RAF Brize Norton Consultation

Airspace Change Proposal

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1 Foreword by the Station Commander of Royal Air Force Brize Norton

Welcome to the RAF Brize Norton Consultation Document on the proposed changes to the controlled airspace (CAS) designed to protect aircraft inbound and outbound from the aerodrome. This consultation is being conducted under the CAA requirements specified in CAP 725 "CAA Guidance on the Application of the Airspace Change Process".

RAF Brize Norton is the largest station in the Royal Air Force and home to the RAF's Strategic and Tactical Air Transport and Air-to-Air Refuelling (AAR) forces, as well as host to many lodger and reserve units. With its mixed fleet of aircraft, RAF Brize Norton provides rapid global mobility in support of UK overseas operations and exercises, as well as AAR support for fast jet aircraft both on operations and in support of UK Homeland Defence.

The dimensions of the CAS surrounding RAF Brize Norton have been in place for over 40 years, with very few adjustments. With the change of aircraft types now using the airfield, coupled with the criteria used to design the procedures, the current design is no longer appropriate for current arrival and departure profiles. Aircraft regularly leave the protected confines of CAS, which can bring them into conflict with other aircraft operating autonomously outside in open airspace. Additionally, RAF Brize Norton has no connectivity to the UK airways network, meaning aircraft have to transit through uncontrolled airspace when flying to and from the UK airways network.

Throughout the design stage, a lengthy process, we have been conscious that the airspace around RAF Brize Norton is some of the busiest and most complex in the UK. With that in mind we have designed the airspace to contain the procedures using the minimum containment feasible. The close proximity of London Oxford Airport (approx. 10nm northeast of RAF Brize Norton), further complicated the design process, as their procedures overlap those of ours. By taking a collaborative approach, the two airports have endeavoured to dovetail both sets of procedures where possible, to reduce the risk of a loss of separation between aircraft.

This consultation specifically relates to the RAF Brize Norton airspace change proposal: the proposed increase to the existing airspace will incorporate the current procedures and the new RNAV procedures and will provide connectivity to the UK Airspace Structure. London Oxford Airport will be completing a separate consultation on their own airspace change proposal, but due to the proximity of the two aerodromes, the two proposals will be assessed by the CAA at the same time.

RAF Brize Norton invites you to participate in this consultation process, which will run from 15th December 2017 to 22nd March 2018, a period of 14 weeks. Details of how you can respond to the consultation are given in the body of this document.

Tim Jones
Group Captain
Station Commander
RAF Brize Norton

2 What is this Consultation About?

This consultation is about the new airspace design proposed to provide the requisite safety for RAF Brize Norton aircraft. The airspace surrounding RAF Brize Norton has not altered since it was established at least 40 years ago[1]. The airspace no longer accounts for the types and speeds of aircraft in current operational use and therefore the shape and dimensions need to be revised.

2.1 Overview

RAF Brize Norton is the largest station in the Royal Air Force (RAF) with approximately 4,230 Service Personnel, 1,500 contractors and 350 civilian staff members. The Station is home to the RAF's Strategic and Tactical Air Transport (AT) and Air-to-Air Refuelling (AAR) forces, as well as host to many lodger and reserve units. With its mixed fleet of aircraft, RAF Brize Norton provides rapid global mobility in support of UK overseas operations and exercises, as well as AAR support for fast-jet aircraft both on operations and in support of UK Homeland Defence[2]. RAF Brize Norton is also designated a Military Emergency Diversion Aerodrome (MEDA).

The nature of the operations supported from RAF Brize Norton requires large AT aircraft to transport military personnel and/or large volumes of expensive and sensitive national military assets, including weaponry and aviation fuel. The current airspace structure surrounding RAF Brize Norton is insufficient to provide adequate protection to these aircraft on arrival to, or departure from the Station.

