

All NATMAC Representatives

13 August 2008

NATMAC CONSULTATIVE LETTER

Dear Colleagues

RATIONALISATION OF THE UNITED KINGDOM'S VOR GROUND-BASED INFRASTRUCTURE

The “*Navigation application & navigation aid infrastructure strategy for the ECAC area up to 2020*” ([ECAC Navigation Strategy](#)) published by Eurocontrol in May 2008, addresses the provision of a future navigation infrastructure and promotes the rationalisation of ground-based navigation aids with increasing use of space-based navigation aids. Specifically, it envisages any remaining reliance on non-directional beacons (NDB) for en-route navigation to disappear by 2015. From 2010 to 2015 it foresees the dependence on the conventional use of VOR to delineate routes to be such that the VOR infrastructure could be rationalised to the point whereby it would only support a route system predicated on aircraft being approved to a minimum standard of Basic area navigation (B-RNAV).

In the UK, a mandate for aircraft carriage of B-RNAV capable equipment above FL95 was issued in 1998 as the first step in the initiative to move to an all RNAV environment. Since then, the Directorate has consulted further on extending the mandate to require aircraft to be equipped to the B-RNAV standard when operating in the UK ATS route system. The introduction of such an extension, which is expected to come into force in 2010, is a key enabler for the commencement of the rationalisation process.

Under the terms of the NATS En Route Limited (NERL) operating licence, NERL is required to operate and maintain the UK's en-route navigation infrastructure that comprises 46 VORs, 44 DMEs and 10 NDBs. Any permanent change to the ground navigation infrastructure requires the approval of the CAA. The attached consultation paper is part of the process to consider the NATS plans for the rationalisation of the VOR infrastructure and is aimed at ensuring the maximum level of consultation with those parties potentially affected by a change to the navigation infrastructure. In addition, NATS will provide DAP with an impact assessment, based on their own consultation, which will constitute the formal proposal for any changes.

You are invited to comment on the attached proposal in relation to any anticipated impact it may have on your organisation or its ability to operate. The deadline for responses is 13 November 2009. The DAP point of contact for this consultation is Mr Anthony Stevens of Controlled Airspace Section, telephone: 0207 453 6553.

Yours sincerely

Original signed

Mark Swan
Director

RATIONALISATION OF THE UNITED KINGDOM'S VOR GROUND-BASED INFRASTRUCTURE

1. Background

- 1.1 The “*Navigation application & navigation aid infrastructure strategy for the ECAC area up to 2020*” ([ECAC Navigation Strategy](#)) published by Eurocontrol in May 2008, addresses the provision of a future navigation infrastructure and promotes the rationalisation of ground-based navigation aids with increasing use of space-based navigation aids. Specifically, it envisages any remaining reliance on non-directional beacons (NDB) for en-route navigation to disappear by 2015. Furthermore, from 2010 to 2015 it foresees the dependence on the conventional use of VOR to delineate routes to be such that the VOR infrastructure could be rationalised to the point whereby it would only support a route system predicated on aircraft being approved to a minimum standard of Basic area navigation (B-RNAV).
- 1.2 In the UK, a mandate for aircraft carriage of B-RNAV capable equipment above FL95 was issued in 1998 as the first step in the initiative to move to an all RNAV environment. Since then, the Directorate of Airspace Policy (DAP) has consulted further on extending the mandate to require aircraft to be equipped to the B-RNAV standard when operating in the UK ATS route system. The introduction of such an extension, which is expected to come into force in 2010, is a key enabler for the commencement of the rationalisation process.

2. Scope

- 2.1 Under the terms of the NATS En Route Limited (NERL) operating licence, which was agreed at the point when the then National Air Traffic Services (NATS) was the subject of privatisation, NERL is required to operate and maintain the UK's en-route navigation infrastructure which comprises 46 VORs, 44 DMEs and 10 NDBs. Any permanent change to the ground navigation infrastructure requires the approval of the CAA. This letter is part of the process to consider the NATS plans for the rationalisation of the VOR infrastructure and is aimed at ensuring the maximum level of consultation with those parties potentially affected by a change to the navigation infrastructure. In addition, NATS will provide DAP with an impact assessment, based on their own consultation, which will constitute the formal proposal for any changes.

3. NERL's plans for navigation service provision & assumptions

- 3.1 To meet the infrastructure element of the ECAC navigation strategy, NERL has devised a plan for the provision of a ground navigation infrastructure in the UK to the year 2020. It is based on the assumption that the use of satellite navigation for all phases of flight will become progressively more dominant until a point is reached beyond 2020 when NDB & VOR will no longer be required and DME/DME fixing and/or on-board inertial reference systems will provide a short-period fallback navigational capability in the event of satellite navigation not being available.
 - 3.1.1 It assumes that from 2010 onwards, the already high aircraft compliance level to the Precision area navigation (P-RNAV) standard at the London airports, (with the exception of London City), will start to be reflected at other airports and that by 2016 the number of aircraft approved to the P-RNAV standard will increase to a point whereby all aircraft operating IFR into the major UK airports will be approved and will thus be capable of flying instrument procedures predicated on P-RNAV design criteria. NERL's aim is to provide a DME infrastructure across the UK that will deliver

a DME/DME fixing capability down to circa 2000 feet AGL. However, in some areas, e.g. locations surrounded by high terrain, this might not prove to be possible.

