Safety and Airspace Regulation Group

UK Civil Aviation Authority

Truncation of London Heathrow WOBUN and BUZAD SIDs (ACP-2017-73) – Post Implementation Review

CAP 2133

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Contents

Contents 3
Executive summary 4
Scope and background of the PIR 5
What is a Post Implementation Review? 5
Background to our conclusions in this PIR Decision 6
Conditions attached to the CAA's decision to approve the change. 6
Relevant events since change (if any) 6
Data collected for the purpose of the PIR 6
Sources of Information 6
Objectives and anticipated impacts 7
The original proposal and its objectives 7
Anticipated Impacts 7
CAA assessment 9
Operational Assessment 9
Safety 9
Operational Feedback 10
Air Navigation Service Provision 10
Utilisation and Track Keeping 11
Traffic 14
Infringements and Denied Access 15
Letters of Agreement 15
Environmental Assessment 15
Community Stakeholder observations 15
International Obligations 15
Ministry of Defence Operations 15
Any other impacts 15
Conclusion 16
Note on plain language 16

Executive summary

1. The CAA's airspace change process is a seven-stage mechanism that is set out in detail in CAP 725[1]/CAP1616[2]. Under this process NATS and Heathrow Airport Ltd submitted an Airspace Change Proposal (ACP) to reduce the length of the "WOBUN" and "BUZAD" Standard Instrument Departures (SIDs) to the CAA on 11th December 2017. The aim of this ACP was to improve aircraft fuel efficiency by reducing the length of time aircraft would plan to fly at low level and thus reducing the amount of fuel needed to be carried (aircraft burn more fuel at lower levels than at higher ones and must carry sufficient fuel to fly the planned route).

2. The proposals were accepted by the CAA on 22nd February 2018 and implemented on 24th May 2018. Competing priorities for the allocation of resources meant that the CAA was unable to start the Post Implementation Review (PIR) one year after implementation as would normally be expected. Instead the CAA commenced the PIR of the impact of its decision and the implemented change on 17th April 2020. The content and outcome of the review process by the CAA is discussed in detail in this report.

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. Irrespective of whether the CAA decision to approve the change was made under the previous process (set out in CAP 725), we will conduct all Post Implementation Reviews in accordance with the process requirements of CAP1616. However, when assessing the expected impacts against the actual impacts we will use the methodology adopted at the time of the original CAA decision in order to do so. In this particular case, the airspace change was conducted in accordance with the CAA's SID Truncation Policy[3] . As such, the change followed a "lighter touch" process than the full CAP 725 requirements, since it was aimed at delivering environmental benefits by removing a requirement to carry unnecessary fuel, without changing the vertical and lateral trajectories actually flown by aircraft.

4. During the review process, the CAA considered the formal response from the Sponsor which is contained in the Sponsor's documents:

   - Post Implementation Review Feedback Form

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

[2] https://publicapps.caa.co.uk/modalapplication.aspx?appid=11&mode=detail&id=8127

[3] https://publicapps.caa.co.uk/modalapplication.aspx?catid=1&pagetype=65&appid=11&mode=detail&id=6027

- Post Implementation Review Report
- Post Implementation Engagement Evidence

Redacted versions of these documents are available on the CAA website.

5. As a result, the CAA has reached the following conclusion:

> The CAA is satisfied that, following the adoption of mitigation actions to improve clarity (publication of NOTAMs, adding route information to the SID descriptions in the UK AIP, additional information added to some third party SID charts, direct communication with specific airlines), the truncation of the WOBUN and BUZAD SIDs back to UMLAT and ULTIB has satisfactorily achieved the intended objectives, and the change is confirmed.

6. This report provides the information the CAA has reviewed and taken into account before reaching these conclusions.

Scope and background of the PIR

What is a Post Implementation Review?

7. 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 [725/1616]. 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).

8. The Guidance states that the purpose of a PIR "is for the change sponsor to carry out a rigorous assessment, and the CAA to evaluate, 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".

9. If the impacts are not as predicted, the CAA will require the change sponsor to investigate why and consider possible mitigations or modifications for impacts that vary from those which were anticipated to meet the terms of the original decision.

10. 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

11. On the 22nd February 2018 the CAA approved the truncation of the Heathrow westerly WOBUN SID from point WOBUN back to point UMLAT (to become the UMLAT SID) and the easterly BUZAD SID from point BUZAD back to point ULTIB (to become the ULTIB SID). This change was implemented on the 24th May 2018.

