

DVOR Rationalisation
Removal of Enroute Dependencies
BIG BNN MID WCO WOD

BIG/ BNN/ MID DVORs and WCO/ WOD NDBs
Holds and STARs
Gateway documentation:
Stage 1 Define

Step 1B Design Principles

V1.2

NATS Uncontrolled

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Publication history

Issue	Month/Year	Change Requests in this issue
1.0	Sep 2019	First Issue submitted to CAA
1.1	Sep 2019	Second Issue including correct ACP reference number and target AIRAC date
1.2	Sep 2019	Updated to reference latest Assessment Meeting slides

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1. Introduction and background

This document continues the CAP1616 process which started when the Statement of Need (DAP1916) was submitted to the Civil Aviation Authority in August 2019:

In order to facilitate the eventual removal of the Westcott (WCO) and Woodley (WOD) NDBs; and Bovingdon (BNN), Midhurst (MID) and Biggin Hill (BIG) DVORs, it is proposed to remove the enroute dependencies from these facilities. Any STARs that use these facilities and not changed by previous DVOR removals will either be dis-established or made RNAV5 and designated by their start points in line with ICAO. Any alternate STARs and Holds will be removed.

In the event that the removal of the dependency requires truncation/ rationalisation of existing STARs, then any portions of STARs removed or rationalised will be replaced by an ATS Route or DCT.

The outer Holds at HON, DELBO and OKESI (for OCK arrivals) will also be made RNAV and added to the relevant RNAV STAR charts.

Finally, as part of this proposal, NATS will take the opportunity to re-designate other STARs that appear on the same chart.

This proposal will therefore remove the enroute dependency from the Biggin Hill, Bovingdon and Midhurst DVORs and the Woodley and Westcott NDBs; and none of the above will result in the change of tracks over the ground or vertical profile at or below 7,000ft.

This SoN replaces DAP1916-3369 (v4.1).

The intent of this document is to summarise and satisfy the requirements for CAP1616 Stage 1 Define Gateway, Step 1B Design Principles. The CAA reference is ACP-2019-07, and the link to the CAA progress page is [here](#).

This proposal was initially limited to removing the dependency of enroute instrument flight procedures in the UK AIP from the Bovingdon (BNN) DVOR and Westcott (WCO) NDB. However, prior to the Assessment Meeting, an updated Statement of Need was submitted to also remove the final enroute dependencies from the Biggin Hill (BIG) and Midhurst (MID) DVORs; alongside the Woodley (WOD) NDB. Therefore, this proposal is focussed on Standard Terminal Arrival Routes (STARs), and their associated Holds which refer to the BIG/ BNN/ MID DVOR or WCO/ WOD NDB, as a conventional navaid in the enroute environment; where NATS is the primary air navigation services provider (ANSP).

The BIG, BNN and MID DMEs (Distance Measuring Equipment) are co-located with the DVOR and will remain in the same location once the DVORs are removed. Similarly, the WCO and WOD NDBs will be renamed as Westcott (WCO) and Woodley (WOD). Airport-based procedures such as Standard Instrument Departures (SIDs) and instrument approaches are not relevant to the enroute scope of this proposal, hence they are excluded. Airport operators are developing separately their own equivalent SID and instrument approach procedures presuming DVOR rationalisation.

NATS took part in a (CAA-led) consultation with the National Air Traffic Management Advisory Committee (NATMAC) in 2008. NATMAC members were provided with a consultation paper which outlined NATS plans to rationalise the DVOR infrastructure; alongside being invited to provide feedback or questions on the proposal. As this consultation was completed before the introduction of CAP1616, there was not a requirement for NATS to engage or seek feedback on Design Principles.

A follow-up informative letter was sent to NATMAC members in 2010 which summarised the results of the consultation; including broad support from airlines and a recognised requirement for airports to remove their

own airport procedure dependencies. NATS, through the DVOR Rationalisation Project, also provided the NATMAC members with an update on the project in 2018; including an explanation of the stages required to remove the navaid dependencies and how they will be physically removed from service.

NATS formally notified all airports in 2018, which have AIP-published procedures using the relevant ground-based navigation aids, that they are required to remove all dependencies by December 2022. This gave airports a four-year notice period to carry out the CAP1616 ACP work required to remove their own dependencies. Airports were given the opportunity to formally request an extension to this period if they wish to rely on a DVOR beyond December 2022.

This document outlines the Design Principles we will use to remove the enroute dependencies from the BIG/ BNN/ MID DVORs and WCO/ WOD NDBs, and the rationale behind them. The Design Principles are focussed on how best to remove the enroute dependencies alongside ensuring that the changes are safe and do not result in any changes to flight behaviour. 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.

