Impact Assessment – Withdrawal of the BCN DVOR.

NATS Bristol – 22nd April 2022

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Contents

1. Executive Summary 4
1.1. DVOR Rationalisation Programme 4
1.2. Recommendations 4
1.2.1. Impact Assessment Recommendations 4
1.2.2. Additional Recommended Actions 4
2. Scope 5
2.1. Considerations 5
2.2. Exclusions 5
2.2.1. STARs 5
2.2.2. BRI Hold 5
2.2.3. VRP Tables 5
3. Impact Assessment 6
3.1. Affected Procedures and Publications 6
3.1.1. Procedures 6
3.1.2. Publications 6
3.2. EGGD 5-1: ATC Surveillance Minimum Altitude Chart 6
3.3. EGGD 6-1: BCN 1X and 1Z SIDs 6
3.4. EGGD 6-2 : BADIM 1X and WOTAN 1Z SIDs 6
3.5. EGGD 6-3 : EXMOR 1X and 1Z SIDs 7
3.6. EGGD 2.19 – Radio Navigation Aids 7
4. Mitigation Options 8
4.1. Aim of mitigation option development 8
4.2. Do Nothing 8

4.3. Conduct a full ACP 9
4.4. Conduct a Level 2C ACP – RNAV Replication of BCN 1X & 1Z and EXMOR 1X & 1Z SIDs (BADIM 1X & WOTAN 1Z deemed to be administrative) 9
4.5. Negotiate an agreement/contract with NERL to keep the BCN DVOR in service until completion of our ACP. 10
4.6. Utilise an existing VOR in place of BCN 11
4.7. Omni Directional Departures 12
4.8. Administrative update to the AIP 12
4.9. RNAV Substitution 13
5. Conclusion 14
5.1. Option moderation 14
5.2. Recommendations of the Conclusion 15
5.2.1. Impact Assessment Recommendations 15
5.2.2. Additional Recommended Actions 15

1. Executive Summary

1.1. DVOR Rationalisation Programme

NERL are withdrawing numerous legacy assets across the country as part of the DVOR rationalisation programme. The DVOR identified in the withdrawal plan which will affect the Bristol operation is the Brecon (BCN) DVOR; this asset is scheduled to be decommissioned on 31st December 2022.

This impact assessment, which is being conducted in accordance with CAP1781, is therefore limited to consider only the impact of the Brecon DVOR withdrawal, the mitigation options available, and finally offers a preferred solution to resolution of the impact of the withdrawal.

1.2. Recommendations

1.2.1. Impact Assessment Recommendations

As a result of the impact assessment the following recommendations are made:

- Using CAP1781 guidance, Bristol Airport pursue through the regulator, approval to utilise RNAV substitution of BCN dependent SIDs, through an interim measure of aircraft FMS coding, thus allowing airlines to continue flying existing profiles without the ground based asset.
- Required AIP administrative updates are completed to be incorporated in the AIP no later than AIRAC 12/22.
- Bristol Airport continue with the full FASI(S) ACP programme so that it is concluded within existing timeframes, thus providing a permanent solution to the DVOR rationalisation programme, compliance with the AMS, and removing the dependency on interim RNAV substitution.

1.2.2. Additional Recommended Actions

Additional recommended actions:

- This impact and associated recommendations are shared with the CAA for their input, initial oversight and approval at the earliest opportunity.
- In conjunction with the ANSP, following Impact Assessment approval, submit a Statement of Need in accordance with the CAP1616 process.
- Given the identified timescale of the rationalisation programme combined with the respective AIRAC cycles, Bristol Airport commences the process of safety review with key stakeholders at the earliest opportunity.

2. Scope

2.1. Considerations

Under CAP1781 - Guidance for RNAV Substitution, Step 1 of the process flow overview states that airports should conduct an impact assessment to identify all flight procedures owned by the unit that are impacted by a specific navigational aid removal.

This impact assessment will consider the withdrawal of the Brecon DVOR in December 2022, as detailed in the NERL plan for DVOR rationalisation. The impact on the Bristol operation will be considered for all Instrument Flight procedures and AIP entries excluding the sub paragraphs detailed in 2.2 below.