12. Due to reports of confusion as to which route should be followed (particularly following runway direction changes where the UMLAT SID had been planned but the ULTIB SID was the one actually flown), the CAA required a full PIR to be undertaken for this ACP, rather than the abridged version which would be used where there were no operational, environmental, or stakeholder implications.

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

13. No conditions were attached to the CAA decision.

Relevant events since change (if any)

14. None except as detailed elsewhere in this document.

Data collected for the purpose of the PIR

Sources of Information

Change Sponsor

15. In addition to the original SID Truncation submission and supporting material, the Sponsor provided a formal PIR Report and Stakeholder Engagement Evidence document. The CAA has also seen examples of relevant Safety Investigation summaries produced by the Sponsor but these will not be published due to the confidential nature of the information they contain.

CAA

16. Confirmation was sought and received from the relevant CAA En Route ATM Inspector that the mitigating actions put in place by the sponsor had resolved the safety concerns[4].

[4] CAA internal discussion 27/11/20.

Objectives and anticipated impacts

The original proposal and its objectives

17. The objective for this airspace change was to reduce the amount of unnecessary fuel carried by airliners leaving Heathrow to the north.

18. Airliners are required to carry sufficient fuel to fly their planned route, plus a defined reserve. Because modern aircraft fly more efficiently at higher altitudes, any restriction which causes them to stay lower increases fuel burn. This consequently requires more fuel to be carried in line with the anticipated consumption, which in turn requires extra fuel to be carried to account for carrying the additional weight. (Airliners do not routinely simply have their tanks filled at each refuelling stop due to the weight penalty of carrying unnecessary fuel.)

19. NATS submitted a proposal to the CAA to reduce the distance northbound aircraft leaving Heathrow formally have to plan to stay low by approximately 20 nautical miles.

Anticipated Impacts

20. The sponsor's submissions for the BUZAD SID truncation to UMLAT and WOBUN SID truncation to ULTIB stated that:

> "This SID Truncation is justified on the basis of fuel saving. The SID will be truncated by 19.8nm [UMLAT] / 20.9nm [ULTIB].
>
> Currently for flight planning purposes these portions are flight planned to be flown at 6000ft however aircraft are invariably climbed to higher levels subject to the traffic scenario at the time.
>
> Some Aircraft Operators calculate fuel required based on the flight plan. By truncating the SID and effectively reducing the 6000ft level portion of the flight, the calculated fuel required will be less. Hence after the SID has been truncated the aircraft will be able to fly carrying less 'excess' fuel.
>
> The overall effect will be positive, and no flights will be penalized as a result of the change."

21. Because the numbers of flights operated with a fuel load based on the formal plan of flying the extra 19.8/20.9nm at 6000ft, rather than the daily experience of an early climb was not known, the sponsor considered that an aggregated quantitative fuel saving could not be identified. However, since every aircraft which carried, and thus burnt, less fuel as a result of the change would derive a positive financial and environmental benefit through the fuel and CO2 saving, the sponsor considered the

overall benefit must be positive since the change was identified as delivering no negative impacts.

22. Figure 1 shows the truncated parts of the SIDs (light blue). The current SIDs are shown in dark blue and the relevant parts of the main route network are in yellow. Prior to the truncations, airlines would be expected to plan to fly all the way to WOBUN or BUZAD at a maximum of 6000ft, and to carry the necessary fuel accordingly. Following the truncations, airlines can plan to start climbing above 6000ft from UMLAT or ULTIB, taking the corresponding reduced fuel consumption into account.

