DVOR Rationalisation
Removal of Enroute Dependencies
Brecon (BCN) Deployment

DVOR BCN Holds and STARs
CAP1616 Stage 2 Gateway

V1.2

NATS Unclassified

Action	Position	Date
Produced	**Airspace Change Specialist** NATS Airspace & Future Operations	September 2020
Approved	**ATC Lead – Airspace** NATS Swanwick ATM Development	September 2020
Approved	**Project Manager L5382 DVOR** Operations and Airspace Programme Delivery	September 2020

Publication history

Issue	Month/Year	Change Requests in this issue
1.0	Sep 2020	Submitted to the CAA
1.1	Sep 2020	Assessment criteria updated for DP3
1.2	Sep 2020	Following feedback from the CAA's gateway meeting, the following additional information/ evidence has been included: - Section 5 – section on "noise impact" updated to reference radar arrival plots and provide further information on holding procedures below 7,000ft - Section 5 – section on "air quality" updated to reference radar arrival plots - Section 11 – updated *engagement evidence* document (Ref 5) - Section 11 – *Ref 6 Bristol and Cardiff Arrivals Aug 2019 V1.0* included as an additional referenced document

Contents

1. Introduction

This document continues the CAP1616 process started with the Statement of Need (DAP1916) submitted in July 2020 (Ref 3). The intent of this document is to summarise and satisfy the requirements of CAP1616 Stage 2. The CAA reference is ACP-2019-069, the link to the CAA progress page is here.

This proposal is limited to removing the dependency of enroute instrument flight procedures in the UK AIP from the Brecon (BCN) DVOR. Hence this proposal is focused on Standard Terminal Arrival Routes (STARs) and Holding procedures which refer to BCN as a conventional navaid in the enroute environment, where NATS is the primary Air Navigation Service Provider (ANSP). There are no changes to ATS routes as part of this proposal.

This proposal contains the relevant changes to remove the dependency on BCN from these STARs and Holds. Design Principles have been developed (Ref 4) which are focused on best removing the enroute DVOR dependencies whilst ensuring the changes are safe and do not result in changes to flight behaviour. This document will identify:

- option concepts for replacing current connectivity relevant to BCN with RNAV procedures;
- an evaluation of those option concepts against the Design Principles;
- a full list of the specific changes.

2. Stage 2 Develop and Assess

Step 2A Options Development

2.1 CAA's PBN STAR Replication Policy (V2) was published in Mar 2018 and was used as the basis for this proposal. It defines PBN STAR Replication as a PBN redesign of an existing conventional STAR from the commencement of the STAR in the ATS enroute network to the termination point with the intention of retaining the existing route and track over the ground (para 5.4). Para 5.5 of the same policy makes assumptions that replication ensures procedures follow the same path over the ground as the existing conventional procedure, as closely as possible. This means that there would be no change to pilot or controller behaviour (apart from technical designation changes), and no change to lateral traffic position.

2.2 Airspace change design options

The design options considered to remove the enroute dependencies from the BCN DVOR, were limited to the following:

Option 0 – Do nothing. Retain all the STARs and Holds unchanged from today's AIP definition.
Option 1 – Using the CAA policies, replicate all relevant STARs and Holds using RNAV, exactly as defined in the AIP without considering any practicalities.
Option 2 – Examine the use of existing STARS and Holds from a practical point of view, re-evaluate how they are used and how the network may be improved by rationalising/truncating/replicating them in a considered manner.
Option 3 – Remove all existing STARs and Holds that refer to or use the BCN DVOR.

On-going engagement throughout the DVOR project - with relevant airfields and ATC procedure teams at the London Area Control Centre at Swanwick - has determined that NATS would replicate conventional STARs and Holds as closely as possible using PBN design criteria (using the RNAV5 specification). As these procedures are replications of current conventional procedures and there is no requirement for ensuring separation from other ATS Routes/STARs, RNAV5 is the preferred specification in order to ensure greatest accessibility to routes, rather than limiting to those aircraft with RNAV1 equipage.

In support of the eventual removal of the BCN DVOR, this proposal will RNAV5 replicate 2 Holds, serving Bristol and Cardiff Airports. Six conventional STARs (3 serving Bristol Airport and 3 Cardiff Airport) will be RNAV replicated, truncated at appropriate waypoints and re-named based on their starting waypoints. These replications will conform as closely as possible to the current conventional procedures, using RNAV5 design criteria.

This proposal will extend two STARs (one each serving Bristol and Cardiff Airports) back to existing waypoints in order to provide flight plannable options and retain important descent planning restrictions. These STARs will also be RNAV5 replicated and re-named as per their starting waypoints. All of the replications will conform as closely as possible to the current conventional procedures, using RNAV5 design criteria.

Finally, two STARs (serving Bristol and Cardiff Airports) will be re-named based on their starting waypoints. No further changes will be made to these STARs, as a future NERL network change is anticipated to update them.

All of the above proposed changes are detailed fully in Annexes C-D.

Bristol and Cardiff Airports have been engaged with regarding this proposal and the changes to the relevant Hold and STARs (evidence of engagement with the airports is detailed in Annex F). The proposed changes are supported by the airports.

2.3 Stakeholder Engagement

As part of Stage 2, CAP1616 requires change sponsors to develop a comprehensive list of Design Options, which are tested with the same group of stakeholders who were engaged with during Stage 1. However, as covered in the Stage 1B Design Principles document (Ref 4), the Design Principles for this submission were constructed around how best to remove the enroute dependencies from the BCN DVOR, alongside ensuring the changes are safe and do not result in any changes to flight behaviour. NATS had previously taken part in a (CAA-led) consultation with the National Air Traffic Management Advisory Committee (NATMAC) on DVOR rationalisation; prior to the introduction of CAP1616 and the requirement to seek feedback on Design Principles.

Alongside the Design Principles, the Design Options have been developed to provide different methods in which the en-route dependencies can be removed from a DVOR, whilst ensuring no changes to flight behaviours. The Design Options have been used consistently across the numerous DVOR submissions as they achieve the same outcome; although they are always reviewed to ensure relevance. We therefore conclude that there is no need to re-consult with the NATMAC members, nor any additional stakeholders, as there will not be any impact upon them.

However, as part of this Airspace Change Proposal and as per previous submissions, NATS has been in contact with relevant airfields which use the STARs and associated Holds we plan to RNAV, specifically Bristol and Cardiff Airports. The aerodrome sections of the AIP for the affected airfields will need to be updated which this engagement has allowed us to inform them of. The proposed changes have been designed to be invisible from an airport's perspective so there are no other impacts anticipated. Annex F provides a summary of the engagement activity for these procedures.

Previous DVOR removal proposals have proposed three Design Options: in summary, to do nothing; to replicate all procedures; and lastly, to examine all procedures and improve where appropriate (rationalise/ truncate/ replicate). These Design Options were accepted by the CAA. NATS was later requested to add an additional option to all future submissions, whereby all procedures with a dependency are removed; thus, removing the DVOR dependency. The CAA acknowledged that this Design Option would not meet the Design Principles however; it is included for completeness.

The Design Options have therefore been developed so they can be applied to each of the individual DVOR submissions and have evolved following guidance from the CAA. As mentioned above, appropriate engagement has previously been completed with NATMAC members and the relevant airports; and airports will be fully briefed when their AIP pages are required to be updated.

