

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

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- 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-1² 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 routing 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