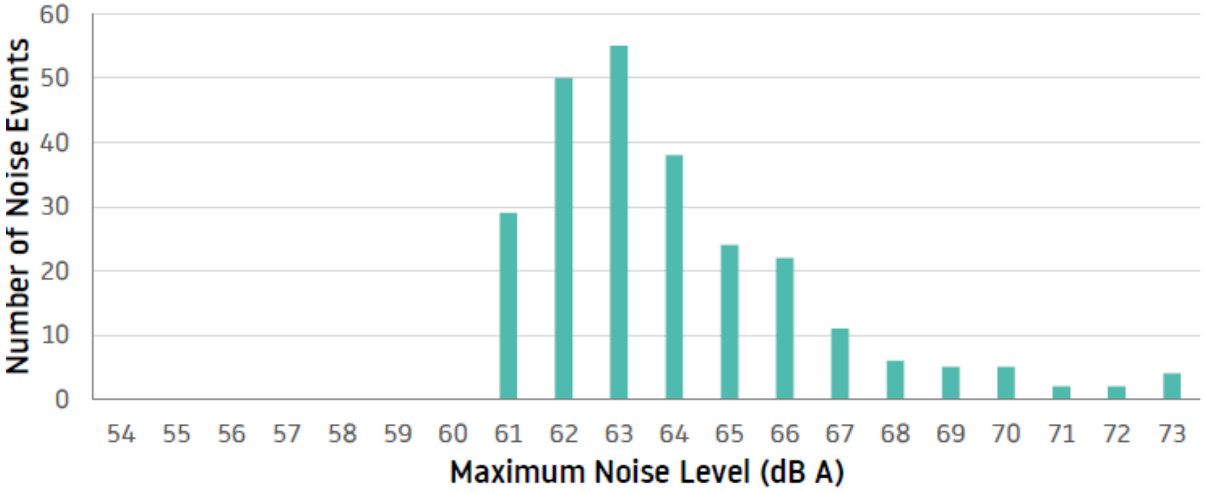
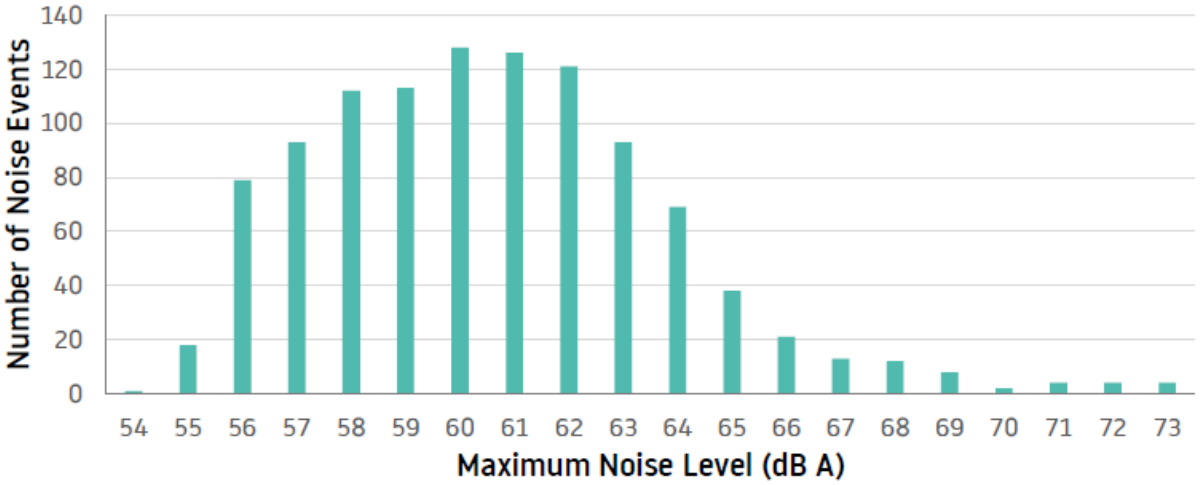


Figure 6 - 2017 Histogram of maximum sound levels in Sandridge



Note: Figures 3, 4, 5 and 6 re-produced with permission from LLAOL.