3. Step 2A Options Development: Design Principle Evaluation

This section evaluates the performance of all 4 Design Options with respect to each of the five Design Principles. The Design Principles developed during Stage 1B (Ref 4) are included in Annex A for reference. As covered fully in the Stage 1B document, the Design Principles for this BCN DVOR submission were reviewed to ensure that they are still relevant; as a consistent set has been used throughout the DVOR Programme.

The below assessment criteria have been used to determine whether each Design Option has met; partially met; or not meet each of the seven Design Principles.

Design Principle	Description	Assessment Criteria		
		Does not meet	Partially meets	Met
DP1 Safety	The proposed airspace change must maintain or enhance the current level of safety	Unlikely to pass a safety case due to major safety issues from proposed changes	Issues identified that would require a robust safety case e.g. workload, IFP (flyability), new hazards	No significant safety issues identified
DP2 No change to flight behaviour	None of the proposed technical changes to definitions of STARs/ Holds would result in a change to actual flight behaviours – laterally, vertically or in dispersal	Proposed change(s) would result in a change to flight behaviour	N/A – either met or not met	None of the proposed changes would result in a change to flight behaviour
DP3 PBN Specification	The proposed airspace change will yield maximum safety and efficiency benefits by using an appropriate standard of PBN	No RNAV replications are made as part of the proposal; or, adequate justification is not provided for the proposed changes	N/A – either met or not met	Conventional procedures are replaced with RNAV versions. Proposed changes fully consider and justify the chosen PBN specification
DP4 Remove DVOR Dependencies	Remove enroute dependencies on the BCN DVOR through appropriate design changes; including removing unnecessary references to the BCN DVOR which are not material to the procedure and rationalising rarely used STARs.	Not all enroute dependencies on the BCN are removed	N/A – either met or not met	All enroute dependencies on the BCN DVOR are removed
DP5 Airspace Optimisation	Where appropriate, the proposed airspace will facilitate an optimised airspace design. Including: - Use PBN Replication – replacing conventional STARs/ Holds with RNAV STARs/ Holds; - Using CAA STAR Truncation Policy, when applied logically to STARs with many common segments, can result in the withdrawal of unnecessary duplicate STARs. - Minor changes to a STAR which currently cannot be flown as it is formally define for legacy reasons – these changes reflect what would actually happen in practice. - Extend or split a current STAR to allow important Descent Planning levels to be formally incorporated in the STAR description	Procedures are not individually evaluated for potential application of this DP; therefore, no technical changes are made	Procedures are individually evaluated for potential application of this DP, but no appropriate technical changes are made	Procedures are individually evaluated for potential application of this DP, and minor changes are made, with justification provided

3.1 Option 0 – Do nothing. Retain all the STARs and Holds unchanged from today's AIP definition.

See the submitted Stage 1 Assessment Meeting slide pack (Ref 1) for further details on the procedures which reference the BCN DVOR on their charts and which would remain as they are, for this option. The table below presents an evaluation of this option against the five Design Principles:

Option 0			REJECT
Description of option			
This is the current scenario. No change to existing AIP definitions of STARs or Holds.			
Design Principle 1: Maintain or enhance the current level of safety			MET
Summary of qualitative assessment No change from today; the level of safety is maintained. Therefore, this Design Principle would be satisfied.			
Design Principle 2: No change to flight behaviours			MET
Summary of qualitative assessment No change to lateral/vertical track patterns. Therefore, this Design Principle would be satisfied.			
Design Principle 3: PBN specification	NOT MET		
Summary of qualitative assessment Procedures are not individually evaluated for potential application of this DP; therefore, no RNAV replications would take place under this Design Option. Does not remove any enroute flight dependency from the BCN DVOR and this Design Principle would not be satisfied.			
Design Principle 4: Remove DVOR dependencies	NOT MET		
Summary of qualitative assessment Procedures are not individually evaluated and therefore all existing enroute dependencies on the BCN DVOR would remain and this Design Principle would not be satisfied.			
Design Principle 5: Airspace optimisation	NOT MET		
Summary of qualitative assessment Procedures are not individually evaluated for potential application of this DP. Therefore, no proposed changes to optimise the airspace would take place under this Design Option and this Design Principle would not be satisfied.			

3.2 Option 1 - Using the CAA policies, replicate STARs/ Holds using RNAV, exactly as defined in the AIP without considering any practicalities.

This option would replace all dependant procedures identified in the Assessment Meeting slide pack (Ref 1) as RNAV procedures. This table evaluates this option against the five Design Principles:

Option 1			REJECT
Description of option			
All IFPs would be replicated exactly as defined in the current AIP. No account would be taken of actual usage, route segment duplication, or other factors.			
Design Principle 1: Maintain or enhance the current level of safety			MET
Summary of qualitative assessment Conventional IFPs replicated as RNAV procedures. The level of safety is maintained or slightly improved due to increased precision. No potential safety issues identified. Therefore, this Design Principle would be satisfied.			
Design Principle 2: No change to flight behaviours			MET
Summary of qualitative assessment No practical change to connectivity therefore, no change to lateral/vertical track patterns. Therefore, this Design Principle would be satisfied.			
Design Principle 3: PBN specification			MET
Summary of qualitative assessment This Design Option would purely replicate procedures like for like using an appropriate PBN specification; including route segment duplications etc. Therefore, this Design Principle would be satisfied.			
Design Principle 4: Remove DVOR dependencies			MET
Summary of qualitative assessment Conventional procedures are replicated under this Design Option, which removes the enroute dependencies on the BCN DVOR. Therefore, this Design Principle would be satisfied.			
Design Principle 5: Airspace optimisation	NOT MET		
Summary of qualitative assessment Asides from replicating conventional procedures as they are currently defined under this Design Option, procedures are not evaluated for potential further airspace optimisation opportunities. Therefore, this Design Principle would not be satisfied.			

Option 2 - Examine the use of existing STARS and Holds from a practical point of view, re-evaluate how they are used and how the network may be improved by rationalising/truncating/replicating them in a considered manner.

This option evaluates the usage of each procedure individually and creates opportunity bespoke to specific procedures. See Annexes C-D below for the detailed proposed change for each of the procedures under this option. This table evaluates this option against the five Design Principles:

Option 2			ACCEPT and PROGRESS
Description of option			
Examine the use of existing IFPs from a practical point of view, re-evaluate how they are used and how the network may be improved by rationalising/truncating/replicating them in a considered manner.			
Design Principle 1: Maintain or enhance the current level of safety			MET
Summary of qualitative assessment IFPs replicated as RNAV procedures with an appropriate PBN specification proposed. The level of safety is maintained or slightly improved due to increased precision. Procedures can be simplified depending on actual usage today. No potential safety issues identified. Therefore, this Design Principle would be satisfied.			
Design Principle 2: No change to flight behaviours			MET
Summary of qualitative assessment No practical change to connectivity therefore, no change to lateral/vertical track patterns. Therefore, this Design Principle would be satisfied.			
Design Principle 3: PBN specification			MET
Summary of qualitative assessment This Design Option would evaluate current IFPs and propose RNAV replication where relevant, including an appropriate specification. Therefore, this Design Principle would be satisfied.			
Design Principle 4: Remove DVOR dependencies			MET
Summary of qualitative assessment This Design Option would evaluate current IFPs and propose that conventional procedures with a BCN dependency are replicated; thus, removing the enroute dependencies on the BCN DVOR. Therefore, this Design Principle would be satisfied. For example, this enables the Bristol BRI 1E STAR to be RNAV replicated which removes the current dependency on the BCN DVOR.			
Design Principle 5: Airspace optimisation			MET
Summary of qualitative assessment This Design Option would evaluate current IFPs and where appropriate, propose changes which would facilitate an optimised airspace design. Therefore, this Design Principle would be satisfied. For example, this enables the Cardiff CDF 1E STAR to be RNAV replicated and extended back to an existing waypoint, thus retaining the important descent planning restriction.			