2.2 Airspace

This consultation concerns a proposal to increase the dimensions of the existing controlled airspace design surrounding RAF Brize Norton and to provide connectivity between RAF Brize Norton and the national airways network. The current airspace structure is shown at Figure 1 and a further explanation of its dimensions and usage is provided at Section 3.2.

[1] With the execption of a small alteration in the late 1990's)
[2] http://www.raf.mod.uk/rafbrizenorton/

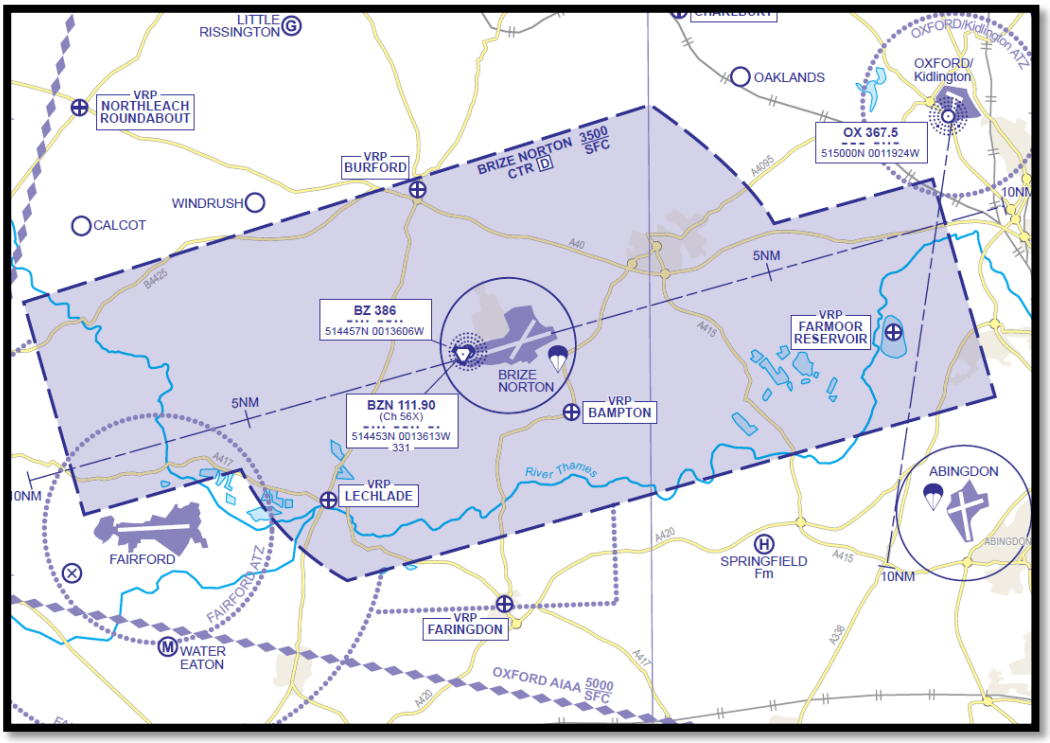

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Figure 1. Current Airspace Design Surrounding RAF Brize Norton

The blue shaded area on Figure 1 represents Class D Controlled airspace[3]. A guide to the different classifications of airspace within the UK can be found at Annex A9. Class D airspace requires all aircraft to obtain a positive clearance from the Controlling Authority (in this case, RAF Brize Norton Air Traffic Control (ATC)) before the aircraft can enter:

- Aircraft can only enter the airspace provided that they operate in accordance with the clearance received; and
- Pilots must comply with the clearance given for crossing or operating within the airspace.

This airspace safeguards the operation of large aircraft with limited manoeuvrability and ensures they are protected in the critical stages of flight – final approach to land and just after take-off. The airspace surrounding the RAF Brize Norton Class D airspace is Class G airspace or 'Uncontrolled Airspace'. In Class G airspace, aircraft can operate autonomously without having to speak to any ATC agency[4]. Aircraft operating in Class G airspace are obliged to "see and be seen", and are responsible for avoiding other aircraft or obstacles (e.g. the ground).