Local Air Quality

116. CAP725 requires that an assessment of local air quality is undertaken where there is the possibility of pollutants breaching legal limits following the implementation of an airspace change. In the UK, if a local authority finds any places where EU regulatory limits are not likely to be achieved, it must declare an Air Quality Management Area (AQMA). In addition, in more recent DfT and CAA guidance, namely Air Navigation Guidance

2017[22] and CAP1616[23] identify that *"Due to the effects of mixing and dispersion, emissions from aircraft above 1,000 feet (amsl) are unlikely to have a significant impact on local air quality".*

117. The nearest AQMAs to the airport are in Luton and along the M1. The nearest of which is the Luton AQMA No.3 which, is approximately 2 km North West from the end of Runway 26 and not overflown by the RNAV-1 route. In addition, track dispersion plots analysed in Annex B show that there are minimal changes to aircraft height as result of the ACP. Therefore, it is considered unlikely that changes to aircraft flight patterns because of the ACP have had any significant impact upon local air quality.

Environmental Conclusions

118. From the analysis of track data both in Annex C and Annex D, we have seen that the main core of departures along the Brookmans Park RNAV-1 SID has reduced direct overflight of the densely populated areas of Hemel Hempstead, Redbourn and the southern areas of St Albans (south of the A1057) and some areas of northern St Albans (north of the A1057). However, as a consequential effect of moving the RNAV-1 SID from densely populated areas, the main core of departures has moved closer to Redbourn, Harpenden and South Harpenden, whilst managing not to directly overfly these areas.

119. We concluded that the change has:

1. reduced direct overflight of Hemel Hempstead, Redbourn, the southern area of St Albans (south of the A1057) and some areas of northern St Albans (north of the A1057), (in the case of St Albans, probably due to radar vectoring);
2. reduced the amount of dispersion up to the St Albans to Harpenden Railway Line;
3. introduced a more concentrated traffic pattern as far as Hatfield and beyond;

120. there has been a shift in the main core of the traffic pattern away from the densely populated areas of Hemel Hempstead and the southern

[22] Department for Transport (DfT). Air Navigation Guidance 2017. Guidance to the CAA on its environmental objectives when carrying out its air navigation functions, and to the CAA and wider industry on airspace and noise management. October 2017. https://www.gov.uk/government/publications/uk-air-navigation-guidance-2017 [accessed May 2019].

[23] CAA. CA1616: Airspace Design: Guidance on the regulatory process for changing airspace design including community engagement requirements. November 2018. https://publicapps.caa.co.uk/modalapplication.aspx?appid=11&mode=detail&id=8127 [accessed May 2019].

extremities of St Albans (as far east as the St Albans to Harpenden railway line), although as a consequential effect, this has shifted the core traffic pattern closer to Redbourn by 0.75Nm (1400m), and slightly closer to Childwickbury, South Harpenden and Harpenden by approximately 300-400m by the time departures cross the A1081 heading east;

121. there is no change in the traffic pattern directly over Wheathampstead (note the main core track of the traffic pattern (as it overflies Sandridge) is approximately 3.7km from Wheathampstead). See also paragraph 108;

122. There has been a negligible shift of the main core of traffic pattern in the vicinity of the northern area of Flamstead, the northern area of St Albans (east of the St Albans to Harpenden railway line and north of the A1057), Sandridge, Wheathampstead and Hatfield.

123. It should be noted that there is still direct overflight of South Harpenden, Harpenden, Wheathampstead and Welwyn Garden City to the north, however, this is as a result of aircraft vectoring and not the SID design. This vectoring is despite a commitment in the ACP for vectoring to not normally occur prior to the railway line between St. Albans and Harpenden and until aircraft had passed 4,000ft and despite the restriction being formalised in LTCC MATS Part II. It is therefore recommended that LLAOL engage further with NATS LTC Operations to determine whether any improvements can be realised. LLAOL and NATS TC Ops should agree that such arrangements are adequately formalised and adhered to, if any enhancements to the existing operational procedures are possible and achievable.

