

# **DVOR / DME /NDB Rationalisation: Example Safety Approach**

CAP 1781b

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# DVOR/DME/NDB Rationalisation – Guidance for the use of RNAV Substitution (CAP 1781)

Example Safety Approach

***NATS***

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# 1. Introduction

## 1.1. Background

In August 2009 and October 2009, the CAA undertook a National Air Traffic Management Advisory Committee (NATMAC) consultation on rationalising the UK VOR infrastructure down from the current 46 VORs to 19 and removing the 10 enroute NDBs operated by NATS. As each of the navigation aids that are to be withdrawn are taken out of service and decommissioned the conventional procedures that reference the navigation aid will no longer be valid and replacement procedures that are independent of the navigation aid will need to be in place. Where the VOR is co-located with a DME the DME may also be removed or relocated depending upon the results of a further consultation on the future of the DME network.

The NATS Enroute procedures such as STARs and Holds that are predicated on, or make reference to, a navigation aid that is to be removed will either be deleted or replaced with suitable RNAV procedures ahead of removal but there are also procedures that are owned by Airports that will be impacted by the rationalisation programme and these will also need to change.

RNAV Substitution provides an additional option for certain procedures affected by removal of a particular navigation aid. It is not an alternative to either deleting procedures or replacing conventional procedures with RNAV procedures when a dependent navigation aid is removed but, subject to certain conditions, can provide an interim step which gives procedure owners additional time to plan and implement their RNAV strategy, including any consultation required by the Airspace Change Process, without preventing the navigation aid rationalisation programme from continuing.

The DVOR/DME/NDB Rationalisation – Guidance for the use of RNAV Substitution (CAP 1781) builds on the approach currently being applied for VOR, DME and NDB non-availability for an extended period such as may occur during replacement activities. In these cases, precedence has been set by approving the continued use of certain conventional procedures, for up to 6 months, even though the dependent navigation aid is not available. This allows those aircraft able to fly the procedure using solely their Flight Management System (FMS) overlay of the procedure, and to continue to file and fly the procedure during the outage. For those aircraft unable to fly the overlay alternative mitigation has to be identified. CAP 1781 extends this approach and allows conventional procedures to continue to be flown by suitably equipped aircraft using their FMS overlays for a much longer period until suitable alternatives to the conventional procedures are available. This may not be until 2026 (or later) where the alternative procedures are expected to be developed as part of major airspace modernisation.

In order to gain approval to apply CAP 1781 owners of procedures that are dependent on a navigation aid which is to be withdrawn must undertake a number of activities to demonstrate to the CAA that the use of the guidance in a particular application is acceptably safe.

## 1.2. Purpose of this document

The purpose of this document is to provide an example of the activities and evidence that the CAA would expect to accompany any request for approval to use the DVOR/DME/NDB Rationalisation – Guidance for the use of RNAV Substitution (CAP 1781). In order to achieve this, the document contains a generic safety argument and identifies typical evidence items that should be considered in order to demonstrate that the proposed use of CAP 1781 is acceptably safe within the context of the operation and the applicant's safety management system. The document also outlines the process that applicants wishing to apply CAP 1781 should follow in order to develop the required evidence.

The implementation assurance can be provided in accordance with local processes if required. Normal CAA requirements for notifying operational change will also need to be complied with irrespective of how the implementation assurance is documented

This guidance has been produced prior to the Air Traffic Management Implementing Regulation, ATM-IR (EU) 2017/373 coming into force. The guidance should be tailored with the local Safety Management System as it stands at the time of use.

## 1.3. Notices<sup>1</sup>

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This document is made available to Airports who may be impacted by removal of NATS Navigational Aids for the purpose set out in Section 1.

This document in no way guarantees or warrants the sufficiency of the safety justifications. Each Airport is required to make their own safety assessments with regard to their operations and be responsible for meeting the CAA's approvals. NATS assumes no liability or responsibility for any errors or omissions in this document and/or for how the content of this document is used or applied.

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<sup>1</sup> These notices should be reviewed by the CAA prior to the regulator publishing any of this document as a CAA Publication or Annex



## 2. Safety Roadmap

In December 2017 a workshop was held at Heathrow Compass Centre to examine the potential safety impacts of using RNAV Substitution for a prolonged period. The issues were explored in depth and a set of requirements considered necessary for safe use of RNAV Substitution were derived. A more detailed explanation of the issues addressed at the workshop and why each requirement is necessary can be found in the notes of the workshop contained in Appendix A.

Section 3 contains the generic safety requirements derived from the safety workshop which underpin the DVOR/DME/NDB Rationalisation – Guidance for the use of RNAV Substitution (CAP 1781) and deliver a set of evidence items.

However, the evidence items on their own do not demonstrate that the use of the guidance to mitigate navigation aid removal on a particular procedure is acceptably safe. To do that requires a safety argument to be developed from a top level claim that the use of the procedure is acceptably safe and supported by appropriate sub claims. Section 4 of this document focuses on that generic safety argument and identifies the typical evidence items that might be used to show achievement of each sub-claim. If achievement of all sub claims can be demonstrated, then the top level claim will be validated.

Section 5 then goes through the assessment process.

Section 6 shows documentation that may be required to support an approval request.