Since the current airspace design at RAF Brize Norton was established many years ago, there have been considerable changes in the types of aircraft operating at RAF Brize Norton, and the performance abilities of those aircraft. In addition, the regulatory environment has developed significantly since the airspace was first

[3] Further information about UK Airspace Classifications can be found here: https://www.caa.co.uk/Consumers/Guide-to-aviation/Airspace/How-is-UK-airspace-structured-/

[4] With the exception of published ATZ and other reserved airspace areas.

designed. RAF Brize Norton ATC and aircrew have identified occasions when aircraft arriving at the aerodrome are unable to turn to position for a final approach and remain within the confines of the Class D airspace. Similarly, all aircraft must leave the control zone when transiting to and from the aerodrome and the national airways network, which means that RAF Brize Norton aircraft are required to transit through Class G airspace; this has led to safety-related events (further details can be found within Annex A5 of this document).

When aircraft leave the Class D airspace they are in uncontrolled airspace where they can expect to encounter General Aviation (GA) aircraft that they will no longer be separated from. RAF Brize Norton wishes to make changes to the dimensions of the Class D airspace surrounding the aerodrome in order to contain their aircraft within the CAS when arriving at or departing from the airfield. This consultation seeks to present details of the proposed changes and gain views on any resulting positive and negative impacts.

This proposal contains detail of the proposed changes to RAF Brize Norton airspace required to contain the RNAV procedures (see Annex A6), that have been designed to deconflict as far as possible with those of London Oxford Airport (LOA). The procedures are presented herein to show how the final airspace design has been derived. It should be understood that the new flight procedures themselves are outside the scope of this consultation.

2.3 What is Not Contained Within the Consultation?

The Civil Aviation Authority (CAA) is responsible for the regulation of civil airports in the UK, but it is the Military Aviation Authority (MAA) that regulates RAF Brize Norton. The MAA has aligned many of its regulations with those of the CAA, although one significant difference is that state aerodromes are not required to consult on proposed route changes. Furthermore, there is no requirement for military sponsors to conduct studies concerning the environmental impacts of military aircraft of military operations, in accordance with Department for Transport (DfT) guidance[5]. However, it is recognised that there might be some dispersion in General Aviation (GA) traffic that might choose to avoid the airspace rather than request clearance through it.

During the requirements capture phase for the new airspace design, it was established that in order to futureproof the design, new navigational techniques needed to be taken into account. Area Navigation (RNAV) technology, using satellite data similar to a car Satellite Navigation system, is already a requirement for aircraft operating in several parts of the world and is planned for implementation within the UK through the Future Airspace Strategy[6]. RAF Brize Norton aircrew need to train and utilise RNAV flight procedures at their home base, so new procedures employing this new technology have been designed for arrivals and departures.

RAF Brize Norton is geographically very close to LOA. Due to the close proximity, many of the flight paths are adjacent to each other or actually overlap. This means that controllers need to coordinate with each other (verbally) in order for both airports to operate safely. However, this creates a high workload for controllers and

[5] Letter from Activing Head of Aviation Policy Division, Aviation Directorate, DfT to Chief Executive, CAA entitled Military Environmental Impacts in Airspace Changes dated 21 December 2016
[6] CAA Future Airspace Strategy for the United Kingdom 2011 to 2030 dated 30 June 2011, available at http://www.caa.co.uk/WorkArea/DownloadAsset.aspx?id=4294978317

hampers the efficiency of both airports. It was identified that new procedures for both airports would be beneficial in alleviating the requirement for coordination. In parallel with the RAF Brize Norton proposal development, LOA recognised a need to provide greater protection to aircraft making an approach to their main instrument runway, Runway 19. The two airports have since worked together to devise new flight procedures and an airspace structure that complements operations from each airport. The airspace detailed within this consultation is that solely required to support operations at RAF Brize Norton. LOA is conducting a separate consultation that details the changes it is proposing to the flight procedures and the airspace surrounding the Runway 19 approach.