124. Operational reports produced by LLAOL demonstrate that aircraft movements have increased by 30% between 2015 and 2017, however, it should be noted that the change proposal was not an enabler for an increase in airport capacity (increase in aircraft movements), nor was the proposal an enabler for an increase in traffic operating earlier in the morning or later in the evening periods. The increase in traffic has led to an increase in aircraft noise exposure levels (expressed as LAeq,16h). Despite this increase in traffic and noise exposure, noise monitoring surveys show that there has been a decrease in maximum sound levels (LAmax) in the majority of areas, which suggests that noise from direct overflights has decreased.

125. Another consequential effect of the RNAV-1 SID is the concentration of aircraft movements. Whilst this concentration of traffic has been successful in reducing the number of people overflown it has also resulted in some communities experiencing an increase in the frequency of overflights. However, this effect was anticipated by the CAA in its original decision

126. It should be noted that LLAOL's Community Noise Report for South Luton shows that revising the altitude at which aircraft make the first turn after departure back to 1030ft AMSL has been successful in reducing noise in South Luton. In addition, LLAOL's Community Noise Report for Sandridge demonstrates that Lmax noise level have reduced. The Sandridge noise report also shows that the average height of aircraft has reduced from 6400ft to 6150ft. It is concluded that this reduction in height will have a negligible effect on aircraft noise.

127. Although outside of the scope of the ACP track adherence to the NPR compliance swathe has also been reviewed. This review has identified that adherence to the new, narrower NPR compliance swathe has decreased. It is therefore recommended that that LLAOL continue to engage with airlines and work collaboratively to identify how further track-keeping improvements can be made, particularly for the worst-performing airlines (see Recommendation 1).

128. It is also concluded that there have been no negative impacts on Local Air Quality, tranquillity, visual intrusion or biodiversity.

129. As a result of the environmental analysis of the PIR data received we conclude that the anticipated impacts and benefits are as the CAA expected.

CAA review of submissions provided by Third Parties

Community Stakeholder observations

130. As part of the data collection process, the change sponsor was required to accept, process and collate noise enquiries/complaints relating to the implementation of this airspace change. This data was subsequently analysed by the change sponsor and submitted to the CAA in support of this Review. The change sponsor provided stakeholder observation data covering the following periods:

- July to November 2016 – a 6-month period following the implementation of the original airspace change proposal. During this time, the change sponsor received a total of 1,782 enquiries/complaints from 322 different postcode locations.
- February to September 2017 – an 8 month period following the implementation of the amended BPK RNAV-1 SID. During this time, the change sponsor received a total of 9,722 enquiries/complaints from 709 different postcode locations.

128. A total of 11,504 enquiries/complaints from 1,031 different postcode locations were received by the change sponsor during the two periods

specified above. As noted above, there has been an increase in Air Traffic Movements (ATMs) at LLAOL during this time and whilst this did lead to a related increase in the number of enquiries/complaints received by the change sponsor during this time, they acknowledge that the majority concerned the implementation of this airspace change proposal.

129. For this Review, we have focussed on the data covering the February to September 2017 period as this covers the implementation of the amended BPK RNAV-1 SID. During this time the change sponsor received 9,722 enquiries/complaints generated by 709 different postcode locations. Within their PIR submission, the change sponsor specified postcode locations as opposed to individuals, so it was not possible to determine the number of individual complainants involved.

130. Focussing on the geographic location, the CAA notes that the highest number of enquiries/complaints came from postcodes in the Harpenden, Sandridge, and north St Albans areas; a total of 3,070 enquiries/complaints were generated by 183 AL4 9 postcodes (St Albans and Sandridge) whilst 1,051 were generated by 28 AL5 1 postcodes (Harpenden). Most enquiries/complaints concerned specific aircraft movements, with the complainants highlighting that the associated noise impact was too loud. The change sponsor also received enquiries/complaints concerning the frequency of aircraft activity on the new departure route. It is likely that a proportion are related to the increase in ATMs that London Luton airport experienced during this time.

131. In addition to the feedback noted and considered above, the CAA has analysed the enquiries/complaints which it received directly from stakeholders following the implementation of this airspace change proposal. The analysis focussed on enquiries/complaints addressed to the CAA's Chair, Chief Executive Officer and/or Group Director Safety Airspace Regulation as well as those submitted via the 'Use of UK Airspace Report' form (FCS1521).