3.1.2 Finally, while the plan also assumes that VOR may not be required after circa 2020, it is not anticipated that VOR will be phased out in its entirety until a second satellite navigation system, in addition to GPS, is fully operational.

3.2 NDB Infrastructure

3.2.1 Many modern aircraft are coming off the production line without an automatic direction finding (ADF) capability. In response to this, the UK CAA has proposed a change to the Air Navigation Order (ANO) that will see the removal of the requirement for the mandatory carriage of ADF for UK registered aircraft. As previously mentioned, it is also seeking an amendment to the ANO which will see the carriage of B-RNAV certified equipment being mandated in Class A airspace. This has provided the catalyst for NERL to produce a plan to remove the 10 en-route NDBs within its inventory by circa end 2012. This is the subject of a separate NATMAC informative letter.

3.3 VOR infrastructure

3.3.1 NERL operates 46 ageing Racal Mk IIA VOR navigation beacons, and action is now required to sustain NERL's future VOR navigation service provision. There are two key constraints: the first is that some form of a VOR infrastructure will be required until at least 2020; the second is that the existing VOR equipment is on the verge of obsolescence and its continued operation cannot be guaranteed in the long term. These systems are no longer supported by the manufacturer with all spares provision and maintenance being carried out internally within NERL.

3.3.2 Following the introduction of the B-RNAV mandate in 1998, the reliance on VOR for beacon-to-beacon navigation has significantly decreased as air navigation service providers (ANSPs) throughout Europe, and indeed globally, have taken the opportunity to create route systems predicated on the carriage of area navigation equipment. Currently, it is estimated that only around 1.5% of IFR operations in the UK are carried out by aircraft that are not B-RNAV approved and that of these operations, around 0.6% are carried out by a single AOC holder.

3.3.3 The extension of the B-RNAV mandate to include the entire vertical extent of the ATS route system will see the requirement for en-route beacon-to-beacon navigation disappear. In relation to en-route airspace, therefore, the point will have been reached where there will no longer be a need to provide a VOR infrastructure as comprehensive as that which currently exists.

3.3.4 From NERL's perspective, the rationalisation of its VOR infrastructure means that it can make significant capital cost savings by not having to replace the entire network of VORs. Furthermore, it will make considerable savings in revenue expenditure as the maintenance task progressively reduces. These are important considerations in any economic environment but particularly in the current climate when NERL will be expected by the regulator – CAA's Economic Regulation Group (ERG) - to reduce its cost base and in turn reduce its charges for the benefit of its paying customers.

3.3.5 NERL’s proposal is to commence the rationalisation of its VOR infrastructure in Autumn 2011 and, over a 5 year period, reduce the network from 46 to 19 beacons. The proposed network following rationalisation comprises the facilities listed in Table 1 and illustrated in Figure 1 below:

Aberdeen (ADN)	Belfast (BEL)	Berry Head (BHD)	Clacton (CLN)
Compton (CPT)	Honiley (HON)	Isle of Man (IOM)	Land’s End (LND)
Ottringham (OTR)	Pole Hill (POL)	Saint Abbs (SAB)	Seaford (SFD)
Stornoway (STN)	Strumble (STU)	Sumburgh (SUM)	Talla (TLA)
Tiree (TIR)	Wallasey (WAL)	Wick (WIK)	