2. Stage 1 Define

Step 1A Assess requirement

- 2.1 The Statement of Need was submitted on 30th August 2019.
- 2.2 The Assessment Meeting was held via teleconference on 4th September 2019. This was attended by an Airspace Change Specialist from NATS and members of the CAA's Airspace Regulation team; as listed in the Assessment Meeting Minutes ^(Ref 2).
- 2.3 The technicalities of the current procedures were described. A presentation was given by NATS to CAA, fully interactive with questions asked and answered.
- 2.4 This proposal is focussed on the removal of the enroute dependencies from the BIG/ BNN/ MID DVORs and WCO/ WOD NDBs; and the option concepts as to how this may be achieved.
- 2.5 The enroute flight procedures under consideration are Standard Terminal Arrival Routes (STARs), enroute holding patterns and terminal holding patterns where the BIG/ BNN/ MID DVOR or WCO/ WOD NDB is material to their definition.
- 2.6 The CAA agreed that this proposal falls under the airspace change process with a provisional level of 2C, subject to the outcome of the Define Gateway.
- 2.7 This proposal is targeting an implementation date of AIRAC 10, 12th September 2020. This is one of the four major annual NAS builds which this proposal can be implemented in, because the proposed changes affect the NAS adaptation.

Step 1A complete

Step 1B Design Principles

- 2.8 The analogy of a toolbox was used to describe potential methods of removing the enroute dependencies from the DVORs and NDBs, with each tool having a specific function, in combination with other tools as appropriate.
- 2.9 A CAA-led consultation occurred with NATMAC in 2009, with a NATMAC Informative produced on 7th October 2010. Airlines were broadly supportive, with the NATS reduction in expenditure as a favourable item.
- 2.10 Revised STAR designations should be in line with standard ICAO method – named after the first waypoint of the procedure, not the final waypoint as per typical UK designations. The route indicator will be named after the destination airport; for example, 'H' would denote Heathrow.
- 2.11 The Design Principle (DP0), with overriding priority is that the airspace change must "Maintain or enhance the current level of safety."
- 2.12 The Design Principle (DP1) driving this change is that *"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"*.
- 2.13 The other Design Principles for this proposal have been created as different approaches for the removal of the BIG/ BNN/ MID DVOR and WCO/ WOD NDB enroute dependencies; these are summarised below:

Design Principle	Description
DP0 Safety	Airspace change must maintain or enhance the current level of safety
DP1 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
DP2 Admin	

	Remove unnecessary references to the BIG/ BNN/ MID DVORs and WCO/ WOD NDBs, which are not material to the procedure
<i>DP3 Withdraw</i>	Some STARs are rarely used, some do the same job, some have segments in common with other STARs (see DP5 Truncate)
<i>DP4 Replicate</i>	PBN Replication – replace conventional STARs/ Holds with RNAV STARs/ Holds
<i>DP5 Truncate</i>	CAA STAR Truncation Policy used here. When applied logically to STARs with many common segments, can result in withdrawal of unnecessary duplicate STARs (DP3) When the final arrangement is decided, the truncated conventional STAR is always RNAV-replicated (DP4). In the case of a change to the actual vertical profile flown in the STAR, additional fuel/CO2 analysis and justification for this this will be provided.
<i>DP6 Technical amendment</i>	Minor changes to a STAR which currently cannot be flown as it is formally defined, for legacy reasons – these changes always reflect what would actually happen in practical terms.

The six Design Principles summarised above are further detailed below with generic examples for context:

2.14 Design Principle 0 (DP0) – Maintain or enhance safety

Any airspace changes must maintain or enhance the current level of safety for all parties concerned.

2.15 Design Principle 1 (DP1) - No change to flight behaviour

The proposed technical changes to the definitions of STARs/ Holds will not result in a change to actual flight behaviours – laterally, vertically or in dispersal.

2.16 Design Principle 2 (DP2) – Admin change

This Design Principle removes unnecessary references to DVORs. Some conventional AIP STAR plates may contain references to a DVOR which is not used in the IFP itself. Assess the impact of removing that reference. Make an administrative change – no change to STAR version number.

Example: A STAR waypoint defined by a conventional navaid and associated radials/ distances, but the navaid is not used in the definition of the IFP itself. There is no actual dependency on the navaid – thus no impact on the IFP.

Method: Update applicable waypoint definitions to remove the navaid fix definitions.

Desired Outcome: Navaid dependency entirely removed from the STAR chart with minimal effort and no impact.

2.17 Design Principle 3 (DP3) - Withdrawal

Some STARs are rarely used, other STARs provide similar connectivity. Assess the impact of removing the rarely-used STARs from service.

Example: A contingency STAR designed to be used when a DVOR is out of service. Where the DVOR is being removed and the STAR replicated in RNAV, there is no requirement for a contingency procedure.