132. From the date of implementation (20th August 2015) up to the start of this review (30th March 2019), the CAA received a total of 491 enquiries/complaints from 338 individual complainants concerning the implementation of this airspace change proposal. 72 enquiries/complaints were addressed to the CAA's Chair, Chief Executive Officer and/or Group Director Safety Airspace Regulation whilst 419 were submitted via the Airspace Use Report form (FCS1521). With regards to the latter, this includes several enquiries/complaints that were addressed to the generic airspace.policy@caa.co.uk mailbox and subsequently transferred across to the Use of UK Airspace Report database.

133. We have used postcode/location data (where it has been provided) to plot the enquiries/complaints to identify specific areas where multiple complainants reside. We used election boundary maps from the Ordnance Survey website to group them into areas (see below) where more than 5 complainants reside.

- St Albans (235 complaints from 136 complainants)
- Sandridge Civil Parish (173 complaints from 129 complainants)
- Harpenden Civil Parish (34 complaints from 23 complainants)
- Wheathampstead Civil Parish (8 complaints from 8 complainants)
- St Michaels Civil Parish (10 complaints from 7 complainants)

134. Several common themes were identified when reviewing the content of these enquiries/complaints, with much of the correspondence received by the CAA highlighting that there had been a noticeable change/increase in the amount of aircraft noise experienced since the implementation of the change and that this was having a detrimental impact on health/quality of life. As stated above, London Luton airport experienced an increase in ATMs during this time, therefore it is likely that a proportion of the enquires/complaints were submitted because of the increase in ATMs as opposed to the implementation of the change (which was not an enabler for an increase in airport capacity (increase in aircraft movements), nor was the proposal an enabler for an increase in traffic operating earlier in the morning or later in the evening periods), particularly when considered against other key themes that were identified, which concerned airport expansion and the frequency of air traffic passing overhead. Within the enquiries/complaints, there were also specific references to a flight path change, the concentration of air traffic, early morning/late night flights and low flying. Whilst a number of enquiries/complaints challenged the validity of the consultation associated with this airspace change proposal, the primary objective of this review is to consider whether the impacts and benefits, as set out in the airspace change proposal, have actually been as anticipated and to identify any operational issues that may have arisen.

135. A comparison of complainants' locations in relation to London Luton's traffic patterns both before and after the implementation of the change has been completed, with the main conclusion being that there have been no unanticipated impacts other than the variance in radar vectoring before the railway line and the slight reduction in altitude over Sandridge.

136. To summarise, we have analysed the enquiries/complaints received by the change sponsor and the CAA as part of this Review. As a result of our analysis, we have concluded that the correspondence received is consistent with the traffic patterns we were expecting and observed when

carrying out our aircraft track analysis and do not give rise to any unforeseen impacts of the proposal.

SurveyMonkey feedback analysis

137. The change sponsor provided PIR data to the CAA to facilitate the CAA PIR process. Whilst the PIR has been undertaken in line with the CAP 725 process and its associated metrics, given that CAP 1616 , 'Guidance on the regulatory process for changing airspace design including community engagement requirements', was introduced in January 2018, it was decided by the CAA that we should apply whatever principles from CAP 1616 that were realistic, considering that the PIR data requirements had already been provided to LLAOL in January 2017 and that the subsequent PIR data was then provided to the CAA in October 2017, all before the publication of CAP 1616.

138. As the PIR has been conducted using CAP 725 metrics, the only element of the CAP 1616 process that we could apply was to publish the PIR data to seek feedback on the data and the impact of the change. This was achieved by publishing the PIR data on the CAA website and using SurveyMonkey to gather feedback. Therefore, PIR data was published in the format as requested by the CAA.

139. This review process included the publication of data received from the change sponsor and the opening of a 28-day feedback window via SurveyMonkey, in which any stakeholder could provide any feedback on the data received and the impact of the change.

140. The Change Sponsor's data analysis and PIR data documentation was published on the CAA website on 30 May 2018 and stakeholders were invited to submit their own observations through the online SurveyMonkey platform. The feedback survey closed on Monday 2 July 2018. We have analysed the SurveyMonkey data received by the CAA from stakeholders and members of the public as part of this review.