2.4 Summary

This consultation is about the new airspace design proposed to enhance the safe operations of RAF Brize Norton aircraft. In the interests of transparency, we have also included details of how the airspace design for RAF Brize Norton developed as a result of the procedure designs. Those additional details include:

- RNAV procedures;
- New conventional approach procedures as an adjunct to LOA procedures; and
- Airspace designs proposed by LOA.

3 Why Change?

The airspace surrounding RAF Brize Norton is no longer considered fit for purpose. These changes are being proposed in order to enhance the safety of operations for aircraft at RAF Brize Norton.

3.1 Overview

The need for a change to the airspace arrangements surrounding RAF Brize Norton has developed through three interrelated themes:

- Existing airspace arrangements are not fit for purpose in that they do not contain the current or future planned standard procedures for RAF Brize Norton, leaving aircraft vulnerable at critical stages of flight;
- Despite following best practice and the introduction of a range of short-term measures, analysis demonstrates that risks to aircraft arriving at and departing from RAF Brize Norton are not 'As Low As Reasonably Practicable' (ALARP); and
- New airspace arrangements will aim to enhance efficiency and improve flight safety for all stakeholders.

3.2 Current Airspace Arrangements

Controlled Airspace (CAS) has existed at RAF Brize Norton for at least 40 years. Since its establishment, the number, type and performance of aircraft based at RAF Brize Norton has changed entirely, as has the nature and type of flying activity in surrounding airspace. This, coupled with changes to the whole range of aviation safety, airspace and Air Traffic Control regulations, procedures and types of service available, has resulted in airspace arrangements that are now outdated. The requirement to change the airspace arrangements within the vicinity of RAF Brize Norton has been the subject of discussion for many years and, for example, was mentioned in a Directorate of Airspace Policy Area of Intense Aerial Activity (AIAA)[7] Review in November 2008[8]. The closure of RAF Lyneham at the end of 2012 led to an Airspace Change Process (ACP) to remove the CAS associated with the aerodrome and the transfer of RAF Lyneham aircraft operations to RAF Brize Norton in 2011. In conjunction with the re-alignment of procedures to PANS-OPS criteria, the procedural and structural airspace issues around RAF Brize Norton have been exacerbated. In recognition of the issues raised by the current airspace design, in 2011 the MoD commissioned studies on how best to resolve those concerns and

[7] An AIAA 'signposts' a volume of Class G airspace as being more congested than others, but offers no additional protection to aircraft operating within it..

[8] A copy of the review can be found here: https://www.ukfsc.co.uk/files/Consultations%20CAA%20DAP/NATMAC%20Consultative%20AIAA%20Nov%202008.pdf

subsequently secured funding and approval to take forward an airspace change proposal.

RAF Brize Norton has a Class D Control Zone (CTR) that extends from the surface to 3,500 feet (ft). It is located within the Oxford Area of Intense Aerial Activity (AIAA) that extends from the surface to 5,000 ft. The majority of aircraft operating from RAF Brize Norton join airway L9, located to the south of the airfield with a base of Flight Level (FL) 65 (6,500 ft), although a significant number of local training flights are also conducted. Unlike most civil airports with CTRs, the RAF Brize Norton CTR does not connect to the airways structure and therefore aircraft have to transit through uncontrolled airspace when flying to and from the UK airways structure. Instrument flight arrival and departure procedures comply with ICAO Procedures for Air Navigation Services - Aircraft Operations (PANS OPS) (which replaced earlier APATC1 procedures) but, because the current airspace was not designed to accommodate instrument flight procedures designed to PANS OPS criteria, these procedures require aircraft to fly to the margins or even outside the existing CTR. Under current arrangements, aircraft operating from BZN transit Class G airspace and the AIAA during a vulnerable phase of their flight (positioning for final approach for landing or immediately after take-off).