Table 1 - Proposed rationalised VOR network

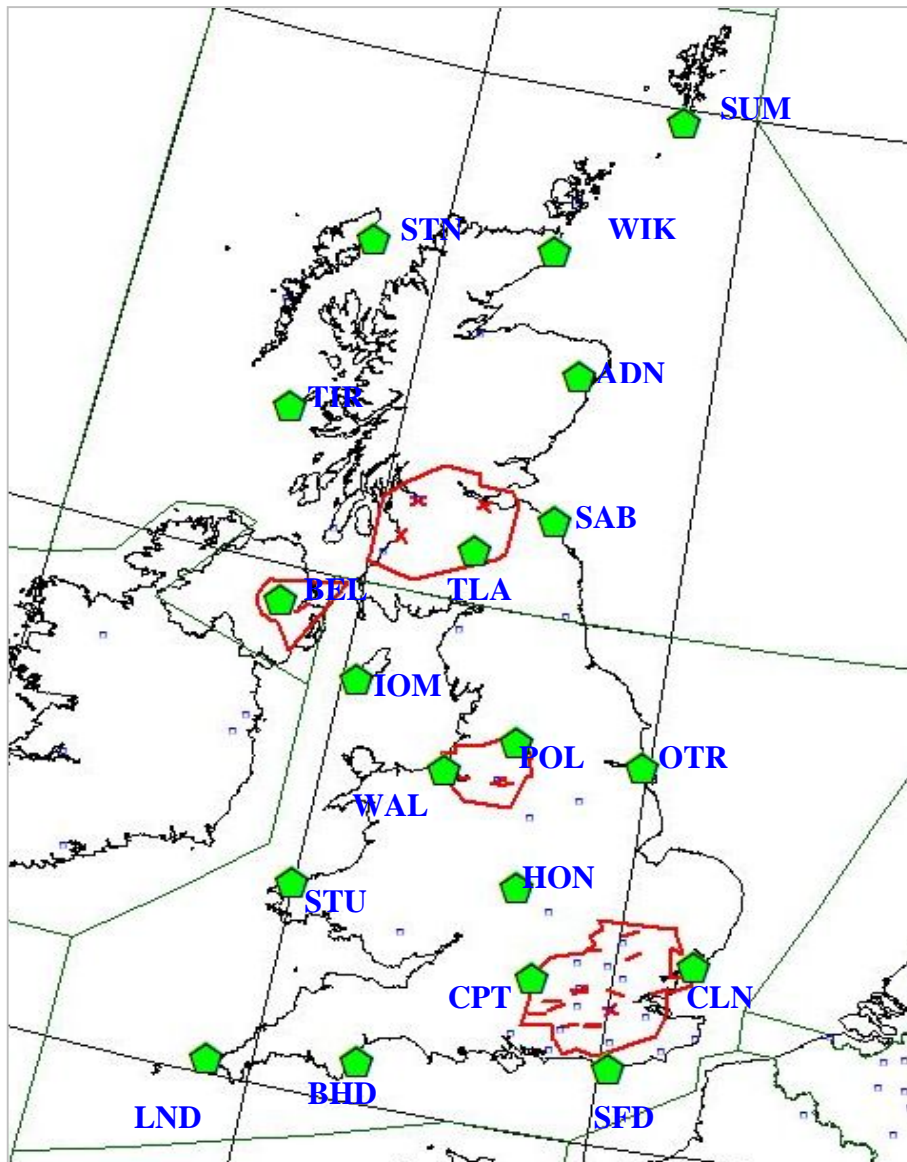


Figure 1 – Illustration of proposed VOR network post rationalisation

3.3.6 In respect of the planned order for the withdrawal of individual beacons from service, a plan has not yet been formulated as it will necessarily be impacted by the outcome of this consultation. However, a pragmatic approach will have to be adopted giving due consideration to the fact that in the early years of the proposed period of rationalisation, there are likely to be aircraft operating outside of the London TMA airfields which would not possess P-RNAV approval and would not, therefore, be able to fly procedures predicated on this requirement.

4. Who or what is likely to be affected?

4.1 The following are likely to be affected by the rationalisation of the VOR infrastructure:

- All operators, commercial, general aviation or State that fly in UK en-route airspace if they are not currently B-RNAV compliant. (State aircraft are exempt from the requirement to be B-RNAV compliant);
- All operators, commercial, general aviation or State that fly into/out of the major UK airports if they are not currently P-RNAV compliant. (State aircraft are exempt from the requirement to be P-RNAV compliant);
- Air Navigation Service Providers (ANSPs) providing a service in en-route and terminal airspace;
- Airport/Aerodrome operators
- DAP, in that there may be changes to the ANO required and that Policy on non-conventional RNAV IAP design and the current requirement for a conventional Missed Approach Procedure (MAP) will be affected for those aerodromes where the MAP is promulgated on a VOR;
- IFR operations and the availability of alternate instrument approaches that maybe required should a VOR on an aerodrome be decommissioned and similarly, the requirement for an IAP to match future equipment fit in the cockpit;
- Redesign of IAP and associated MAP that rely upon a VOR for the hold;
- Redesign of SIDs to P-RNAV design criteria; and,
- Aircraft flying outside controlled airspace that may have had a dependence upon a specific VOR signal.

4. Effect on B-RNAV coverage provided by VOR/DME fixing

4.1 It is not the intention here to go into detail as regards the effect of reducing the VOR infrastructure on the navigation service provision in UK airspace. Nonetheless, it is recognised that it is important to provide indicative information as to what coverage will be provided post-rationalisation.

4.2 The impact on upper controlled airspace

4.2.1 Upper controlled airspace is any volume of airspace above FL195. Figures 2 and 3 below provide a comparison between the VOR/DME position-fixing capability of the current infrastructure and that of the proposed rationalised infrastructure.