3.3 Option 3 – Remove all existing STARs and holds that refer to or use the BCN DVOR.

This option removes each STAR and Hold with a BCN dependency and replaces *BCN DVOR/DME* with *BCN DME*. This table evaluates this option against the five Design Principles:

Option 3			REJECT
Description of option			
Remove all existing IFPs for which the BCN DVOR is materially important.			
Design Principle 1: Maintain or enhance the current level of safety	NOT MET		
Summary of qualitative assessment The removal of these procedures would create a gap in the network. This would require all aircraft currently using the existing IFPs to be channelled into other, potentially busy flows/ sectors, which could greatly increase controller workload in those areas. This could create significant safety issues from such substantial changes. Therefore, this Design Principle would not be satisfied.			
Design Principle 2: No change to flight behaviours	NOT MET		
Summary of qualitative assessment Aircraft would not be able to use the current procedures, causing a significant change in flight behaviours to work around this. Therefore, this Design Principle would not be satisfied.			
Design Principle 3: PBN specification	NOT MET		
Summary of qualitative assessment Procedures are not individually evaluated for potential application of this DP. Therefore, no RNAV replications would take place under this Design Option and this Design Principle would not be satisfied.			
Design Principle 4: Remove DVOR dependencies			MET
Summary of qualitative assessment All en-route procedures with a dependency on the BCN DVOR would be removed; thus, removing all dependencies and therefore satisfying this Design Principle.			
Design Principle 5: Airspace optimisation	NOT MET		
Summary of qualitative assessment Procedures are not individually evaluated for potential application of this DP. Therefore, no proposed changes to optimise the airspace would take place under this Design Option and this Design Principle would not be satisfied.			

3.4 Summary – Options Development

Using the five Design Principles, we have evaluated the four concept Design Options, as summarised above.

3.5 *Option 0: Do Nothing – Retain all the STARs and Holds unchanged from today's AIP definition.* This does not achieve the removal of dependencies from the BCN DVOR. **Rejected.**

3.6 *Option 1: Using the CAA policies, replicate STARs/ Holds using RNAV, exactly as defined in the AIP without considering any practicalities* – this achieves the removal of dependencies from the BCN DVOR and provides RNAV replication of existing conventional procedure. However, it does not allow additional network optimisations to be proposed such as improving network connectivity or withdrawing duplicate route segments. **Rejected.**

3.7 *Option 2: Examine the use of existing STARS and Holds from a practical point of view, re-evaluate how they are used and how the network may be improved by rationalising/truncating/replicating them in a considered manner.* This achieves the removal of dependencies from the BCN DVOR; alongside providing the opportunity to improve upon the current airspace and procedures such as introducing an important descent planning level. **Accepted and progressed.**

3.8 *Option 3: Remove all existing STAR and Holds that refer to or use the BCN DVOR.* This would technically remove the dependencies from the BCN DVOR; however, it removes STARs and Holds that are used and needed by aircraft today and going forward. **Rejected**

Conclusion: Design Option 2 concept best meets all five of the Design Principles. The shortlist comprises the Option 2 concept only. The other three design option concepts are therefore not progressed.

End of Step 2A

4. Step 2B Options Appraisal

4.1 The baseline (do nothing) option does not achieve the removal of dependencies from the BCN DVOR. The ratings for the baseline option against each of the Design Principles shows that whilst it maintains safety levels and creates no change to flight behaviours, it does not meet the remaining three Design Principles.

4.2 Following the Design Principle evaluation, we conclude that the following Design Option 2 could be used to remove the dependencies from the BCN DVOR in accordance with the Design Principles:

Examine the use of existing STARS and Holds from a practical point of view, re-evaluate how they are used and how the network may be improved by rationalising/truncating/replicating them in a considered manner.

4.3 There would be no change in fuel/ CO_2/ greenhouse gas emissions due to this proposal because there would be no change to lateral or vertical tracks. Fuel uplift changes are unlikely to occur. There are no costs or benefits which could be reasonably monetised due to this enroute proposal.

4.4 Safety Assessment: The Option 2 concept would take full account of existing usage and connectivity needs. It would ensure all IFPs are designed by an APD, as regulated by CAA SARG. There would be a qualitative improvement in safety because each remaining IFP would use improved navigation specifications and be defined in an official manner. Today's conventional IFPs are known to be flown using FMS overlays, which are not state regulated in the same way.

5. BCN Option 2 Cost/ Benefit Analysis

The CAP1616 Appendix E cost/ benefit analysis is given below.

Group	Impact	Level of Analysis	Evidence
Communities	Noise impact on health and quality of life	N/A	As there are no proposed changes to lateral or vertical tracks there will be no impact on noise or quality of life. The supporting radar arrival plots (Ref 6) for Bristol and Cardiff arrivals show a large spread of traffic across different altitude bands (0-FL100) which will not change as an outcome of this change. Below 7,000ft, a wide swathe of traffic can be seen being vectored onto final approach which will remain the same. Above 7,000ft, the arrival and holding procedures – which this proposal is focused on - are shown. Although not clearly seen on the radar plots, both Bristol and Cardiff Airports do hold traffic below 7,000ft. As explained within the engagement evidence emails (Ref 5), this is typically for training flights or during exceptional circumstances i.e. inclement weather or go-arounds. NATS therefore contends that this proposal still falls under the airspace change process as a Level 2C proposal; and does not require noise analysis.
Communities	Air quality	N/A	No changes below 1,000ft. The supporting radar arrival plots (Ref 6) show that traffic below 1,000ft for Bristol and Cardiff Airports is made up of traffic on final approach; none of the proposed changes will affect this.
Wider society	Greenhouse gas impact	Monetise and quantify	No proposed changes to lateral or vertical tracks so no impact
Wider society	Capacity/ resilience	Qualitative	No changes
General Aviation	Access	N/A	No changes
General Aviation/ commercial airlines	Economic impact from increased effective capacity	Quantify	No changes
General Aviation/ commercial airlines	Fuel burn	Monetise	No proposed changes to lateral or vertical tracks so no impact.
Commercial airlines	Training cost	N/A	N/A – there is not expected to be any airline training or associated cost.
Commercial airlines	Other costs	N/A	Updates to FMS and flight planning systems will be completed via the routine AIRAC updates. There are no other known costs which would be imposed on commercial aviation.
Airport/ Air navigation service provider	Infrastructure costs/benefit	Qualitative and quantitative	The cost of implementation of the change, adaptation of systems is estimated to be £65,000. Removal of the en-route dependency enables decommissioning of the DVOR (once airfields have removed their dependencies i.e. SIDs). This will yield an annual cost saving of circa £10,000 per DVOR (BCN).
Airport/ Air navigation service provider	Operational costs	N/A	N/A – this proposal would not lead to changes in operational costs.
Airport/ Air navigation service provider	Deployment costs	Qualitative and quantitative	N/A – this change would be introduced via briefings and bulletins for staff, with no additional training or simulation training/costs required.