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### 3. Safety Requirements

<u>No.</u>	<u>Requirement</u>	<u>Evidence item</u>	<u>Owner</u>	<u>When</u>
SR 1.	The CAA shall develop a Data Quality Requirement (DQR) with all FMS coding houses to ensure that existing overlays remain unchanged if they are used to support procedures to which CAP1781 has been applied	E5.3	CAA	Guidance Issue
SR 2.	The applicant shall conduct a review of the AIP and MATS Part 2 to identify all references to the navigation aid being removed that impact their procedures.	E4.1	Applicant	Approval request
SR 3.	CAP 1781 shall only be applied if it can be demonstrated that only RNAV 1 certified aircraft and crews will be flying the procedure (or, as a minimum, such a significant proportion as to not impact ATS safety through ATC workload or similar)	E2.1 / E3.1 / E5.1	Applicant	Approval request
SR 4.	CAP 1781 shall not be applied to Final Approach Procedures.	E2.1 / E3.1 / E5.1	Applicant	Approval request
SR 5.	An FMS overlay shall already exist for any procedure where CAP 1781 is to be applied.	E2.1 / E3.1 / E5.1	Applicant	Approval request
SR 6.	To mitigate GNSS unavailability, there shall be adequate DME/DME coverage in the area where the CAP 1781 is to be applied. Information available from NERL.	E2.2	Applicant	Approval request
SR 7.	A baseline analysis to determine the current track over the ground of procedures where it is intended to apply CAP 1781 shall be conducted prior to application for approval.	E7.2	Applicant	Approval request
SR 8.	The applicant shall provide evidence of engagement with General Aviation Stakeholders at the applicant's Airport (where practicable) or which operate in the vicinity to raise awareness of the removal of the Navigation Aid and seek to identify alternative mitigations where the removal could potentially affect the applicant's operations through GA actions/interactions. If the Navigation Aid is a NERL asset, then NERL should assist the applicant.	E6.4	Applicant	Approval request
SR 9.	For each Navigation Aid proposed for removal the coding houses shall inform CAA whether any flight procedures referencing the navigation aid include any of the following leg types VI, CI, FD, CD, CR, VR, VD, AF when requested. The CAA will support a potential applicant in determining this requirement.	E5.3	CAA	Guidance published

<b>No.</b>	<b>Requirement</b>	<b>Evidence item</b>	<b>Owner</b>	<b>When</b>
SR 10.	Check whether the FMS overlay for the procedure contains any of the ineligible leg types i.e. VI, CI, FD, CD, CR, VR, VD, AF. Applicant may work with coding houses and CAA to seek to amend procedure provided no change to track over the ground if ineligible leg types are found.	E5.3	Applicant	Approval request
SR 11.	CAA approval for the use of CAP 1781 on any particular procedure shall include a check as to whether the FMS overlay for the procedure contains any of the ineligible leg types i.e. VI, CI, FD, CD, CR, VR, VD, AF.	E5.2	CAA	Approval
SR 12.	AIP charts of procedures that will apply CAP 1781 shall be amended as per the guidance in the CAP.	E6.1	Applicant	Implementation
SR 13.	An AIC (or similar) covering the subject shall be issued by the CAA.	E6.1	CAA	Implementation
SR 14.	Additional text shall be added to the AD Section of the AIP as per CAP 1781.	E6.1	Applicant	Implementation
SR 15.	Where CAP 1781 is being applied a NOTAM shall be raised at the time of withdrawal by the Navigation Aid Operator. The Applicant shall make the Navigation Aid Operator aware that CAP 1781 is being applied, coordinate the approach with the NAO to ensure no duplication or potential confusion and that the wording of the NOTAM and the time limits applied to it shall be in accordance with those specified in CAP 1781.	E6.3	Applicant, NavAid operator	Implementation
SR 16.	The Airport shall include a message in the ATIS transmission or other means of dissemination (DataLink or RT) regarding the unavailability of the navigation aid for a period of at least 3 months. If the Applicant or ANSP has safety issues or concerns regarding the length and/or complexity of the ATIS message other acceptable means of compliance should be discussed with CAA SARG.	E6.3	Applicant	Implementation
SR 17.	The track over the ground of aircraft flying a procedure where CAP 1781 has been applied shall be analysed and compared with the baseline no less than annually or when requested by the CAA. Further action may be required if a change is determined to be significant.	E7.1	Applicant	Post Implementation
SR 18.	The CAA needs to provide specific approval before CAP 1781 can be implemented by the Applicant. The CAA will inform the Coding Houses that approval has been given and the DQR activated.	E6.5 G1	CAA/ Applicant	

**Table 1 - Safety Requirements**

The Safety Requirements in Table 1 were derived from the workshop held at Heathrow on 4th December 2017 (see Appendix A). Safety Requirement SR 1 is a pre-requisite to be satisfied by the CAA prior to issue of CAP 1781. Safety Requirement SR 9 will also be undertaken by the CAA and if possible the list of affected procedures will be published and made available either in the guidance or another suitable document to allow applicants to complete SR 10. Safety Requirement SR 11 will form a part of the CAA Approval process. Safety Requirement SR 13 is a pre-requisite to be satisfied by the CAA prior to implementation.

The remaining requirements are the responsibility of the applicant and evidence will be required to demonstrate compliance.

Evidence of compliance to Safety Requirements SR 2 to SR 8 and SR 10 must be provided by the applicant in any request to use the guidance.

Evidence of compliance to requirements SR 12, SR 14, SR 15 and SR 16 is required following approval and prior to implementation. The requirements when met will deliver a set of evidence items. The evidence items will then be used to substantiate the structured argument shown in Section 4.

Evidence of compliance to requirement SR 17 is required post implementation with a time scale to be agreed with the sponsor and the regulator.

## 4. Safety Argument to support the use of CAP 1781

### 4.1. Principle underpinning the Safety Argument

The safety argument is based on the principle that if an FMS overlay already exists for a given conventional flight procedure, and the majority of aircraft are suitably equipped to use that overlay, then the majority of aircraft will already be using the FMS overlay to fly the procedure independent of the ground based nav aids on which the procedure is defined. If that is the case, then removal of any navigation aid supporting that particular procedure will have little effect as the majority of aircraft will continue to fly exactly as they would if the navigational aid were still in place.

There is precedence for continuing to fly certain conventional flight procedures using only the FMS overlay during short term (typically 3 to 6 months) VOR/DME outages for equipment replacement. Where it was possible to show that the majority of aircraft were suitably equipped and able to use FMS overlays, equipment replacement has recently been accomplished without provision of an alternative facility during the outage. No safety issues have been reported as a result of the use of overlays rather than using the conventional procedure.