4.2.2 In these figures, and all subsequent figures in this document, a 'blue' area denotes an area of airspace supported by a fully redundant VOR/DME position fixing capability whereby any single failure of a navigational aid, (e.g. DME or VOR), will not affect the availability to support B-RNAV in that area.

4.2.3 In these figures, and all subsequent figures in this document, a 'red' area denotes an area with a non-redundant VOR/DME position-fixing capability whereby any single failure of a navigational aid will result in a loss of position fixing capability to support B-RNAV in that area.

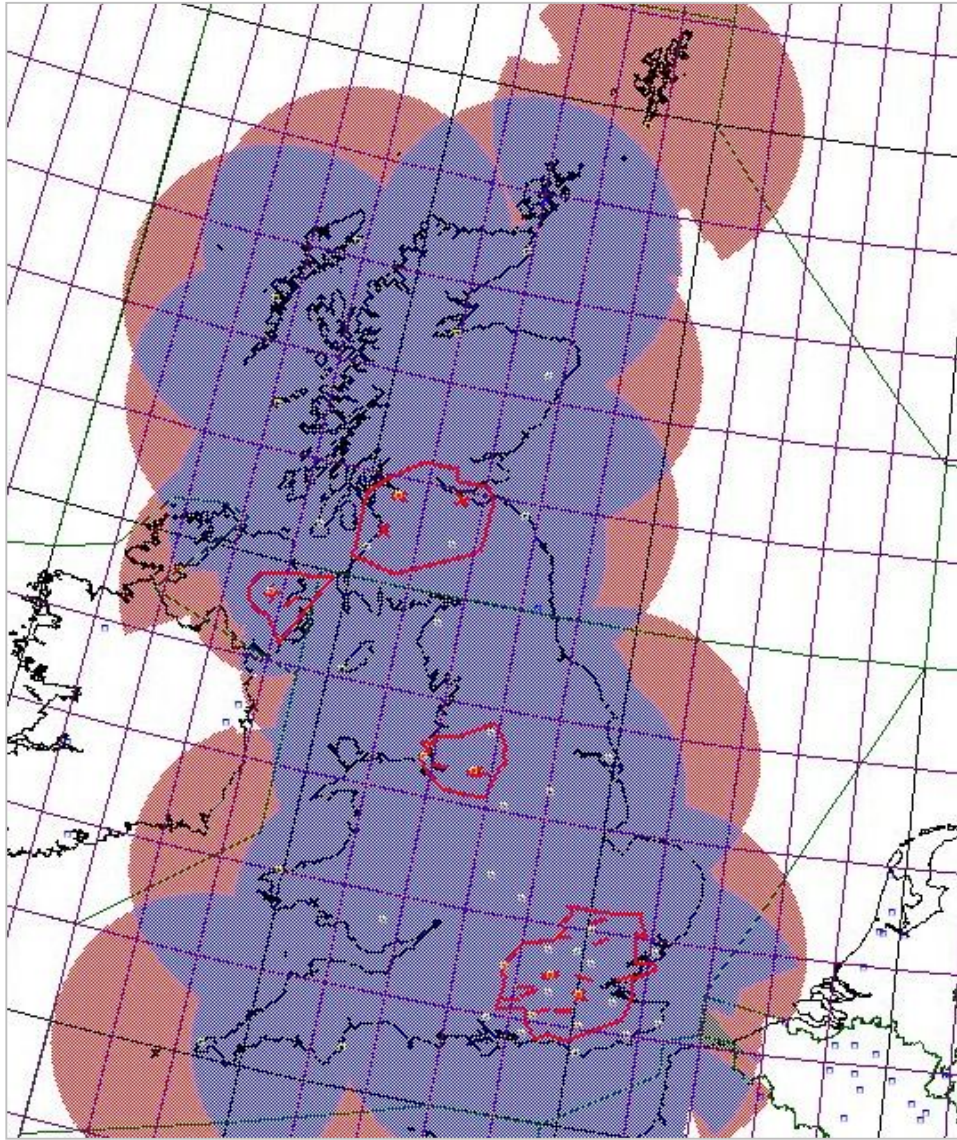


Figure 2 - Current VOR/DME position-fixing capability supporting UK upper controlled airspace (FL195)