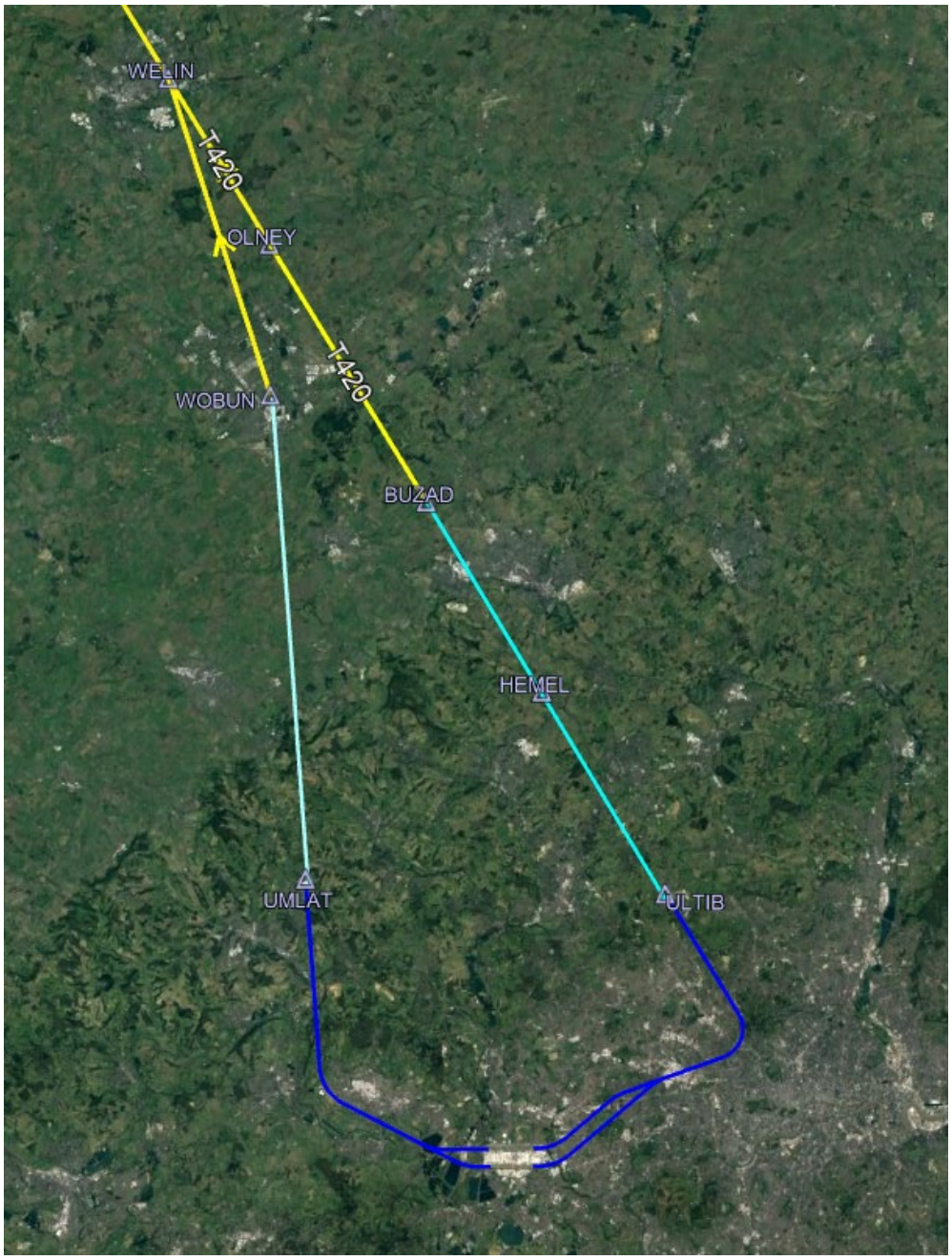

Figure 1 – The SID Truncations

CAA assessment

23. We have taken into consideration the interval since implementation and the change in utilisation of UK airspace when conducting this assessment.

Operational Assessment

Safety

24. The Sponsor reported that initially there was a degree of uncertainty/confusion about where aircraft should head once they had flown the truncated SID. In particular, this occurred when the wind, and thus runway, direction changed, as follows:

- Aircraft leaving London Heathrow file a flight plan for the expected departure direction. 70% of the time this is Westerly, so aircraft heading for WELIN would do so via UMLAT and WOBUN, using the UMLAT SID and ATS Route T418.
- When the wind changes direction, aircraft will need to head to WELIN via the Easterly direction (passing points ULTIB, HEMEL, BUZAD and OLNEY). This involves taking the ULTIB SID and ATS Route T420.
- While changing the aircraft navigation systems to fly an ULTIB SID rather than an UMLAT SID ensured the aircraft departed London Heathrow correctly, it did not change the list of expected intermediate points between the end of the SID and WELIN. This meant it was not necessarily clear to either Flight Crews or aircraft navigation systems where the aircraft should go next on the way to WELIN having reached point ULTIB. (The relevant aircraft navigational systems use the point names, rather than the route names, so the distinction between following ATS Route T418 and ATS Route T420 did not provide a cross-check within the aircraft navigation computers.)
- In some cases, the path via UMLAT and WOBUN was not fully cleared from the relevant aircraft systems following the wind direction change. Some aircraft navigation systems therefore indicated that having reached point ULTIB on the ULTIB SID, the aircraft should head to point UMLAT and then head to WELIN via WOBUN, rather than going via HEMEL, BUZAD and OLNEY.