5.1 Conclusion: There would be a positive impact on safety whilst also improving the overall network connectivity.

End of Step 2B

6. Summary

6.1 This document details the STARs and Hold where the BCN DVOR is material to the instrument flight procedure. It describes the current connectivity; the method used to progress the change; and the proposed connectivity.

6.2 This proposal will RNAV replicate a number of procedures which will confirm as closely as possible to the current conventional procedures, using RNAV5 design criteria.

6.3 Some minor administrative changes to STARs and a Hold are included, in order to improve the consistency of charts within the AIP and to follow CAA/ ICAO guidance on the naming of STARs (i.e. changing the name to reference the start point of the STAR).

6.4 This submission also includes a number of technical amendments: six STARs will be truncated at appropriate waypoints; and two STARs will be extended back to existing waypoints in order to maintain important descent planning restrictions.

6.5 The proposed connectivity remains entirely unchanged due to RNAV5 replication, with or without ATS route extensions:

- routes are unchanged
- connectivity is unchanged
- hence flight behaviours and traffic patterns over the ground are unchanged.

6.6 Annexes C-D below detail the IFP changes we are proposing to make in support of removing the BCN DVOR enroute dependencies and rationalisation of the network, as summarised in Table 1 below:

Ref	Airport	Type	Procedure	BCN DVOR	Proposed Changes
1	Bristol	STAR	BRI 1A	Not dependent	RNAV5 replicated, truncated at existing waypoint *AMRAL* and re-named
2	Bristol	STAR	BRI 1E	Dependent on BCN	RNAV5 replicated, extended back to existing waypoint *UMOLO* and re-named
3	Bristol	STAR	BRI 1B	Dependent on BCN	RNAV5 replicated, truncated at new waypoint *FIFAH* and re-named
4	Bristol	STAR	BRI 1C	Not dependent	Re-named
5	Bristol	STAR	BRI 2D	Not dependent	RNAV5 replicated, truncated at existing waypoint *DAWLY* and re-named
6	Cardiff	STAR	CDF 1A	Not dependent	RNAV5 replicated, truncated at existing waypoint AMRAL and re-named
7	Cardiff	STAR	CDF 1E	Dependent on BCN	RNAV5 replicated, extended back to existing waypoint UMOLO and re-named
8	Cardiff	STAR	CDF 1B	Dependent on BCN	RNAV5 replicated, truncated at new waypoint FIFAH and re-named.
9	Cardiff	STAR	CDF 1C	Not dependent	Re-named
10	Cardiff	STAR	CDF 3D	Not dependent	RNAV5 replicated, truncated at existing waypoint *DAWLY* and re-named
11	Bristol	Hold	BRI	Not dependent	RNAV5 replicated
12	Cardiff	Hold	CDF	Not dependent	RNAV5 replicated

Table 1: Summary of proposed changes

7. Conclusion

7.1 We have assessed that there are no foreseen adverse impacts of making the proposed changes described in the tables below (Annexes C - D) and conclude that making these technical changes to the procedures would not alter traffic patterns.

8. Annex A: Design Principles

Design Principle	Description
DP1 Safety	The proposed airspace change must maintain or enhance the current level of safety
DP2 No change to flight behaviour	None of the proposed technical changes to definitions of STARS/ Holds would result in a change to actual flight behaviours – laterally, vertically or in dispersal
DP3 PBN Specification	The proposed airspace change will yield maximum safety and efficiency benefits by using an appropriate standard of PBN
DP4 Remove DVOR Dependencies	Remove enroute dependencies on the BCN DVOR through appropriate design changes; including removing unnecessary references to the BCN DVOR which are not material to the procedure, and rationalising rarely used STARs
DP5 Airspace Optimisation	Where appropriate, the proposed airspace will facilitate an optimised airspace design. Including: - Use PBN Replication – replacing conventional STARs/ Holds with RNAV STARs/ Holds; - Using CAA STAR Truncation Policy, when applied logically to STARs with many common segments, can result in the withdrawal of unnecessary duplicate STARs. - Minor changes to a STAR which currently cannot be flown as it is formally define for legacy reasons – these changes reflect what would actually happen in practice. - Extend or split a current STAR to allow important Descent Planning levels to be formally incorporated in the STAR description

9. Annex B: Design Option 2: Procedure Detail

This section demonstrates the proposed changes for Design Option 2. The below screenshots show the current procedures and have been taken from the Assessment Meeting Slides [Ref 1].

Option 2: *Examine the use of existing STARS and holds from a practical point of view, re-evaluate how they are used and how the network may be improved by rationalising/truncating/replicating them in a considered manner.*

Bristol - BRI 1A/ BRI 1E STARs

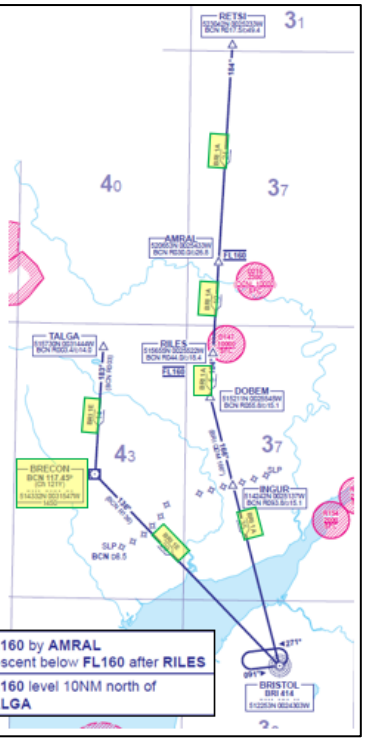
1) BRI 1A STAR – not dependent on BCN DVOR (SLP defined by BCN)

RETSI - AMRAL - RILES - DOBEM - INGUR – BRI

2) BRI 1E STAR – dependent on BCN DVOR

TALGA - BCN - BRI

New waypoint/ 5LNC required at the SLP between BCN and BRI (*PEGZA* has been reserved)