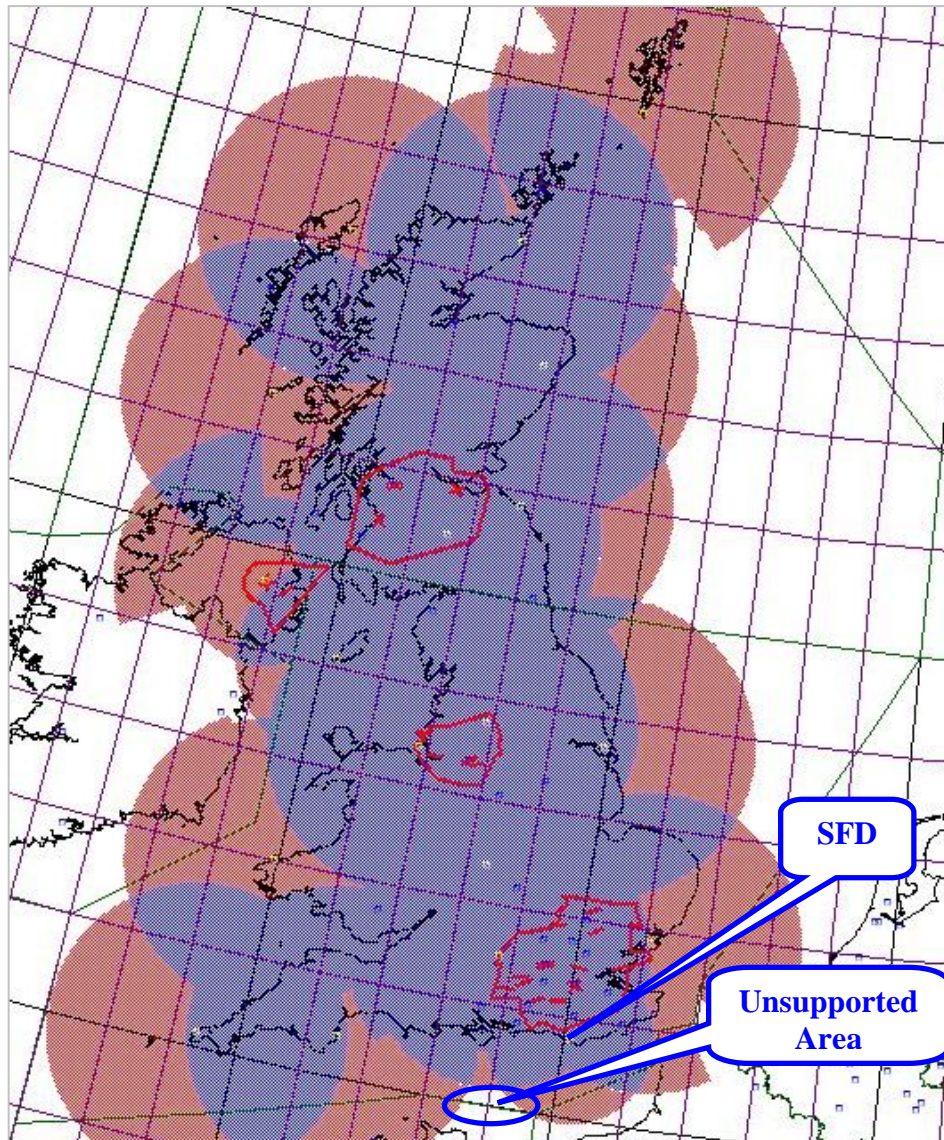


Figure 3 - VOR/DME position-fixing capability supporting UK upper controlled airspace (FL195) post proposed rationalisation

- 4.2.4 The area of airspace highlighted in Figure 3 which becomes unsupported by a VOR/DME position-fixing service provided by the rationalised network of VOR beacons, could become supported by increasing the current designated operational coverage (DOC) of Seaford (SFD) VOR.
- 4.3 The impact on lower controlled airspace (FL95 – FL194)
 - 4.3.1 The area of lower controlled airspace within the current UK CAA mandate for B-RNAV aircraft equipage lies between FL95 and FL194 within the UK. Figures 4 and 5 below provide a comparison between the VOR/DME position-fixing capability of the current infrastructure and that of the proposed rationalised infrastructure at FL95.