25. The relatively short flying time to ULTIB (only a few minutes) mean that flight crews were faced with an unclear route while dealing with the other tasks associated with take-off, a point in the flight at which such distractions are extremely unwelcome.

26. In trying to clarify the situation, some flight crews contacted the Heathrow tower air traffic controllers for information. As this a non-standard query it introduced distraction and additional workload to an extremely busy operation. The Heathrow

controllers generally did not have the capacity to deal with the query and instructed the flight crews to ask the en route controllers once airborne. This introduced further workload as it meant there were two sets of flight crew-controller interactions.

27. The short flying time between Heathrow and ULTIB meant that the situation had not necessarily been resolved by the time the aircraft reached ULTIB, turning it from a planning issue into a tactical issue.

28. In some cases, aircraft turned the wrong way in an attempt to follow their previous flight plan. In extreme cases this took them towards other traffic or airspace structures, requiring immediate resolution by air traffic controllers.

Operational Feedback

29. Airlines reported initial Flight Crew uncertainty and track deviation issues, as discussed under Safety.

30. Following the resolution of these through revised planning and briefing materials (publication of a NOTAM, adding route information to the SID descriptions in the UK AIP, additional information added to some third party SID charts), no further issues have been raised.

Air Navigation Service Provision

31. As discussed under Safety, the Sponsor's Air Traffic Controllers initially experienced some disruption and additional workload due to the Flight Crew uncertainty and track deviation as discussed under Safety.

32. As both the Sponsor and the Air Navigation Service Provider, the Sponsor was responsible for ensuring the development and implementation of suitable resolutions to the issues. This involved publishing a NOTAM[5] in the first instance to ensure that flight crews and other relevant staff were aware of the potential issue. This was followed by a second NOTAM providing additional specific routing information. In some cases, airlines were contacted directly to draw their attention to the NOTAM if it appeared that their flight crews were not aware of it.

33. Further discussions then followed with the companies which provide the airlines with their navigation databases, and at NATS Lead Operator Panel, a forum which brings operational and flight planning experts together to discuss operational issues. The inclusion of a "reference track" to indicate the normal next direction to flight crews was raised as a potential solution, but each navigation data provider is entitled to implement a solution in the way which best works for their systems.

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[5] NOTAM – Notice To Airmen. The aviation industry's standard method for notifying operational staff of urgent issues. Operational staff are required to check information such as NOTAMs at the start of any duty period.

Utilisation and Track Keeping

34. As the new SIDs represent truncated versions of the previous SIDs, their utilisation remains unchanged (traffic heading north from London Heathrow, from the westerly or easterly runway as appropriate).

35. However, as noted under Safety, there have been acknowledged issues with track keeping, which is why this ACP has undergone a full PIR, rather than the shortened version which is applied to ACPs which have no material change on aircraft behaviour.

36. In particular, there were occasions where aircraft flying the new ULTIB SID headed west to try and join up with the route via WOBUN, rather than staying on the correct routing and heading north.

37. The below three figures show the original SIDs (dark blue) joining the route structure (yellow) at WOBUN and BUZAD (Fig 2); the truncated SIDs (dark blue) joining the route structure (yellow) at UMLAT and ULTIB (Fig 3); and the incorrect left turn from ULTIB to UMLAT (orange) which some aircraft tried to make so as to join up with the previously planned route via WOBUN (Fig 4).