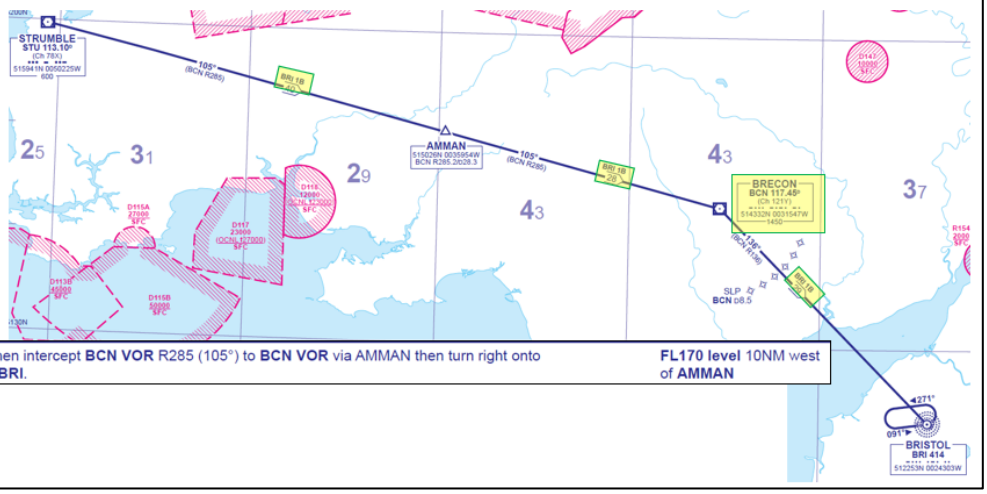
BRI 1A	Arrival via **RETSI** (N862, N42) continue on 184° to **AMRAL** then **RILES** then **DOBEM**. At **DOBEM** turn left onto **NDB(L) BRI** QDM 166° to **NDB(L) BRI.**	**FL160** by **AMRAL** Descent below **FL160** after **RILES**
BRI 1E	Arrival via N864 (see Note 3) to **TALGA,** continue to **BCN VOR** on R003(183°) then turn left onto **BCN VOR** R136 to **NDB(L) BRI.**	**FL160** level 10NM north of **TALGA**

Bristol – BRI 1B STAR

3) BRI 1B STAR –
dependent on BCN DVOR

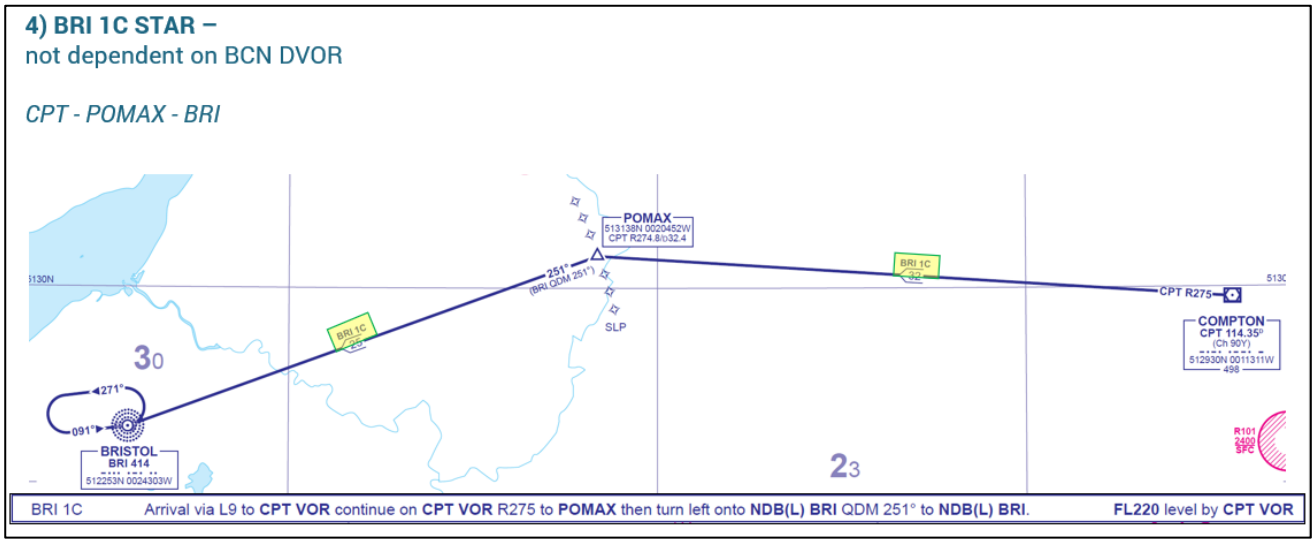
STU - AMMAN - BCN - BRI

New waypoints/ 5LNCs required at the SLPs:
- 10NM west of AMMAN (*FIFAH* has been reserved);
- and between BCN - BRI (*PEGZA* has been reserved)

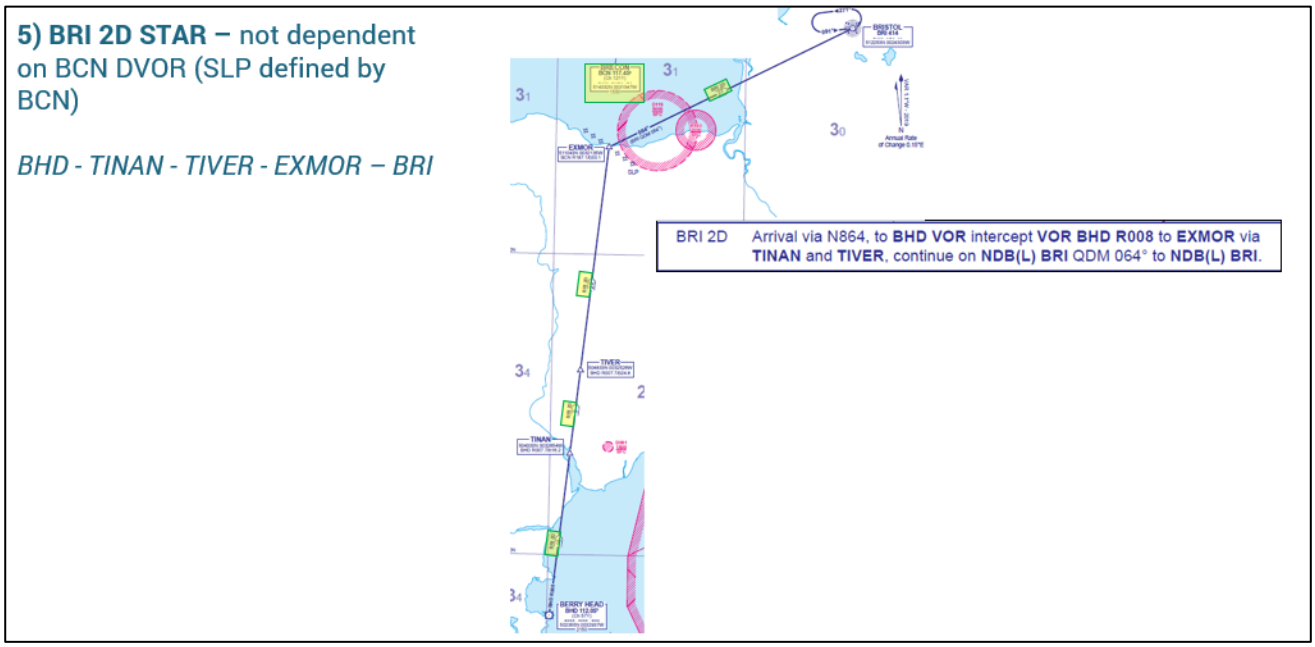


BRI 1B	Arrival via L9 to **STU VOR** then intercept **BCN VOR** R285 (105°) to **BCN VOR** via AMMAN then turn right onto **BCN VOR** R136 to **NDB(L) BRI.**	**FL170 level** 10NM west of **AMMAN**