However, NATS and other ANSPs that have used this approach did initially experience some issues because coding houses were also withdrawing the associated FMS overlays for the prescribed period when notified of the extended outage of any particular navigational aid. If the overlay is not available in the FMS, then the aircraft can't fly the procedure however capable it is. Those issues were overcome with agreement on how notification of such outages should be made but it does highlight the importance of the principle that the FMS overlays continue to be available. With the possibility of them being required for up to 5 years (or more) after the withdrawal of the relevant navigational aids special provision will be required to ensure FMS overlays remain available: the approach taken during shorter outages will not be sufficient.

The difference between short term use during non-availability of a single navigational aid affecting a small number of procedures and prolonged use for multiple navigational aids affecting a much larger number of procedures could be significant. There may be more aircraft flying overlays of conventional procedures and the range of procedures may be extensive and include some procedure types not previously considered during short term outages. The increased duration and increase in numbers of aircraft flying conventional procedures using only their overlays will mean that the likelihood of an error arising due to navigation capability issues or changes/errors in the FMS overlay could increase.

In order to mitigate these factors, use of the guidance will be restricted to aircraft certified as RNAV1 and evidence will be required that coding houses are aware that the procedure is now being flown using only the FMS overlay and hence any proposed change to the overlay should be reviewed by the procedure owner and CAA. Furthermore, monitoring of aircraft performance once the navigation aid is removed will be undertaken by the Airport/ATSU to demonstrate that there is no change to the baseline aircraft performance and track over the ground which could be considered to be significant by either the CAA or the Applicant.

### 4.2. Safety Argument

Figure 1 illustrates the generic safety argument that needs to be validated in order to claim that the top level goal of "The use of DVOR/DME/NDB Rationalisation – Guidance for the use of RNAV Substitution (CAP 1781) to mitigate navigation aid removal for specified routes and/or flight procedures at a particular airport/ATSU is acceptably safe" is met.

In order to achieve this each of the sub goals G2-G8 need to be shown to be met. Example evidence items have been identified which if available without any unacceptable limitations or shortcomings should be sufficient to claim that the sub goal is met.

Further details of the evidence items and the activities required to develop them are contained later in this document.

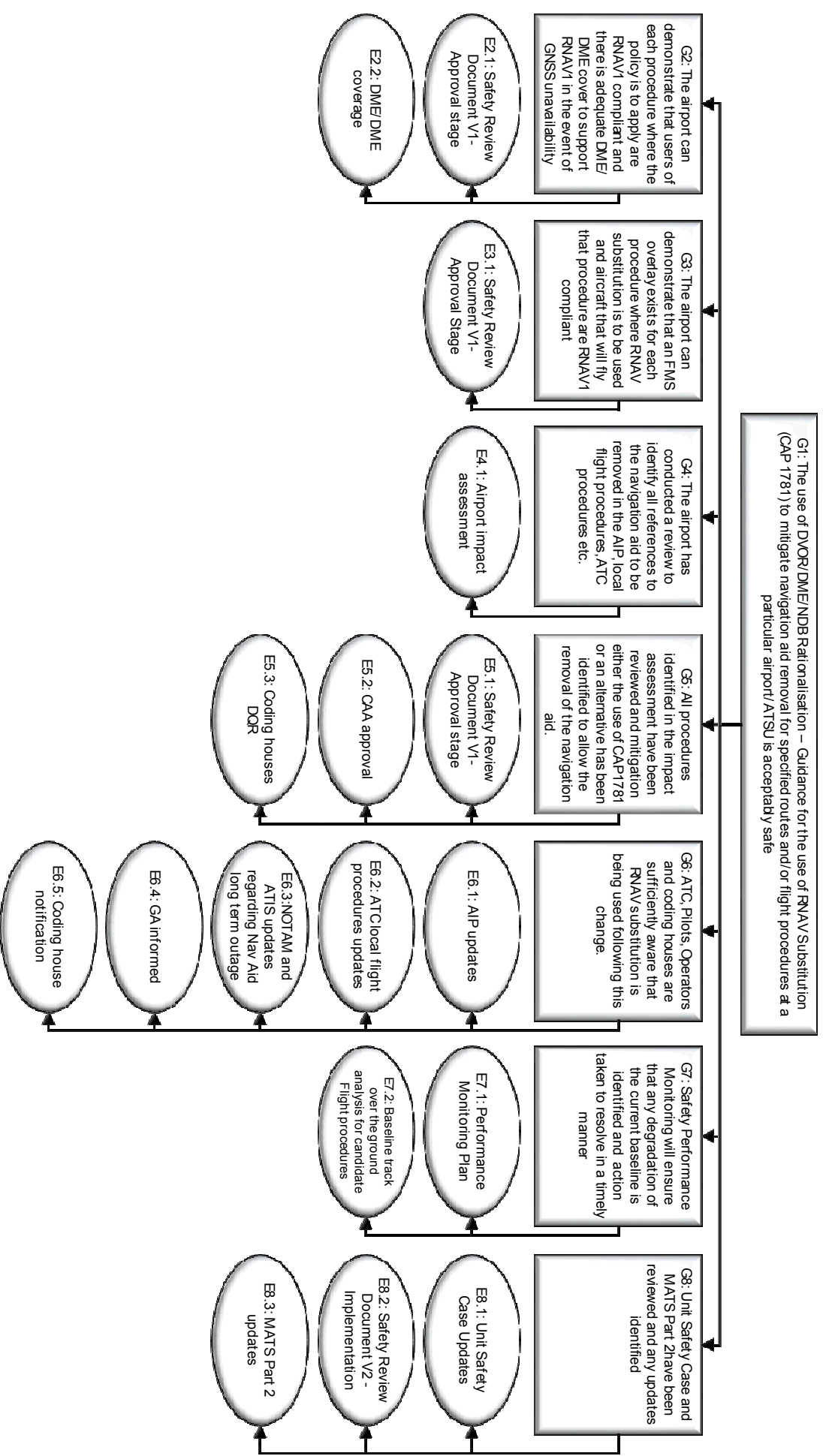


Figure 1 – Safety Argument



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## 5. Example Process for Applicants wanting to apply to use CAP 1781