141. A total of 175 SurveyMonkey responses were received answering 16 questions. Three responses were discounted due to test submissions and duplicate responses.

142. This process involved collating the feedback and then analysing that feedback to assist the CAA in determining whether the impacts of the change were as expected in our 2015 decision. The feedback received, together with a detailed analysis of the responses is provided at Annex E together with a summary of the main themes of the feedback.

143. A significant theme raised by stakeholders throughout the responses concerned the increase in traffic levels since the RNAV-1 SID was implemented in 2015, and that the noise impacts were not as expected, causing impacts to health and wellbeing. Flights were also operating earlier in the morning and later in the evening, thus increasing the exposure to noise. Airport expansion and the increase in air traffic is not something for which the CAA has a regulatory responsibility, and therefore, the increase in movements and the impact of increased noise is a matter for the appropriate planning authorities; this proposal was not an enabler for traffic increases, nor did it enable any increase of flights in the early morning periods or late on in the evening periods. This is not a matter for the CAA to consider with this change proposal and the subsequent PIR, although we recognise that the increase in movements has probably given rise to an increase in noise complaints.

144. Following the CAA review of stakeholder feedback in Annex E, we have addressed the variety of topics in the PIR report and associated annexes. As a result of our PIR review, we have concluded that the feedback received through the SurveyMonkey process is consistent with the anticipated impacts of this airspace change proposal.

Conclusion

Operational Conclusions

145. The CAA is satisfied that the implementation of the proposal has not adversely affected the safety on the operation provided at London Luton Airport and allied surrounding airspace within which the SIDs are located and which was already tolerably safe.

146. As a result of the implementation of the amended RNAV-1 SIDs in Feb 2017 to address issues affecting some operators with Boeing aircraft, there have been no adverse impacts on any aspects of service delivery and specifically, there have been no adverse impacts on safety and airspace efficiency.

147. Generally, since Feb 2017, the flyability of the SIDs by the various airlines is as expected and the main core of flight tracks in the dispersion tracks plots provided to the CAA by LLAOL support this conclusion.

148. While Luton provided monthly airline track dispersion plots to the CAA, there was no evidence provided by LLAOL these airlines were engaged with, to explain their flight tracks. It is recommended LLAOL continue to engage with airlines and work collaboratively to identify whether track-keeping improvements within the NPR monitoring swathe can be achieved as necessary, particularly for the worst-performing airlines (as highlighted in Annex C).

Environmental conclusions

149. Following the implementation and operation of the RNAV-1 SIDs via Brookmans Park and a review of the PIR data by the CAA, the CAA has concluded that the impacts are as expected, and as portrayed in the CAA decision of 13 August 2015. The CAA has, however, noted that some radar vectoring is occurring before the St Albans to Harpenden railway line.

Complaints conclusion

150. As a result of our analysis, the CAA has concluded that the themes associated with a significant proportion of the total received are consistent with the traffic patterns we were expecting and observed when carrying out our aircraft track analysis and do not give rise to any unforeseen impacts of the proposal.

Overall conclusion and confirmation of London Luton Airport Runway 26 RNAV-1 SIDs via Brookmans Park

151. Following the implementation and operation of the RNAV-1 SIDs via Brookmans Park and a review of the PIR data by the CAA, the CAA has concluded that the impacts are as expected, and as portrayed in the CAA decision of 13 August 2015. The CAA has, however, noted that some radar vectoring is occurring before the St Albans to Harpenden railway line.

152. The CAA's airspace change process in respect of the LLAOL airspace change request dated 29 August 2014 has now been confirmed and concluded.

Note on plain language

153. The CAA has attempted to write this report as clearly as possible. Our approach has been to include all the relevant technical material but also to provide a summary and of the conclusions the CAA has reached in reliance on it in as understandable a way as possible. Nevertheless, when summarising a technical subject there is always a risk that explaining it in more accessible terms can alter the meaning. For that reason, the definitive version of our assessment and conclusions are in the attached technical reports.

List of Annexes