Bristol – BRI 1C STAR



Bristol – BRI 2D STAR



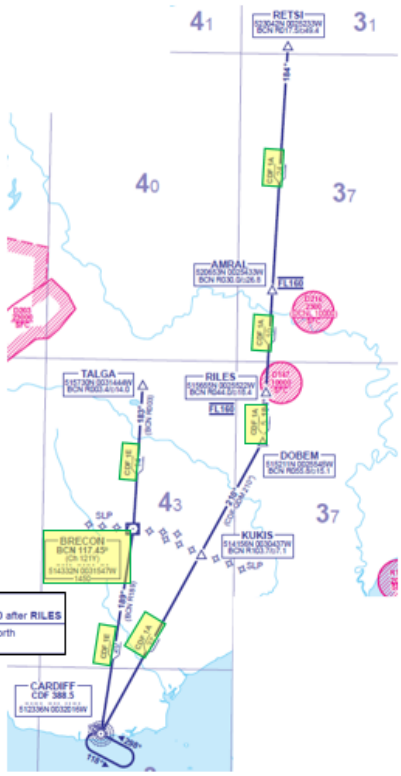
Cardiff – CDF 1A/ CDF 1E STARs

6) CDF 1A STAR – not dependent on BCN DVOR (SLP defined by BCN)

RETSI - AMRAL - RILES - DOBEM - KUKIS - CDF

7) CDF 1E STAR – dependent on BCN DVOR

TALGA - BCN - CDF

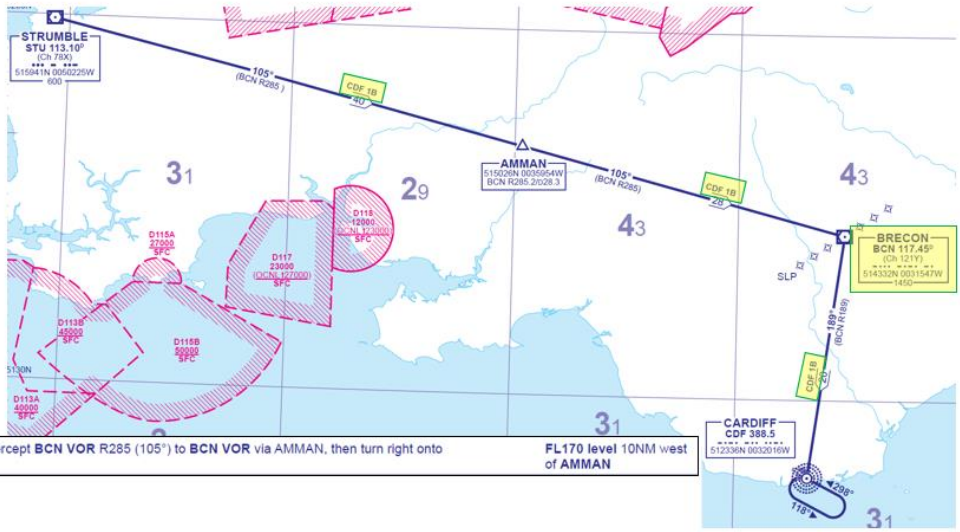


CDF 1A	Arrival via **RETSI** (N862, N42) continue on 184° to **AMRAL** then **RILES** then **DOBEM**. At **DOBEM** turn right onto **NDB(L) CDF** QDM 210° to **NDB(L) CDF**.	**FL160** by **AMRAL** descent below **FL160** after **RILES**
CDF 1E	Arrival via N864 (see Note 3) to **TALGA**, continue to **BCN VOR** on R003(183°) then turn right onto **BCN VOR** R189 to **NDB(L) CDF**.	**FL160** level 10NM north of **TALGA**