Once the impact is understood, the possible mitigation options will be investigated for applicability and feasibility and a preferred action plan will be developed for further consultation with the CAA.

2.2. Exclusions

2.2.1. STARs

STARs are the responsibility of NERL and have been captured under a separate element of work to convert conventional STARs with RNAV 5 route replication. Changes implemented through AIRAC 09/2021 have already removed the BCN dependency from all but one Bristol STAR. The remaining BRI 1C is scheduled to have its BCN dependency removed at AIRAC 05/2022.

2.2.2. BRI Hold

In order to accommodate the RNAV 5 replicated STARs that were implemented in AIRAC 09/2021, the BRI hold was also subject to formal RNAV coding which was implemented concurrently.

2.2.3. VRP Tables

In accordance with AIC W 015/2022 and W 100/2021, we are aware that the CAA is drafting AIP changes to remove references to ground based navigation from VRP tables; this work is scheduled to conclude with implementation in AIRAC 08/2022 and therefore removes the need to impact assess AIP EGGD AD 2.22 5.

3. Impact Assessment

3.1. Affected Procedures and Publications

3.1.1. Procedures

The withdrawal of the Brecon DVOR affects the following Bristol Airport Instrument Flight procedures:

- EGGD 5-1 : ATC SMAC
- EGGD 6-1 : BCN 1X and 1Z SIDs
- EGGD 6-2 : BADIM 1X and WOTAN 1Z SIDs
- EGGD 6-3 : EXMOR 1X and 1Z SIDs

3.1.2. Publications

The withdrawal of the Brecon DVOR affects the following Bristol AIP Publications:

- EGGD 2.19 : Radio navigation Aids

3.2. EGGD 5-1: ATC Surveillance Minimum Altitude Chart

The ATC SMAC contains a pictorial depiction of the BCN VOR/DME using standard aeronautical chart symbology. This requires an administrative update to the chart to depict DME symbology.

3.3. EGGD 6-1: BCN 1X and 1Z SIDs

The BCN 1X and 1Z SIDs contain multiple references to BCN including the naming convention, pictorial depiction of the VOR/DME using aeronautical chart symbology, and radial and range data. With the removal of BCN DVOR, the BCN 1X and 1Z SIDs are unavailable without mitigation.

3.4. EGGD 6-2 : BADIM 1X and WOTAN 1Z SIDs

The BADIM 1X and WOTAN 1Z SID chart contains references to BCN in respect of position information of the SID termination points. These termination points do also specify lat & long data, and radial & range position reference to both CPT and HON too. Given that the BCN reference is not used for any other purpose such as climb profile, it is proposed that an administrative update to the chart removing the BCN reference shall suffice.

3.5. EGGD 6-3 : EXMOR 1X and 1Z SIDs

The EXMOR 1X and 1Z SID chart contains multiple references to BCN including climb position information, pictorial depiction of the VOR/DME using aeronautical chart symbology, and waypoint position information at both SOMOT and the SID termination point EXMOR. With the removal of BCN, the EXMOR 1X and 1Z SIDs will be unavailable without mitigation.

3.6. EGGD 2.19 – Radio Navigation Aids

Table 2.19 contains reference to the BCN VOR/DME. The removal of BCN DVOR requires an administrative update to the AIP.

4. Mitigation Options

4.1. Aim of mitigation option development

Following several meetings with the CAA to obtain guidance on the CAP1781 process and requirements, a workshop was held between the Bristol Airport operations management team and NSL, the air navigation service provider to Bristol Airport; the aim of this workshop was to identify and document, possible mitigations to the impacted procedures and publications detailed in section 3.

The textual output of that session is detailed below; it is further supplemented with a matrix demonstrating how, of the 5 affected procedures and publications, we have been able to mitigate the impact to continue operations post asset removal in December 2022.