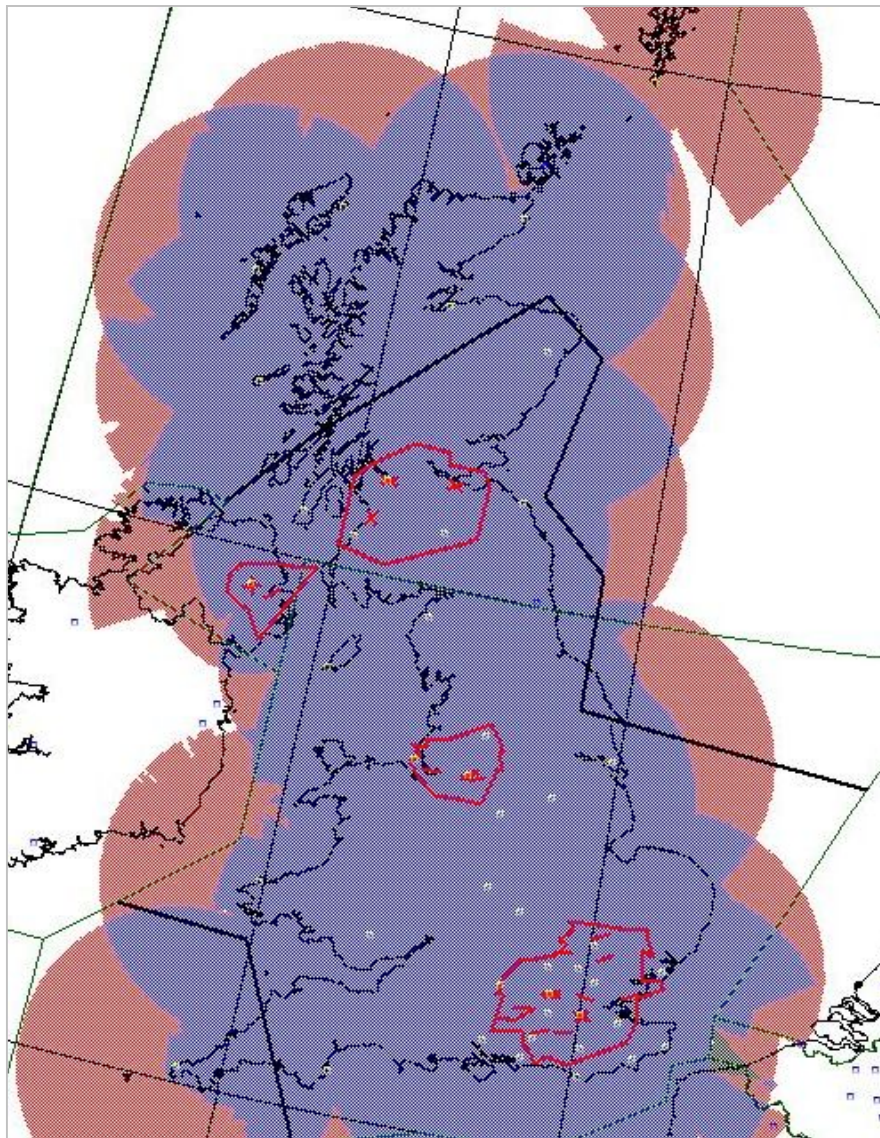


Figure 4 - Current VOR/DME position-fixing capability supporting lower controlled airspace (FL95)