### 5.1. Process flow overview

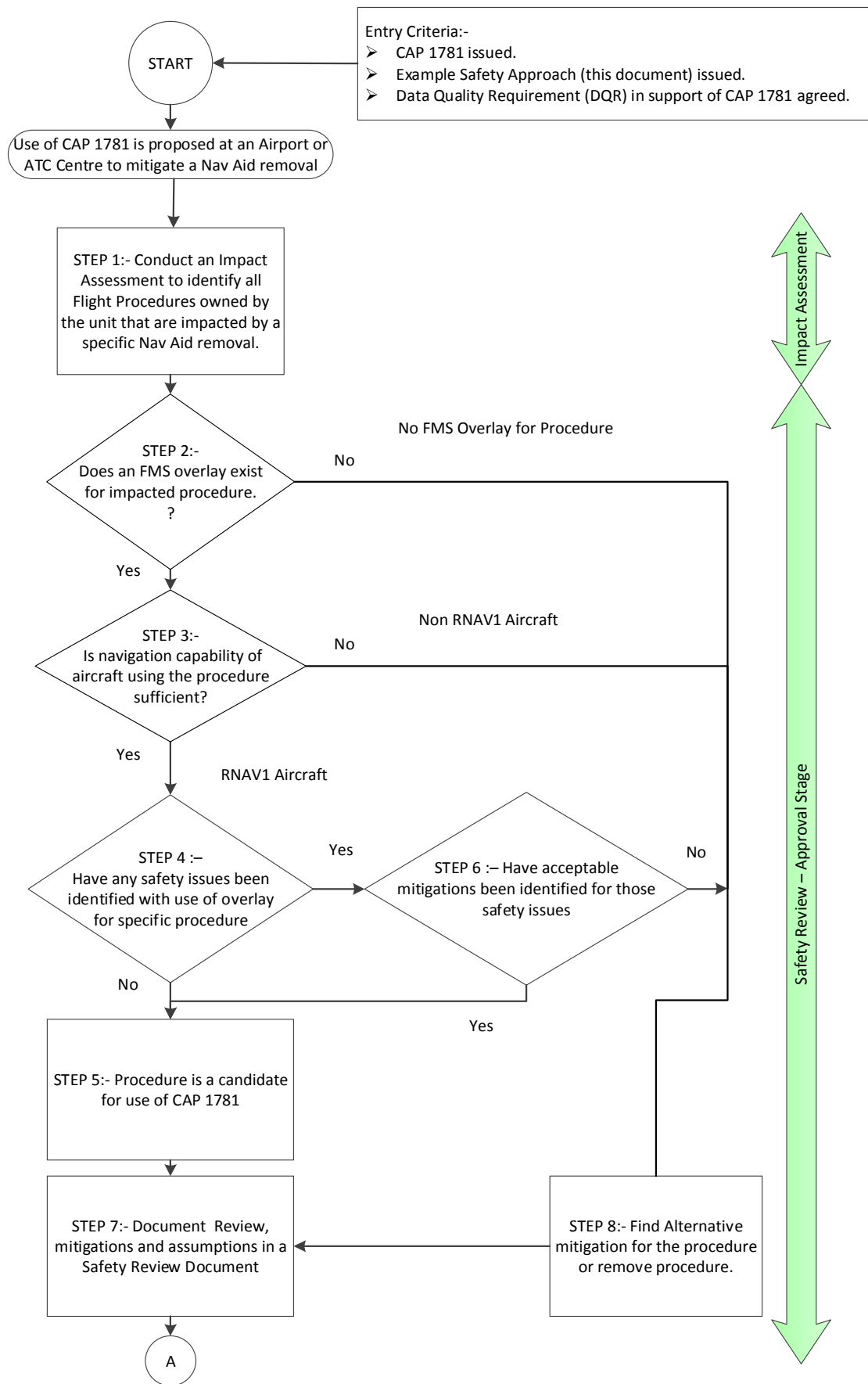


Figure 2 – CAP 1781 Approval Process Part 1

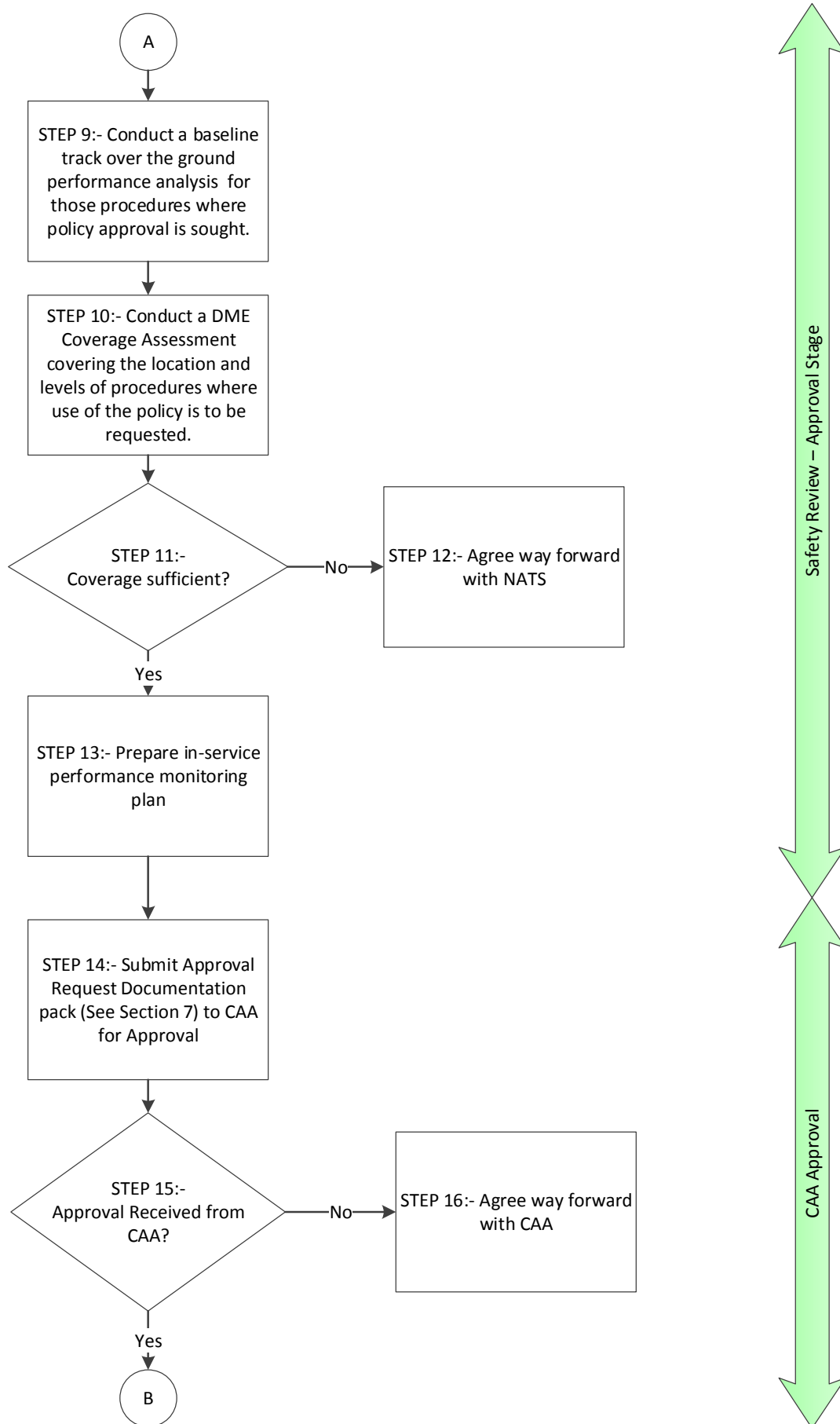


Figure 3 – CAP 1781 Approval Process Part 2

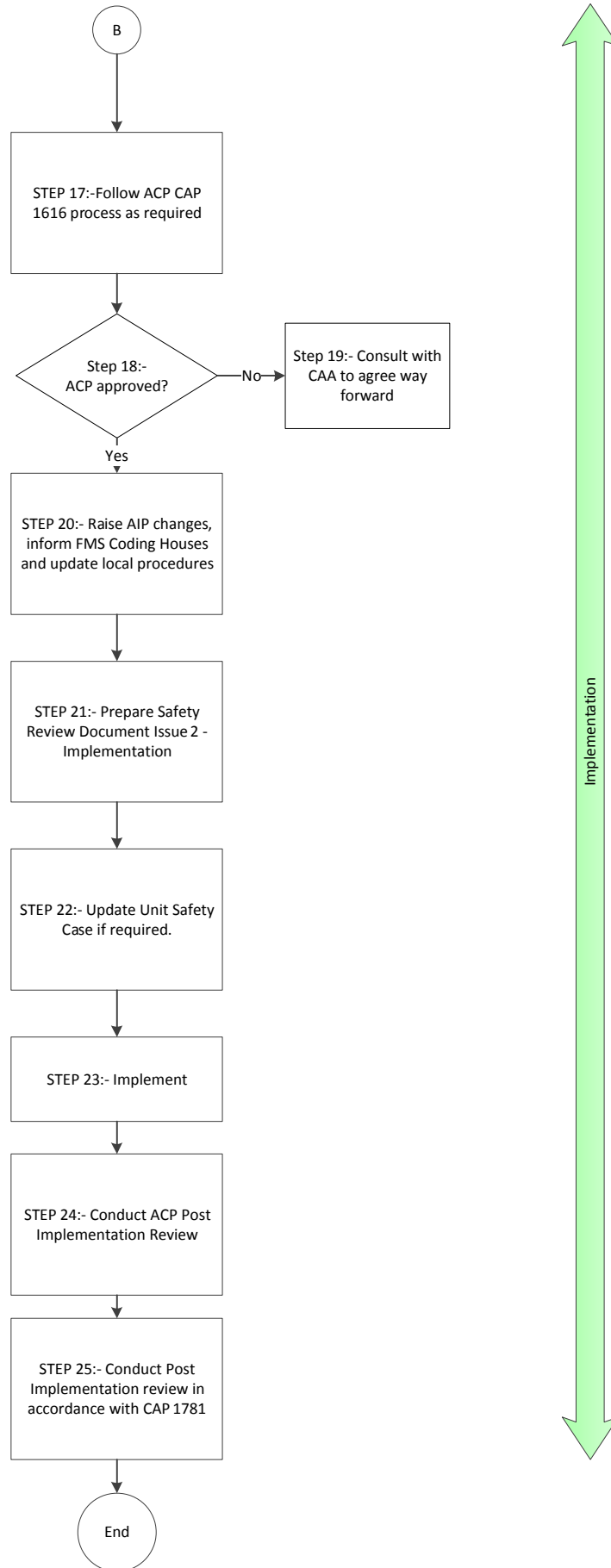


Figure 4 – CAP 1781 Approval Process Part 3

## 5.2. Conduct Impact Assessment

Conduct Impact Assessment – Process Step 1	
Entry Requirement	<ul style="list-style-type: none"> <li>• AIP.</li> <li>• Local Procedures/Instructions including MATS Part 2/ Letters of Agreement (LOA), ATSMAC, VRPs.</li> <li>• Review GA implications (including Airspace Infringement mitigation).</li> </ul>
Objective	<ul style="list-style-type: none"> <li>• Review AIP to identify any references to the navigation aid being removed that are in support of Airport. Review must extend into the textual part of the document and not solely the flight procedure plates.</li> <li>• Review local procedures/instructions to identify any references to the Navigation Aid being removed that are in support of Airport.</li> </ul>
Who	<ul style="list-style-type: none"> <li>• Airport Assessment Lead.</li> <li>• Airport ATC representation.</li> <li>• Airport owner representation if not Assessment Lead.</li> <li>• Aircraft Operator representation.</li> </ul>
<b>Output- Evidence item 4.1</b>	<b>Airport Impact Assessment Document (See Section 6.3)</b>