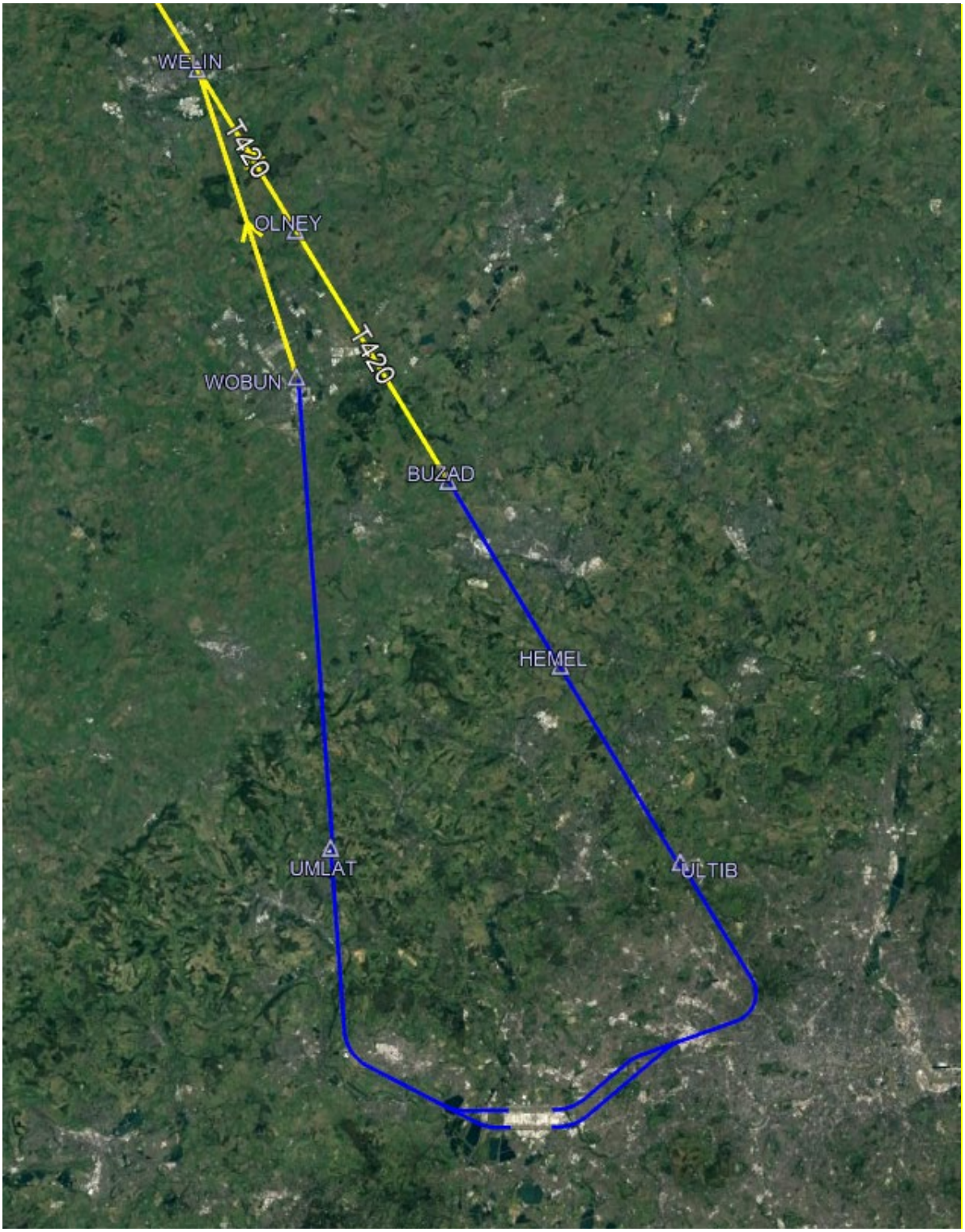

Figure 2 – The original un-truncated SIDs

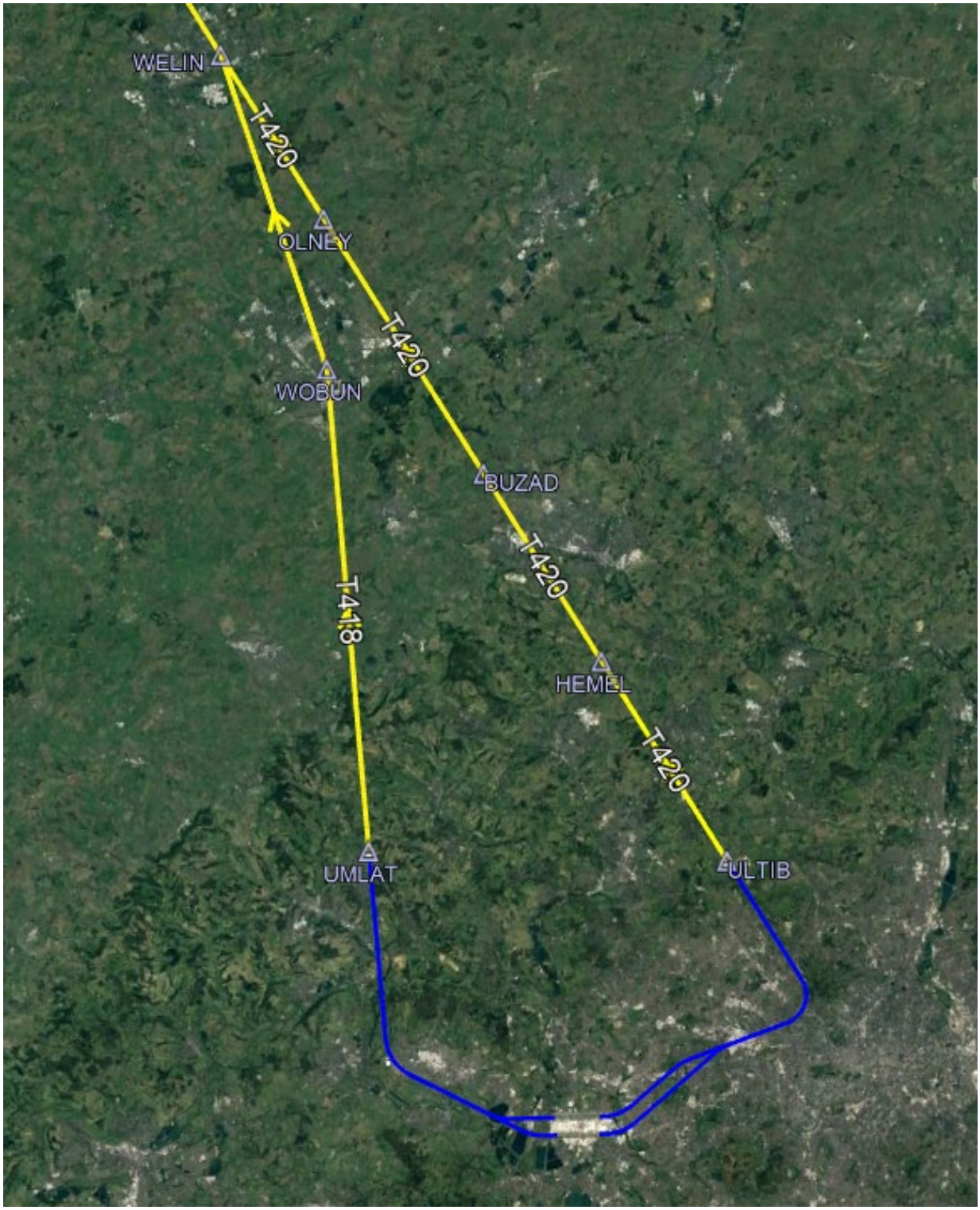

Figure 3 – The Truncated SIDs as Published

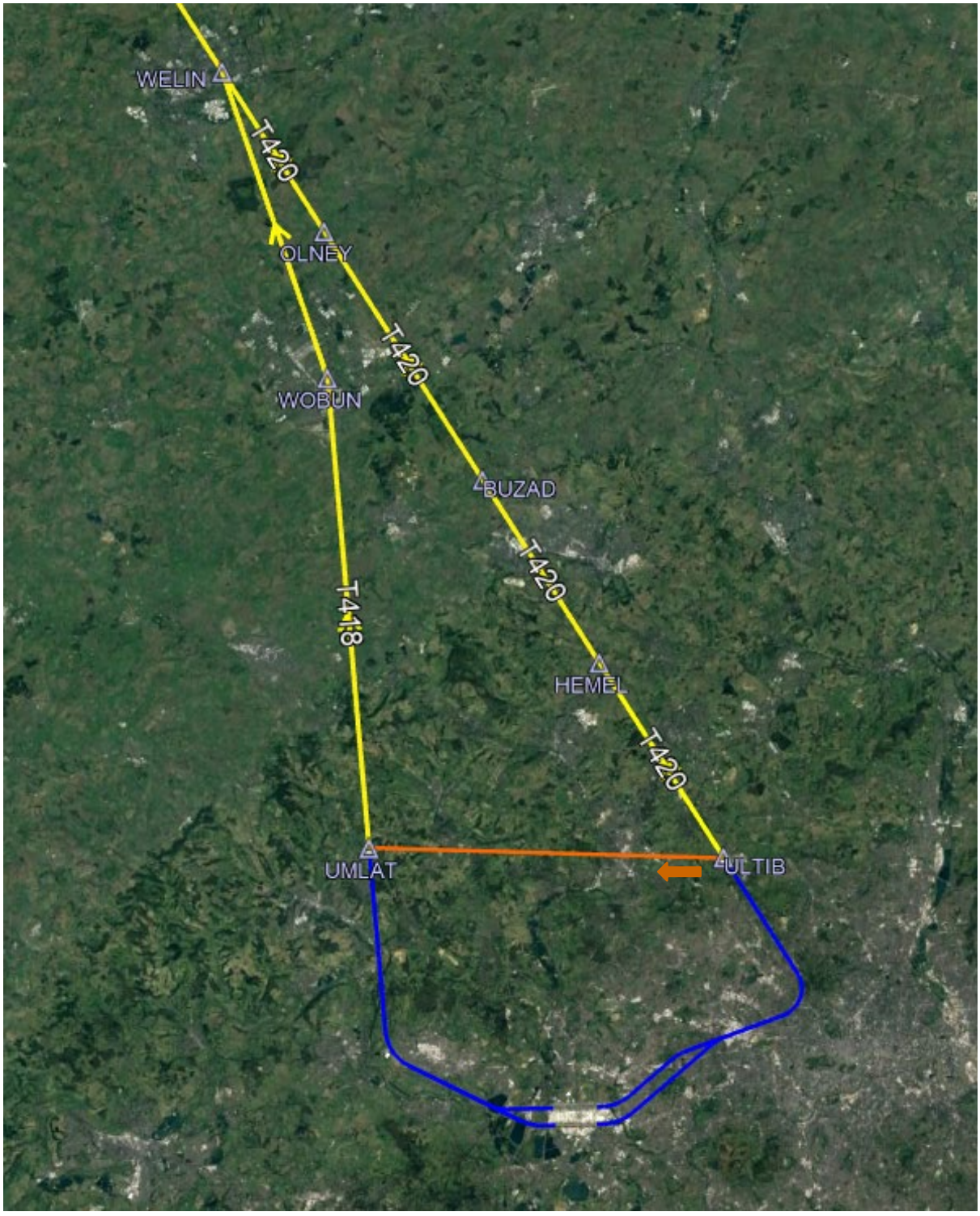

Figure 4 – The Incorrect Left Turn at ULTIB

Traffic

38. This ACP had no impact on traffic levels.

Infringements and Denied Access

39. Not applicable as this ACP relates to the definition of routes within controlled airspace. The airspace boundaries themselves have not changed.

Letters of Agreement

40. Not applicable as this airspace is all under the control of NATS.

Environmental Assessment

41. The sponsor considers that no meaningful quantitative environmental assessment can be undertaken as the overall reduced amount of fuel used by the airlines (and thus greenhouse gases produced) as a result of the SID truncations is not known. Information at this level of detail is considered commercially sensitive by airlines and is not generally released.