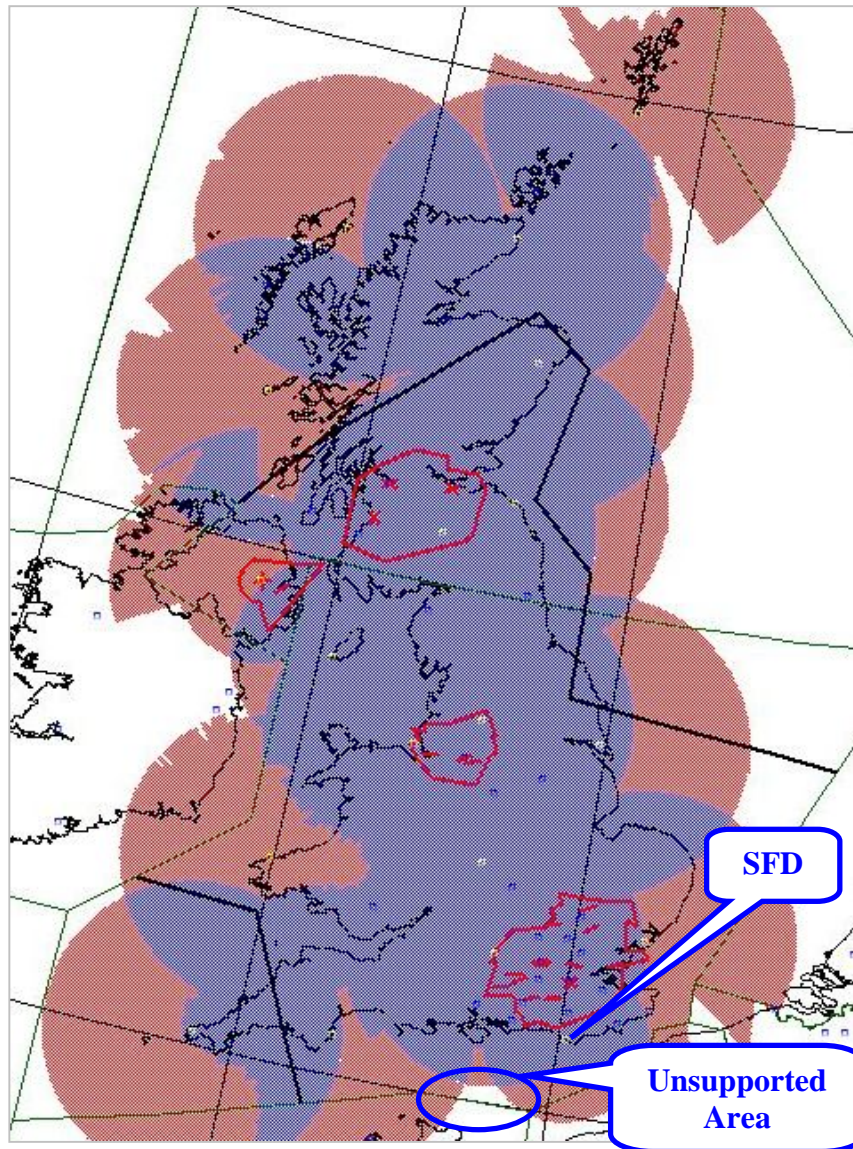


Figure 5 - VOR/DME position fixing capability supporting lower controlled airspace (FL95) post proposed rationalisation

4.3.2 As previously mentioned, the area of airspace highlighted in Figure 5 which becomes unsupported by a VOR/DME position-fixing service provided by the rationalised network of VOR beacons could become supported by increasing the current designated operational coverage (DOC) of Seaford (SFD) VOR.

4.4 The impact on Lower ATS Routes (FL94 and below)

- 4.4.1 The area of lower controlled airspace below the current UK CAA mandate for B-RNAV aircraft equipage lies at FL94 and below. As terrain screening effects tend to be more prominent at lower altitudes, the impact of a reduced network of VOR beacons is greatest within this volume of airspace. This is illustrated in figures 6 and 7 below, which provide a comparison between the VOR/DME position-fixing capability of the current infrastructure and that of the proposed rationalised infrastructure at FL35.

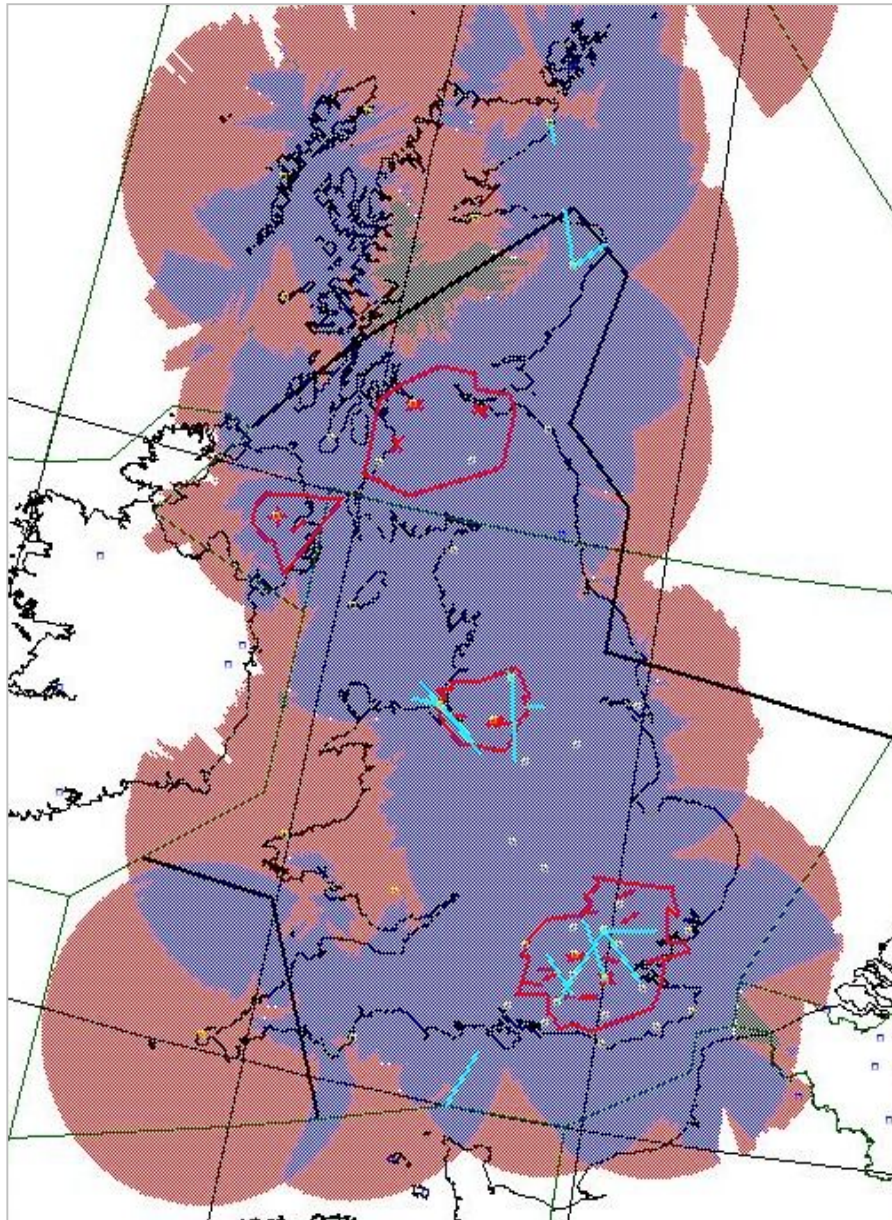


Figure 6 - Current VOR/DME position-fixing capability supporting UK ATS lower route structure (FL35)