To aid assessment and assurance of the options, the matrix used a RAG status with the following definitions:

Legend	**Mitigated solution by Dec 22**	**Temporarily mitigated solution by Dec 22; but permanent solution required**	**Mitigated solution possible, but outside Dec '22 timeline**	**No acceptable mitigated solution.**

4.2. Do Nothing

The "do nothing" option has been considered versus the impacts detailed above in section 3. This option, which is effectively a tactical ATC service, would leave Bristol Airport without connectivity to the airways system thus generating uncertainty for airlines in fuel planning processes, and increased uncertainty in the ATM system as a result of aircraft flying unexpected tracks or routings. This is anticipated to significantly impact on workload of flight crew and ATCOs, and may impact on the safe provision of ATC service delivery.

Additionally, leaving the legacy SIDs published with incorrect charts and data in the AIP, may result in confusion that again introduced the risk of reduced safety margins. It is also considered by the workshop participants, that incorrect published data would raise regulatory concerns and be unacceptable to all interested stakeholders.

	EGGD 5-1	EGGD 6-1	EGGD 6-2	EGGD 6-3	EGGD 2.19
Do Nothing					

4.3. Conduct a full ACP

Given Bristol's significant operational dependency on the Brecon DVOR, cemented by strong post-pandemic recovery; participants considered that a full ACP should be undertaken to mitigate the issues identified in section 3 above. This requirement was previously recognised and identified in 2018; as such, it is captured throughout ACP-2018-55 (Bristol – airspace, departure and arrival procedures FASI South Programme). The DVOR rationalisation programme is referenced in the Statement of Need at Stage 1A; furthermore, Design Principle 4 (Technical – use of modern navigation technology) was afforded Priority A status at Stage 1B stating that reliance on legacy technology must be removed.

A full ACP will allow for designs of replacement SIDs to mitigate the removal of the BCN DVOR. Bristol Airport started this process in 2018 as referenced above, with a defined plan and timeline communicated to both the CAA and ACOG, which, amongst other key objectives, addressed the withdrawal of the Brecon DVOR in line with the December 2022 deadline.

Unfortunately, the Covid pandemic had an adverse impact on the Bristol ACP programme, with the decision taken in 2020 to formally pause for a period of 12 months due to lack of funding; this decision was not unique to Bristol and common across industry. Whilst the ACP restarted in 2021 following government financial support, the implementation timeline faced a further delay of circa 12 months to accommodate alignment with other stakeholders in FASI(S) Deployment 1. This results in an anticipated implementation date of Spring 2025.

Whilst numerous ACPs were 'paused' due to the pandemic, and the ACOG masterplan has been amended for alignment, the timeline for the NERL DVOR rationalisation programme has remained unchanged resulting in dis-alignment and a delta of circa 2.5 years between asset withdrawal and Bristol ACP implementation. The objective of Bristol to address the withdrawal of the Brecon DVOR by December 2022 is therefore no longer achievable, but the mitigation remains strong for a permanent solution.

	EGGD 5-1	EGGD 6-1	EGGD 6-2	EGGD 6-3	EGGD 2.19
Do Nothing					
Conduct a Full ACP					

4.4. Conduct a Level 2C ACP – RNAV Replication of BCN 1X & 1Z and EXMOR 1X & 1Z SIDs (BADIM 1X & WOTAN 1Z deemed to be administrative)

CAP1781 provides guidance for dealing with the removal of a DVOR which was considered by workshop participants. However, with experience of the relatively new CAP1616 process growing,

participants considered that from experience the timeline for completion of a Level 2C ACP would likely extend beyond the scheduled December 2022 date for the withdrawal of the Brecon DVOR asset. This would result in a hiatus period for multiple highly utilised Bristol SIDs, with no DVOR asset, and therefore ground based procedure, and no RNAV overlays until conclusion of the Level 2C ACP. Furthermore, participants also considered that a CAP1616 Level 2C ACP would incur additional financial cost for Bristol Airport as obtained in a proposal from NSL; this would arise at a time of limited CAPEX, plus result in the potential for confusion of stakeholders during engagement and consultation exercises.

Participants therefore concluded that a Level 2C ACP was not a viable option as a mitigation solution on multiple grounds.