42. However, as an example, the sponsor identified that a Boeing 747 on a 13 hour flight could save up to 550kg fuel burn and up to 1.7 tonnes less CO2 produced. Smaller aircraft, or those on shorter routes, would deliver proportionately smaller savings.

43. The sponsor therefore considers that the ACP does deliver a meaningful environmental improvement, even if this cannot be quantified.

Community Stakeholder observations

44. Ground community stakeholders would not be consulted about a SID Truncation ACP in accordance with the SID Truncation Policy, and were thus not contacted about this PIR.

International Obligations

45. Not applicable as this airspace change is wholly contained within the London FIR and does not reach any international borders.

Ministry of Defence Operations

46. This ACP only affects General Aviation Traffic using the formal Instrument Flight Rules route structure within Controlled Airspace. As such, it has no impact on MoD operations except where MoD aircraft use these routes in the same way as civil traffic. It has no impact on military training areas.

Any other impacts

47. No other impacts have been identified.

Conclusion

48. The CAA is satisfied that, following the adoption of mitigation actions to improve clarity (publication of NOTAMs, adding route information to the SID descriptions in the UK AIP, additional information added to some third party SID charts, direct communication with specific airlines), the truncation of the WOBUN and BUZAD SIDs back to UMLAT and ULTIB has satisfactorily achieved the intended objectives, and the change is confirmed.

Note on plain language

49. 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 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.