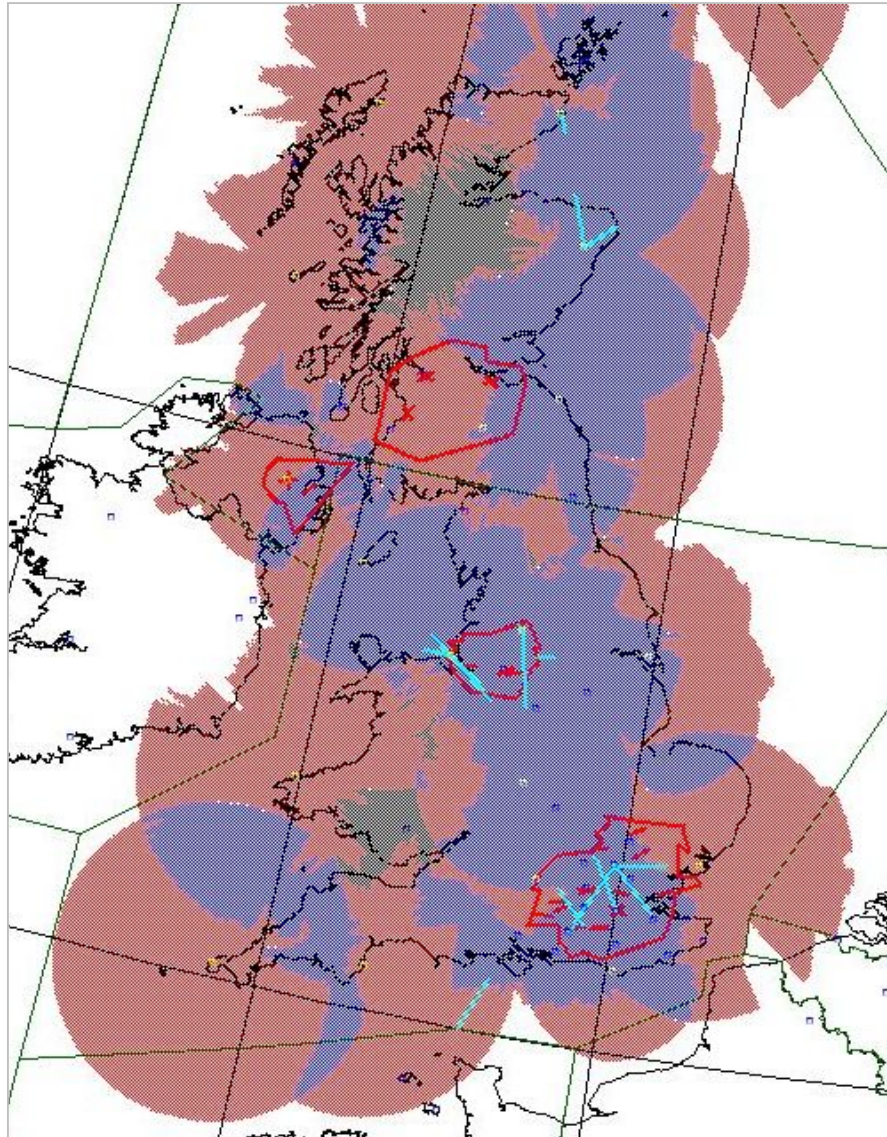


Figure 7 - VOR/DME position-fixing capability supporting UK ATS lower route structure (FL35) post proposed rationalisation

5. Conclusion of analysis of VOR/DME fixing provision

5.1 Detailed theoretical coverage analysis of the low level route segments has been carried out by NERL and in all cases, a non-redundant VOR/DME fixing capability would be provided by the rationalised VOR infrastructure and in all but a few short route segments, fully redundant VOR/DME fixing capability would be provided.

6. Consultation Period

6.1 The time allowed for comment on the consultation will be 12 weeks from the date of this communication.

7. Response

- 7.1 This communication forms part of the NATMAC aviation consultative process. As such, you are invited to comment on the above proposal in relation to any anticipated impact it may have on your organisation or its ability to operate. The DAP point of contact for this consultation is Mr Anthony Stevens of Controlled Airspace Section, telephone: 0207 453 6553.