Cardiff – CDF 1B STAR

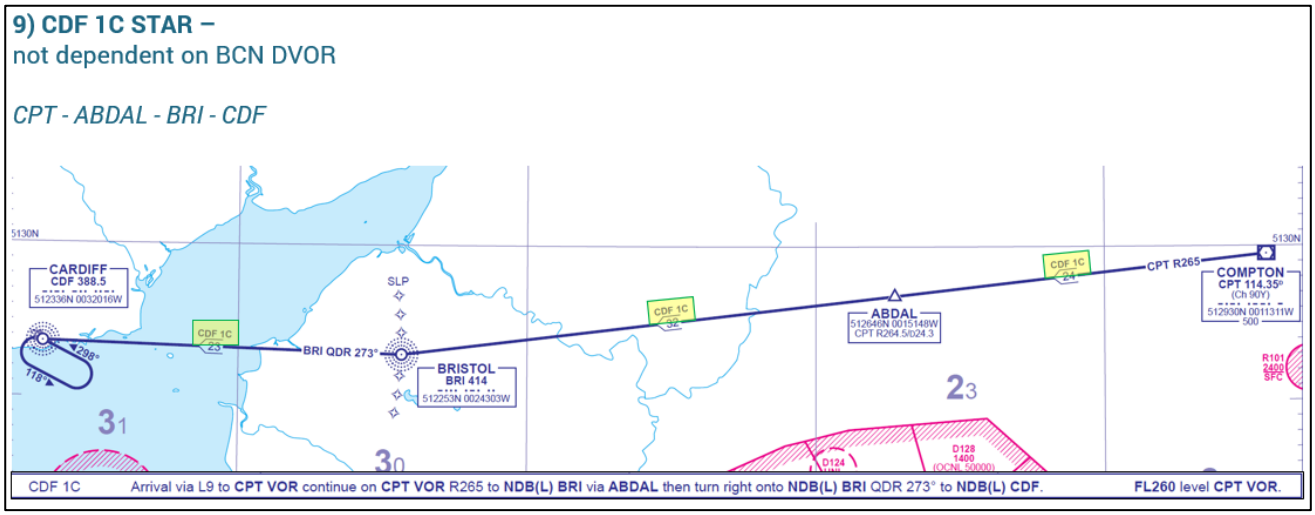
8) CDF 1B STAR – dependent on BCN DVOR

STU - AMMAN - BCN - CDF

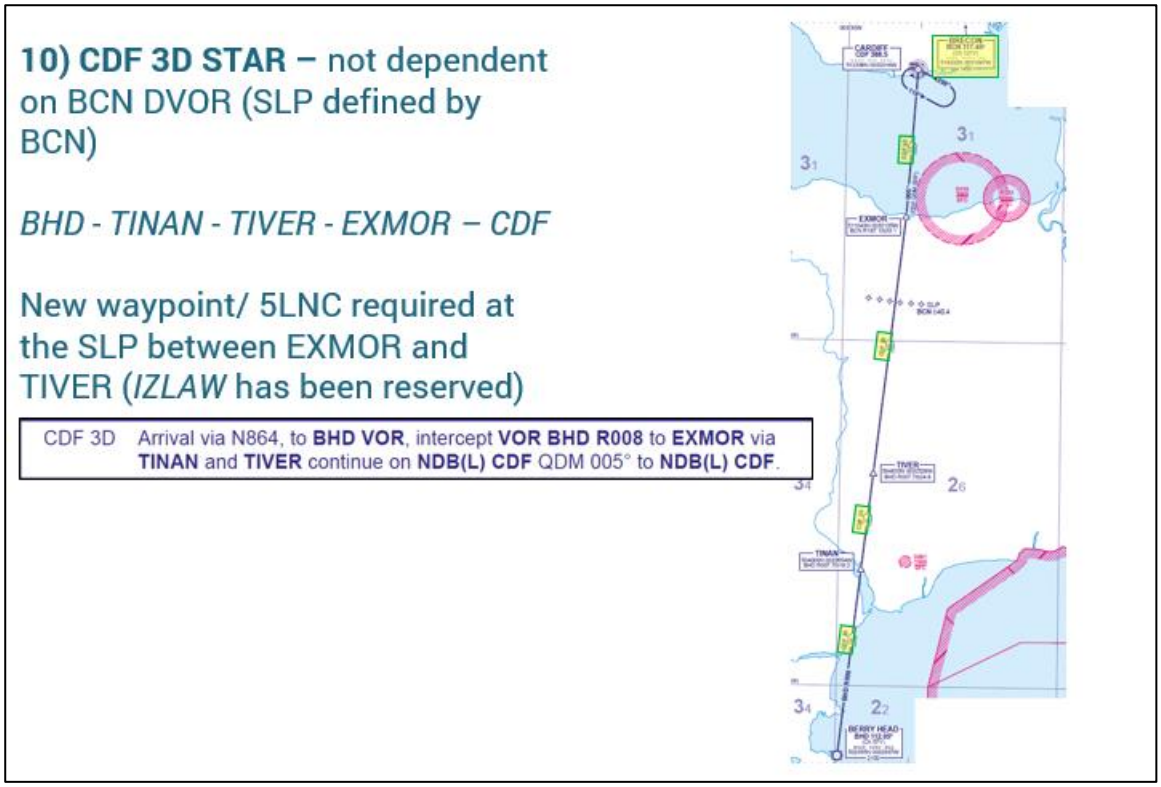


CDF 1B	Arrival via L9 to **STU VOR** then intercept **BCN VOR** R285 (105°) to **BCN VOR** via AMMAN, then turn right onto **BCN VOR** R189 to **NDB(L) CDF**.	**FL170 level** 10NM west of **AMMAN**

Cardiff – CDF 1C STAR



Cardiff – CDF 3D STAR



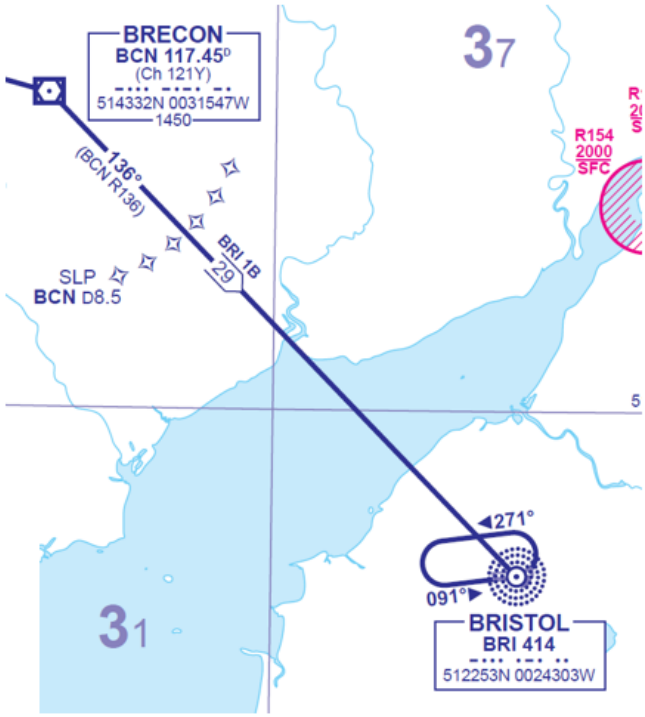
Bristol Hold

11) Bristol Hold

To be RNAV5 replicated

STARs to end at FL70 at BRI

Lower Level – unchanged from today
Upper Level – TBC



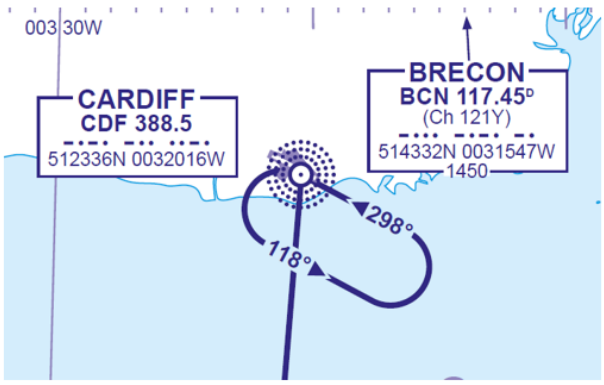
Cardiff Hold

12) Cardiff Hold

To be RNAV5 replicated

STARs to end at FL70 at CDF

Lower Level – unchanged from today
Upper Level – TBC



10. Annex C: Impact Assessment – Bristol Procedures

For charts and technical notes, see the Assessment Meeting slide pack (Ref 1) for the current IFPs.

Current IFP	Current route connectivity/ STAR	Design Principle	How	Proposed route Connectivity/ STAR	Impact of proposed change on connectivity and flight behaviour
BRI 1A STAR	*RETSI - AMRAL - RILES - DOBEM - INGUR - BRI*	Satisfies all DPs except DP4 is not relevant for this change (no BCN dependency to remove)	RNAV5 replication, truncation and re-designation	N862: *AMRAL - RILES - DOBEM - INGUR - BRI* Re-named as **AMRAL 1B**	The conventional STAR will be RNAV5 replicated, truncated at existing waypoint *AMRAL* and re-named. This proposal will also likely amend the level at *RILES* – following operator feedback. This is dependent on engagement and feedback currently ongoing. STAR to be re-named based on its new starting waypoint *AMRAL* and the 'B' designator used to denote the destination airport (Bristol). The STAR will be replicated and created using RNAV design criteria to align as closely as possible with the existing routeing.
BRI 1E STAR	*TALGA - BCN - BRI*	Satisfies all 5 DPs	RNAV5 replication, STAR extension and re-designation	N864: *UMOLO - TALGA - BCN - PEGZA - BRI* Re-named as **UMOLO 1B**	The conventional STAR will be RNAV5 replicated, extended back to existing waypoint *UMOLO* (along N864) and re-named. Extending the STAR back to *UMOLO* will provide flight plannable options and retain the important descent planning restriction. New waypoint required at the SLP between *BCN* and *BRI* (5LNC *PEGZA* has been reserved).

Current IFP	Current route connectivity/ STAR	Design Principle	How	Proposed route Connectivity/ STAR	Impact of proposed change on connectivity and flight behaviour
					STAR to be re-named based on its new starting waypoint *UMOLO* and the 'B' designator used to denote the destination airport (Bristol). The STAR will be replicated and created using RNAV design criteria to align as closely as possible with the existing routeing.
BRI 1B STAR	*STU - AMMAN - BCN - BRI*	Satisfies all 5 DPs	RNAV5 replication, truncation and re-designation	L9: *FIFAH - AMMAN - BCN - PEGZA - BRI* Re-named as FIFAH 1B	The conventional STAR will be RNAV5 replicated, truncated at new waypoint *FIFAH* (5LNC has been reserved) and re-named. New waypoint required at the SLP between *BCN* and *BRI* (5LNC *PEGZA* has been reserved). STAR to be re-named based on its new starting waypoint *FIFAH* and the 'B' designator used to denote the destination airport (Bristol). The STAR will be replicated and created using RNAV design criteria to align as closely as possible with the existing routeing.
BRI 1C STAR	*CPT - POMAX - BRI*	Satisfies DP1, DP2 and DP5 – no RNAV replication (DP3) and no BCN dependency to remove (DP4)	Re-designation	*CPT - POMAX – BRI* Re-named as CPT 1B	STAR to be re-named based on its starting waypoint *CPT* and the 'B' designator used to denote the destination airport (Bristol). No further changes will be made as this STAR is likely to change as part of a future NERL network change.