	EGGD 5-1	EGGD 6-1	EGGD 6-2	EGGD 6-3	EGGD 2.19
Do Nothing					
Conduct a Full ACP					
Conduct a Level 2C ACP					

4.5. Negotiate an agreement/contract with NERL to keep the BCN DVOR in service until completion of our ACP.

A request was submitted to NERL in August 2021 to provide costs and anticipated terms for a commercial contract to maintain the Brecon DVOR and extend the asset life beyond December 2022. NERL responded in November 2021 but were only able to provide a firm commitment on cost for year 1 (2023), with ROM costs provided to assist with budgetary forecasting for subsequent years up to 2026. The NERL proposal was somewhat ambiguous on how costs of asset maintenance would be distributed, documenting a shared distribution of cost between Bristol and Cardiff, with no provision for financial support coming from other airspace users of the navigation facility.

As a secondary factor to cost, due to the age of the asset and availability of spare components, NERL's ability to extend and maintain the Brecon DVOR came with a 'best endeavours' caution, making it equivalent to NERR status for an airport owned asset that is maintained by a contractor. This presents an unquantifiable degree of operational risk in terms of operational availability of the navigational aid.

Taking both the cost and risk into consideration, Bristol Airport wrote to the CAA in December 2021 stating that this was not a viable option. With Bristol Airport having already assessed this option and documented the outcome to the regulator, workshop participants agreed that it should

not be progressed further for consideration due to cost and its temporary nature not providing sufficient mitigation as a solution.

	EGGD 5-1	EGGD 6-1	EGGD 6-2	EGGD 6-3	EGGD 2.19
Do Nothing					
Conduct a Full ACP					
Conduct a Level 2C ACP					
Extend the use of the BCN DVOR					

4.6. Utilise an existing VOR in place of BCN

The use of existing VORs in the region to supplement SIDs was considered by workshop participants as an alternative to a procedure redesign that would require an element of CAP1616 be applied. This possibility has previously been discussed with NATS Procedure Design Group who confirmed that the redefinition of waypoints from an alternative DVOR, and a definition of a DME point to resolve the climb profile reference, would be possible with a relatively modest cost to complete the change.

However, as the BCN 1X and 1Z SIDs are a conventional design based on a radial to the VOR, changing those segments to direct points would change the fundamental design of the SID itself; as such, it would be subject to the requirements of an ACP.

The exact level of detail and PDG effort is unknown placing uncertainty on both the cost and time elements for the redesignation of the routes. Participants of the workshop therefore concluded that this option was potentially viable as a mitigated solution for routes other than BCN SIDs, but importantly, completion ahead of December 2022 timeframe could not be assured.

	EGGD 5-1	EGGD 6-1	EGGD 6-2	EGGD 6-3	EGGD 2.19
Do Nothing					
Conduct a Full ACP					
Conduct a Level 2C ACP					
Extend the use of the BCN DVOR					
Utilise an alternate DVOR					

4.7. Omni Directional Departures

An Omni Directional Departure provides a terrain assured IFR departure method from an airfield without requirement for a full SID. Bristol do not currently have such procedures in place or have experience of their usage. Use of this method would therefore require engagement with PDG and for those procedures to be established and published in the AIP.

The cost of implanting such procedures is unknown at the point completing this impact assessment, but workshop participants anticipate it to be less than that required for a SID making it possibly viable as a long term solution. However, with work still to be scoped and contracted, it is not a solution that will be concluded ahead of the December 2022 timeframe.

	EGGD 5-1	EGGD 6-1	EGGD 6-2	EGGD 6-3	EGGD 2.19
Do Nothing					
Conduct a Full ACP					
Conduct a Level 2C ACP					
Extend the use of the BCN DVOR					
Utilise an alternate DVOR					
Omni Directional Departure					

4.8. Administrative update to the AIP

The change to para 2.19 can be achieved by simple admin updates to the AIP. It is also believed that given the minimal and editorial nature of the changes to charts 5-1 and 6-2, these can also be achieved through relatively simple administrative updates.

	EGGD 5-1	EGGD 6-1	EGGD 6-2	EGGD 6-3	EGGD 2.19
Do Nothing					
Conduct a Full ACP					
Conduct a Level 2C ACP					
Extend the use of the BCN DVOR					
Utilise an alternate DVOR					
Omni Directional Departure					
Admin Updates					

4.9. RNAV Substitution

Bristol Airport is predominantly serviced by a 'based carrier' code C operation. For many years, these commercial aircraft have flown the Bristol SID profiles using waypoint data stored within the aircraft Flight Management System (FMS), meaning that aircraft are already utilising RNAV equipment to fly departure profiles, rather than flying the conventional procedure based on the ground-based asset.