## 5.3. Conduct Safety Review – Approval Stage

Conduct Safety Review V1 – Approval Stage – Process Step 2-13	
Entry Requirement	<ul style="list-style-type: none"> <li>• Issued Impact Assessment Document.</li> <li>• Review CAP 1781 requirements.</li> </ul>
Objective	<ul style="list-style-type: none"> <li>• Identify for each procedure if there is an existing FMS overlay and if aircraft flying the procedure are RNAV1.</li> <li>• Identify mitigation for non RNAV1 aircraft.</li> <li>• Identify if the procedure contains an ineligible leg type notified in CAP 1781 and if so, document any mitigations identified (CAA will provide assistance on request).</li> <li>• Identify any airport specific/non-standard aspects of the procedure.</li> <li>• Identify candidate procedures for the use of CAP 1781.</li> <li>• For those procedures consider any safety issues and how these maybe mitigated.</li> <li>• Identify the final set of procedures where it is considered CAP 1781 could be applied.</li> <li>• Identify any limitations or shortcomings.</li> </ul>

Who	<ul style="list-style-type: none"> <li>• Airport Assessment Lead.</li> <li>• Airport ATC representation.</li> <li>• Airport Owner representation if not Assessment Lead.</li> <li>• Aircraft Operator representation.</li> </ul>
<b>Output- Evidence item 3.1 and 5.1</b>	<b>Safety Review Document: - See Section 6.4</b>

### 5.4. CAA Approval

Conduct CAA Approval – Process Step 14	
Entry Requirement	<ul style="list-style-type: none"> <li>• Issued Compliance Report including Safety Review Document V1</li> </ul>
Objective	<ul style="list-style-type: none"> <li>• Gain Approval from the CAA to apply CAP 1781 to specified procedures to mitigate removal of a navigation aid.</li> <li>• For procedures not suitable for the application of CAP 1781 but impacted by the navigation aid removal propose either alternative mitigation or removal of the procedure (for CAA approval).</li> <li>• CAA to check as part of the approval process if any candidate procedures for the Guidance include any of the ineligible FMS leg types i.e. VI, CI, FD, CD, CR, VR, VD, AF.</li> </ul>
Who	<ul style="list-style-type: none"> <li>• CAA</li> </ul>
<b>Output- Evidence item 5.2</b>	<b>CAA Approval</b>

### 5.5. Conduct Safety Review – Implementation Stage

Conduct Safety Review V2 – Implementation – Process Step 15-23	
Entry Requirement	<ul style="list-style-type: none"> <li>• CAA Approval to use CAP 1781.</li> <li>• ACP Approval (as required)</li> </ul>
Objective	<ul style="list-style-type: none"> <li>• Develop in service performance monitoring plan.</li> <li>• Raise AIP update.</li> <li>• Update Local Procedures if required.</li> <li>• Inform Coding Houses that CAP 1781 has been applied.</li> <li>• Identify any limitations or shortcomings.</li> <li>• Complete Airline engagement.</li> </ul>
Who	<ul style="list-style-type: none"> <li>• Airport/ATSU Assessment Lead.</li> <li>• Airport/ATSU ATC representation.</li> <li>• Aircraft Operator representation.</li> </ul>
<b>Output- Evidence item</b>	<b>Safety Review Document V2: -</b> Updates the Safety Review Document V1 and completes the safety argument

<b>8.2 leading to 8.1 and 8.3</b>	shown in Figure 1 with the required evidence items. <b><u>Unit Safety Case updates as required.</u></b>
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## 5.6. Conduct Safety Review – Post Implementation Stage