Current IFP	Current route connectivity/ STAR	Design Principle	How	Proposed route Connectivity/ STAR	Impact of proposed change on connectivity and flight behaviour
BRI 2D STAR	*BHD - TINAN - TIVER - EXMOR - BRI*	Satisfies all DPs except DP4 is not relevant (no BCN dependency to remove)	RNAV5 replication, truncation and re-designation	N864: *DAWLY - TIVER - EXMOR - BRI* Re-named as **DAWLY 1B**	The conventional STAR will be RNAV5 replicated, truncated at existing waypoint *DAWLY* and re-named. *DAWLY* is not published on the STAR but is on the route N864 between *BHD* and *TIVER*. *TINAN* will also be removed from the STAR. STAR to be re-named based on its new starting waypoint *DAWLY* and the 'B' designator used to denote the destination airport (Bristol). The STAR will be replicated and created using RNAV design criteria to align as closely as possible with the existing routeing.
BRI Hold	N/A	Satisfies DP1. DP2 and DP3 – no BCN dependency to remove (DP4) and no further changes proposed (DP5)	RNAV5 replication	N/A	This Hold will be RNAV replicated, to match as closely as possible with the currently published conventional Hold.

11. Annex D: Impact Assessment – Cardiff Procedures

For charts and technical notes, see the Assessment Meeting slide pack (Ref 1) for the current IFPs.

Current IFP	Current route connectivity/ STAR	Design Principle	How	Proposed route Connectivity/ STAR	Impact of proposed change on connectivity and flight behaviour
CDF 1A STAR	*RETSI - AMRAL - RILES - DOBEM - KUKIS - CDF*	Satisfies all DPs except DP4 is not relevant (no BCN dependency to remove)	RNAV5 replication, truncation and re-designation	N862: *AMRAL - RILES - DOBEM - KUKIS - CDF* Re-named as AMRAL 1C	The conventional STAR will be RNAV5 replicated, truncated at existing waypoint *AMRAL* and re-named. The future proposal will also amend the level at *RILES* – following operator feedback. This is dependent on current engagement and feedback. STAR to be named based on its new starting waypoint *AMRAL* and the 'C' designator used to denote the destination airport (Cardiff). The STAR will be replicated and created using RNAV design criteria to align as closely as possible with the existing routeing.
CDF 1E STAR	*TALGA - BCN - CDF*	Satisfies all 5 DPs	RNAV5 replication, STAR extension and re-designation	N864: *UMOLO - TALGA - BCN - CDF* Re-named as UMOLO 1C	The conventional STAR will be RNAV5 replicated, extended back to existing waypoint *UMOLO* (along N864) and re-named. Extending the STAR back to *UMOLO* will provide flight plannable options and retain the important descent planning restriction. STAR to be re-named based on its new starting waypoint *UMOLO* and the 'C' designator used to denote the destination airport (Cardiff).

Current IFP	Current route connectivity/ STAR	Design Principle	How	Proposed route Connectivity/ STAR	Impact of proposed change on connectivity and flight behaviour
					The STAR will be replicated and created using RNAV design criteria to align as closely as possible with the existing routeing.
CDF 1B STAR	*STU - AMMAN - BCN - CDF*	Satisfies all 5 DPs	RNAV5 replication, truncation and re-designation	L9: *FIFAH - AMMAN - BCN - CDF* Re-named as **FIFAH 1C**	The conventional STAR will be RNAV5 replicated, truncated at new waypoint *FIFAH* (5LNC has been reserved) and re-named. STAR to be re-named based on its new starting waypoint *FIFAH* and the 'C' designator used to denote the destination airport (Cardiff). The STAR will be replicated and created using RNAV design criteria to align as closely as possible with the existing routeing.
CDF 1C STAR	*CPT - ABDAL - BRI - CDF*	Satisfies DP1, DP2 and DP5 – no RNAV replication (DP3) and no BCN dependency to remove (DP4)	Re-designation	*CPT - ABDAL - BRI - CDF* Re-named as **CPT 1C**	STAR to be re-named based on its starting waypoint *CPT* and the 'C' designator used to denote the destination airport (Cardiff). No further changes will be made as this STAR is likely to change as part of a future NERL network change.
CDF 3D STAR	*BHD - TINAN - TIVER - EXMOR - CDF*	Satisfies all DPs except DP4 is not relevant (no BCN dependency to remove)	RNAV5 replication, truncation and re-designation	N864: *DAWLY - TIVER - IZLAW - EXMOR - CDF* Re-named as **DAWLY 1C**	The conventional STAR will be RNAV5 replicated, truncated at existing waypoint *DAWLY* and re-named. New waypoint required at the SLP between *TIVER* and *EXMOR* (5LNC *IZLAW* has been reserved).

Current IFP	Current route connectivity/ STAR	Design Principle	How	Proposed route Connectivity/ STAR	Impact of proposed change on connectivity and flight behaviour
					DAWLY is not published on the STAR but is on the route N864 between BHD and TIVER. TINAN will also be removed from the STAR. STAR to be re-named based on its new starting waypoint *DAWLY* and the 'C' designator used to denote the destination airport (Cardiff). The STAR will be replicated and created using RNAV design criteria to align as closely as possible with the existing routeing.
CDF Hold	N/A	Satisfies DP1. DP2 and DP3 – no BCN dependency to remove (DP4) and no further changes proposed (DP5)	RNAV5 replication	N/A	This Hold will be RNAV replicated, to match as closely as possible with the currently published conventional Hold.

11. Annex E: List of references

Reference	Name	Hyperlink
1	*BCN DVOR CAP1616 Stage 1 Assessment Meeting Slide pack*	Link
2	*BCN DVOR Assessment Meeting minutes (redacted)*	Link
3	*BCN DVOR Statement of Need*	Link
4	*BCN DVOR Stage 1B Design Principles*	Link
5	*BCN DVOR Removal Engagement Evidence (redacted) V1.1*	Link
6	*Bristol and Cardiff Arrivals Aug 2019 V1.0* A supporting document showing radar plots of arrival traffic at Bristol and Cardiff Airports, for August 2019.	Link

12. Annex F: Engagement Evidence

This section summarises the engagement activities in support of this ACP.

Stakeholder	Type of engagement	Date	Notes
Bristol Airport	Email	July 2020	Email outlining proposed changes to Bristol procedures (STARs/ Hold) as part of the DVOR Rationalisation programme; seeking feedback and approval.
Cardiff Airport	Email	July 2020	Email outlining proposed changes to Cardiff procedures (STARs/ Hold) as part of the DVOR Rationalisation programme; seeking feedback and approval.

End of document