Desired Outcome: Withdraw the contingency STAR from service, since using satellite based or DME/DME PBN navigation the replicated replacement for the primary STAR will always be available. Connectivity for relevant ATS routes/ waypoints will be retained.

2.18 Design Principle 4 (DP4) - Replication

Replicate the current IFPs using the CAA PBN STAR Replication Policy (Sep 2016) and Policy for RNAV Holding Attached to Arrival Procedures in UK Airspace (Feb 2016). Assess the impact of changing the navigation status.

Example: Most STARs can be replicated from conventional navigation to RNAV5 specification. Those few which cannot are detailed under Design Principle 5.

Method: Employ an Approved IFP Designer (APD) to analyse the existing conventional STAR/ Hold.
The APD is instructed to use appropriate RNAV criteria to draw up replacements, following the same track over the ground and vertical definitions as closely as possible using RNAV design criteria

Desired Outcome: Replication of IFPs under these policies means there would be no significant change to tracks over the ground, purely technical changes to the definitions of the IFPs. Contingency STARs/ Holds, based on conventional navigation alternate DVORs, would no longer be required, thus they can be withdrawn from service (Design Principle 3).

2.19 Design Principle 5 (DP5) - Truncation

Assess the impact of truncating specific STARs. Several STARs have common “heads” and/or route segments in common with ATS routes – unnecessary duplication. An ATS Route or Flight Plannable Direct (DCT) may be extended/ implemented to match STAR route segments until a common “head” is reached, or to suitable intermediate waypoint shortening the IFP.

Example: A STAR shares a common segment with an ATS Route

Method: Truncate the STAR at a waypoint ensuring no change to connectivity
Replicate the remainder using RNAV5 (Design Principle 4)
Re-designate the resulting IFP as per ICAO method (see para 2.10).

Desired Outcome: No change to connectivity.
Replication of remaining segments of IFP under STAR Replication Policy means there would be no change to tracks over the ground, purely technical changes to the definitions of the IFPs. (Design Principle 4)
Fewer, less complex IFPs. Less ongoing maintenance. Overall burden is reduced for NATS and IFP Regulator. Simplifies network structures, reduces FDP processing.

2.20 Design Principle 6 (DP6) - Technical Amendment

This corrects an existing IFP technical issue which is worked around in practice; or corrects an existing flight-plan disconnection which is also worked around in practice. Assess the impact of correcting an existing error to match the actual workaround.

Example: A stack-swap STAR often has no connectivity with the flight plan route as it starts at a particular waypoint which the majority of flights bypass entirely.
Should a stack-swap situation occur, cockpit and ATC workload would increase as the disconnected stack-swap STAR would need to be manually issued and input by the flight crew via the more appropriate connection waypoint.

Method: Amend the rarely-used, non-flight-plannable STAR to use a more appropriate waypoint.

Instruct an APD to draw up the revised STAR and designate the resulting IFP as per ICAO method (see para 2.10).

Desired Outcome: Improvement to connectivity – updated the IFP to what it should always have been and align it with what would happen in practice.
 A potential reduction in cockpit/ATC workload under busy stack-swap situations.
 No impact on actual flight behaviours.

3. Stakeholder Engagement

The Design Principles used for this proposal were originally devised for the SAM/ OCK DVOR proposal, submitted in October 2018. They have since been used for numerous DVOR proposal submissions in order to maintain consistency across the DVOR Programme; however, they are reviewed for each individual proposal to ensure relevance. The individual proposals seek the same outcome, just applied to different physical nav aids.

As per previous submissions, airports will be fully briefed on the proposed changes and the justification behind why the enroute DVOR/ NDB dependencies are being removed. This will be focussed on airports whose aerodrome AIP pages will change as a result of the nomenclature changes. However, the proposed changes have all been designed to be invisible from an airport’s perspective, asides from the administrative AIP changes; there are no other impacts anticipated.

The enroute changes as part of this proposal, and previously, will have a minimal impact on airspace users as flight paths will not change; and there will be no impact to ground-based communities. Hence, due to the nature of the DVOR rationalisation ACPs, stakeholder engagement on each Design Principle for each individual submission is not relevant or necessary.

Step 1B complete

4. Annex A List of references

Reference	Title and description
1 For publication	<i>DVOR Rationalisation BIG, BNN, MID DVORs and WCO, WOD NDBs Stage 1 Assessment Meeting V1.2</i> Slide pack presented at the Stage 1 assessment meeting; redacted for publication. This is the primary reference material for illustrations of current IFPs in this stage 1 document. Link to document on portal.
2 For publication	<i>DVOR Rationalisation BIG, BNN, MID DVORs and WCO, WOD NDBs Assessment Meeting Minutes (redacted)</i> Link to document on portal.

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