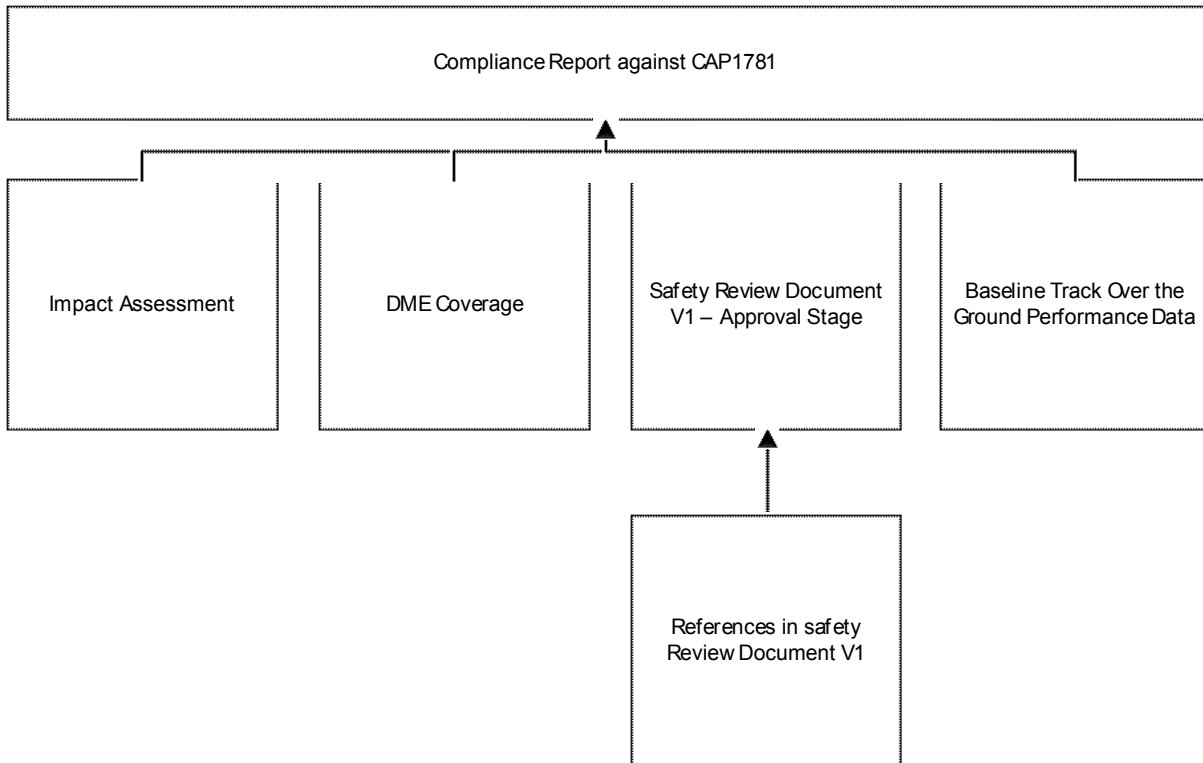
<b>Conduct Safety Review V2 – Post Implementation – Process Step 24-25</b>	
Entry Requirement	<ul style="list-style-type: none"> <li>• Compliance Report.</li> <li>• Agreed Baseline.</li> <li>• ACP Post implementation Review criteria as per CAP 1616 (Data Operational Information and other evidence) if required</li> </ul>
Objective	<ul style="list-style-type: none"> <li>• In service performance monitoring.</li> <li>• Post ACP review.</li> </ul>
Who	<ul style="list-style-type: none"> <li>• Airport/ATSU Assessment Lead.</li> <li>• Airport/ATSU ATC representation.</li> <li>• Aircraft Operator representation.</li> </ul>
<b><u>Output-Evidence Item</u></b> <b><u>7.2</u></b>	Baseline Track Over the Ground Performance Review report and mitigations



# 6. Documentation to submit in support of an approval request

## 6.1. Overview

An application to the CAA to request approval to apply CAP 1781 to flight procedures should include the documents shown in Figure 5



**Figure 5 Approval Documentation Pack**

## 6.2. Compliance Report Against CAP 1781 - Safety Argument Application Overview

The application overview is the top level summary document. It needs to include the following:

- 1 Confirmation that the argument and activities conducted comply with the CAP 1781 and references this Document or similar process appropriate to the sponsor SMS.
- 2 Table containing :-  
A list of relevant Procedures at the Unit where approval to use CAP 1781 is being requested.  
Confirmation that the safety requirements SR2-SR8 in Section 3 are satisfied by each procedure.  
Reference to where in the Safety Review document the evidence of compliance to each safety requirement is contained for each procedure.
- 3 Table containing: -  
List of procedures impacted by the Navigation Aid removal where alternative mitigation is proposed.  
Type of alternative Mitigation proposed which may include CAP1781 RNAV Substitution, but may not be limited to CAP 1781 solutions.  
Reference to where in the Safety Review Document the rationale for the selected alternative mitigation is contained together with the supporting evidence.
- 4 Limitations: - Please highlight key limitations to safety or service that will result from the Navigation Aid removal.

## 6.3. Impact Assessment

The impact assessment document shall contain: -

- 1 List of those involved in the impact assessment and their role.
- 2 List of all flight procedures owned by the Airport that are impacted by the Navigation Aid being removed. The source of the procedure should also be identified in the list.
- 3 List of all the Airport ATC procedure references to the Navigation Aid being removed. The source of the procedure should also be identified in the list.
- 4 List of all textual references to the Navigation Aid being removed in the Airport section of the AIP.
- 5 List of all charts owned by the Airport that will require update as a result of the navigation Aid removal.
- 6 List of any other impacts to the Airport as a result of the Navigation Aid being removed. This should include potential impacts to General Aviation based at the Airport or in the vicinity of the Airport.

## 6.4. Safety Review Document – Approval Stage

The Safety Review Document shall contain: -

- 1 List of those involved in conducting the review and their role.
- 2 For each procedure where approval to use the Guidance is required provide:-  
Evidence to demonstrate compliance to SR 2-12 (Section 3). The evidence may be contained within the document or referenced.  
State how potential safety issues associated with the use of the Guidance on each procedure has been considered. If safety issues have been identified detail any required mitigations (e.g. fallback procedures) to manage those issues.  
Impact to non RNAV1 aircraft as a result of use of the Guidance. Details on how this will be managed.  
State assumptions/limitations/shortcomings.
- 3 For each procedure or reference in the impact assessment to the Navigation Aid being removed where alternative mitigation has been provided, document shall provide: -  
Details of the proposed mitigation.  
Rationale with supporting evidence as to why the mitigation is acceptably safe.  
Impact on operators and General Aviation of the mitigation. Details of how this impact will be managed.

## 6.5. Safety Review Document – References

All referenced documentation in the Safety Review Document shall be provided in the Compliance Report.

## 6.6. Baseline track over the ground performance

For each candidate procedure where use of CAP 1781 is proposed a baseline set of current tracks over the ground performance data shall be provided. This is required to show the spread of current tracks on the procedure and facilitate post implementation analysis. It should also propose actions to be undertaken in the event of significant change to tracks, statistical rationale for determining significant change, intervention procedures in use and proposed and monitoring proposals.

## 7. Implementation Safety Documentation

Once approval has been received from the CAA to use the Guidance on certain procedures or alternative mitigation has been approved then implementation assurance will be required. The assurance needs to demonstrate compliance to the safety requirements SR13 to SR 16 and reference the CAA Approval and the Safety Review document – Approval stage. Any local procedures for operational change also need to be complied with and changes to unit safety documentation identified. This will then enable the claim structure in Section 4 to be validated and the top level claim of: -

**G1- The use of DVOR/DME/NDB Rationalisation – Guidance for the use of RNAV Substitution (CAP 1781) to mitigate navigation aid removal for specified routes and/or flight procedures at a particular airport/ATSU is acceptably safe.**

to be substantiated. Section 5 identifies a Safety Review Document – Implementation to contain the required assurance.