The ability for these aircraft to fly the SID is therefore not actually impacted by the DVOR being available or not. This has been demonstrated on numerous occasions where the Brecon DVOR has suffered a temporary failure or removed from service for routine planned preventative maintenance. Flightcrew do not seek additional navigational assistance from ATC during these scenarios, as the loss of the asset is effectively invisible to them with the FMS being their primary method of navigation throughout the SID profile.

Given that the aircraft already have FMS coding for the SIDs, the workshop participants anticipate that RNAV substitution would be an extremely efficient option, both in terms of the operational implementation and cost. Bristol Airport is cognisant of the process detailed in CAP1781, and understand that a safety review shall be conducted prior to submission to the CAA seeking formal approval. Positively, Bristol Airport have submitted to the CAA a review of conventional IFPs within the last 5 years, and have access to extensive track keeping information that can provide evidence as to whether any change has been made to tracks over the ground. It is not expected that this would be the case.

To conclude, whilst not a permanent solution, this is an extremely effective temporary solution that can be achieved within the timeframes of the DVOR rationalisation programme.

	EGGD 5-1	EGGD 6-1	EGGD 6-2	EGGD 6-3	EGGD 2.19
Do Nothing					
Conduct a Full ACP					
Conduct a Level 2C ACP					
Extend the use of the BCN DVOR					
Utilise an alternate DVOR					
Omni Directional Departure					
Admin Updates					
RNAV substitution with FMS coding of SIDs					

5. Conclusion

5.1. Option moderation

Section 4 of this report considered multiple options which have been clearly summarised in both textual and matrix format. Only those options with a realistic probability of completion should be considered; as such, the table from 4.9 is updated below to remove options returning solely 'red' status:

	EGGD 5-1	EGGD 6-1	EGGD 6-2	EGGD 6-3	EGGD 2.19
Conduct a Full ACP					
Utilise an alternate DVOR					
Omni Directional Departure					
Admin Updates					
RNAV substitution with FMS coding of SIDs					

This reduces the number of options from eight to five, from which participants believe that both "Utilise an alternative DVOR" (does not aide/mitigate the impact on all SIDs), and "Omni Directional Departure" (requires an ACP that may be combined with the overarching ACP-2018-55) should be discounted.

	EGGD 5-1	EGGD 6-1	EGGD 6-2	EGGD 6-3	EGGD 2.19
Conduct a Full ACP					
Admin Updates					
RNAV substitution with FMS coding of SIDs					

This additional narrowing leaves three options: a permanent solution to administrative changes, plus two-stage solution to the SID issues (a first phase of utilising existing FMS Coding and a second phase of ACP completion within appropriate timelines).

5.2. Recommendations of the Conclusion

5.2.1. Impact Assessment Recommendations

As a result of the impact assessment the following recommendations are made:

- Using CAP1781 guidance, Bristol Airport pursue through the regulator, approval to utilise RNAV substitution of BCN dependent SIDs, through an interim measure of aircraft FMS coding, thus allowing airlines to continue flying existing profiles without the ground based asset.
- Required AIP administrative updates are completed to be incorporated in the AIP no later than AIRAC 12/22.
- Bristol Airport continue with the full FASI(S) ACP programme so that it is concluded within existing timeframes, thus providing a permanent solution to the DVOR rationalisation programme, compliance with the AMS, and removing the dependency on interim RNAV substitution.

5.2.2. Additional Recommended Actions

Additional recommended actions:

- This impact and associated recommendations are shared with the CAA for their input, initial oversight and approval at the earliest opportunity.
- In conjunction with the ANSP, following Impact Assessment approval, submit a Statement of Need in accordance with the CAP1616 process.
- Given the identified timescale of the rationalisation programme combined with the respective AIRAC cycles, Bristol Airport commences the process of safety review with key stakeholders at the earliest opportunity.