### Important Note

The implementation assurance can be provided in accordance with local processes if required. Normal CAA requirements for notifying operational change will also need to be complied with irrespective of how the implementation assurance is documented

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# Appendix A Safety Workshop

In December 2017 a workshop was held at Heathrow Compass Centre to explore the potential safety impacts of using RNAV Substitution when the navigational aids used to define conventional procedures are withdrawn. An impact assessment was conducted prior to the workshop to identify all procedures and references to the London and Southampton VORs in the AIP. These two VORs were then used as the test cases for the assessment during the workshop and examples of each procedure type were selected for consideration at the workshop. Where possible the examples selected covered usage at different types of airports with different traffic demand and complexity.

Attendees at the workshop covered the main areas potentially effected by the guidance and included representation from:

- CAA
- MOD
- Heathrow ATC
- Heathrow Airport Ltd
- Gatwick Airport Ltd
- Southampton Airport ATC
- Terminal Control Swanwick ATC / Prestwick ATC
- Aircraft Operators
- Aircraft Manufacturers
- Pilot Associations
- FMS Navigation Data Providers (Coding Houses)
- NATS Safety
- NATS Procedure Design Group

## Procedure Types Dependent on the LON and SAM VORs.

As a result of the impact assessment for the LON and SAM VORs the following procedure types and references were identified in the AIP and MATS Part 2.

Standard Instrument departure (SID)

Standard Departure Route

Noise Preferential Route (NPR)

Preferential Departure Route (PDR)

Transitions

Missed Approach

Radio Comms

Holds

Standard Arrival Routes (STARs)

Standard Arrival Routes (STARs)

Visual Procedures

Charts

Textual References

MATS Part 2

## Key Areas discussed

### Track Over the Ground

In order to use RNAV Substitution assurance is needed that aircraft will continue to fly the same track over the ground when a navigation aid is removed as they did whilst the navigational aid was operational. Any resulting changes in the track over the ground would be considered to be an airspace change and the guidance would not be applicable.

In order to ensure that there is no change the following considerations must apply: -

- a) Firstly, there must be an existing overlay for the procedure and that procedure must not change following the navigation aid removal.
- b) In order to ensure sufficient accuracy only aircraft certified to RNAV1 will be eligible to fly the procedure under the guidance.
- c) It was identified that certain leg types used in overlays may make reference to navigation aids. Therefore, if the navigation aid were no longer in service the track over the ground could change. Consequently, if those leg types exist in an overlay then that procedure would not be eligible for the guidance. N.b. this is applicable to Figure 2, Step 4
- d) Monitoring of aircraft track over the ground is required for procedures using RNAV Substitution. This should be achieved through comparison with pre navigation aid removal performance.

### Chart and Textual AIP Updates

Any change to the AIP charts to remove for example a DVOR that is no longer available or its frequency or bearing information could result in new waypoints being added that could change the aircraft track. From the pilot's viewpoint leaving this data on the charts could result in pilots trying to tune to navigation aids that have been removed. Following discussion agreement on the best approach was as follows: -

- a. The existing charts would remain unchanged and as a consequence frequency, bearing and distance information from navigation aids no longer in service would remain.
- b. A note would be added to the chart to state that the navigation aid was unserviceable on a long term basis and that the procedure could only be flown by RNAV 1 aircraft using the FMS overlay.
- c. FMS instructions would be included on the AIP chart to enable aircrew briefings of procedures which require a cross check between the FMS and AIP chart to be undertaken.
- d. AIP Supplement issued identifying Navigation Aid being removed and listing impacted procedures where RNAV Substitution is being employed
- e. A NOTAM would be raised to inform aircrew of navigation aid unavailability.
- f. The ATIS message (or another method) would include notification of navigation aid unavailability. This message would continue for at least 3 months.
- g. The magnetic variation will need to be maintained in the AIP tables.
- h. In addition to any chart changes the relevant AD Section will also need to be updated.

### DME/DME Coverage

Aircraft may be achieving their RNAV1 capability solely through DME/DME coverage. For those aircraft using GNSS the fallback during space weather, jamming, or satellite unavailability will be DME/DME. Therefore, sufficient DME/DME coverage at the levels relevant to the procedures using overlays will be required.

## Alternative Mitigation Strategies

For procedures where there is no existing FMS overlay such as textual references, visual procedures etc. the following is a list of alternative strategies that may be employed.

- a. Delete the Procedure
- b. Replace reference to a navigation aid with a waypoint and lat/long references.
- c. Use an alternative navigation aid to specify a position.
- d. For airports whose traffic is mainly RNAV1 ATC could provide headings to non RNAV traffic to mirror the existing procedure<sup>2</sup>. This would increase ATC workload so the workload impact would require assessment.

## Radio Fail Procedures and Holds

Radio Fail Procedures are generally not coded as an FMS overlay. Therefore, if a current procedure is dependent on a navigation aid being removed consideration should be given as to whether the procedure could be simplified such that it can be input by pilots using the fixed page of the FMS when required.

## Holds

Standard Holds are already coded in the FMS. However non-standard holds are not and therefore would either need to be created or replaced by a waypoint.

## General Aviation

The impact to the GA community is being progressed outside of the workshop due to non-availability of appropriate representation at the workshop. However, it is recognised that awareness by the GA community of the changes is essential and evidence of GA engagement at each airport impacted by a navigation aid removal will be required by CAA as part of the approval to apply RNAV Substitution.

## Safety Requirements.

The output from the safety workshop has been used to derive a set of a safety requirements that an Airport should address in order to request approval to use the guidance.

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<sup>2</sup> CAP 1616 may apply.



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