3.3 Driver for Change

3.3.1 Enhanced Safety

The principle driver for change is that of enhancing the safety of aircraft operations at and within the vicinity of RAF Brize Norton. This Airspace Change Proposal seeks to resolve the following issues:

- Aircraft joining or departing the airways structure have to cross busy Class G airspace between the CTR and the airway. This proposal will help to reduce the risk of a mid-air collision of RAF Brize Norton aircraft within 20 NM of RAF Brize Norton.
- Aircraft positioning for final approach to the runway are not fully contained by the current CAS which potentially brings them into confliction with unknown traffic.
- The interaction of RAF Brize Norton and London Oxford Airport flight procedures is complex and workload is intensive for both airports' ATC staff.

Aircraft departing from and arriving at RAF Brize Norton will routinely join airway L9 to the south of the airfield which provides access to the national airways network. The NAXAT Standard Instrument Departure (SID) requires aircraft to route via NAXAT to join CAS at MALBY, close to Kemble and South Cerney airfields, both of which are regularly busy with non-transponding aircraft. Typically, of all the aircraft types departing RAF Brize Norton, over 60% utilise this SID. Similarly, aircraft arriving at RAF Brize Norton follow a Standard Terminal Arrival Route (STAR) from Airway L9. This proposal intends to contain these arrival and departure procedures within CAS, as described more fully at Section 5.

Air traffic controllers currently provide aircraft within the Class D CTR with a Radar Control Service. This is intended to afford the highest level of protection to aircraft within the most critical phases of flight. However, when aircraft are unable to remain within the confines of the CAS on arrival, or when aircraft leave the CTR to join

airways, controllers have to provide a different level of service to aircraft. These segments of flight currently take place in Class G uncontrolled airspace. The highest service available within Class G airspace is a Deconfliction Service (DS) where controllers will aim to provide 5 Nautical Miles (NM) lateral separation or 3,000 ft vertical separation against unknown traffic.

These separation criteria can be extremely difficult to achieve within the areas of high traffic density typically encountered around RAF Brize Norton because GA operating within Class G airspace do not need to call any ATC unit, and can operate autonomously. This makes it difficult to predict their flight paths and to ensure a safe distance can be maintained between the aircraft. The situation is further complicated because the large RAF Brize Norton aircraft require a wide turn radius. In order to maintain safe separation criteria controllers often have to issue several avoiding action instructions to pilots. Issuing these instructions creates a high workload for both controllers and pilots. Since 2012, ATC personnel have logged many instances where aircraft have deviated from published procedures due to ATC intervention in order to avoid unknown traffic and ensure that the prescribed separation is maintained. Annexes A3 and A4 provide details of these occurrences. The data confirms that these have largely been due to pilots taking avoiding-action turns when in receipt of a DS. The graph at Figure 2 depicts the number of Flight Safety Reports that have been raised by controllers and/or pilots. The information shows reports up to 2017, although the data relating to aircraft being diverted from the SID or STAR route due to conflicting traffic is only available up to 2013. The reason for this is because until 2013, these reports were filed as Defence Air Safety Occurrence Reports (DASORS); after 2013, due to the high number of reports being received, it was suggested that controllers simply make a note of the number of occasions that this occurs. The results of the controller logged instances are found within Annexes A3 and A4. During 2012, there were over 40 instances of deviation from SIDs or STARs that resulted in the submission of a flight safety report as shown at Figure 2.

Although a DS offers the highest level of ATC service outside of CAS, it is not automatically provided; each pilot will request the most appropriate service for the flight conditions. When in receipt of a Traffic Service (TS), controllers provide pilots with traffic information about aircraft that will potentially conflict, but it is the pilot's responsibility to ensure that safe separation standards are maintained. Therefore, pilot actions to resolve conflictions when flying whilst in receipt of a TS are neither captured within the statistics shown at Figure 2, nor within the details provided at Annex A3. **Consequently, these figures only partially evidence the number of aircraft that leave the confines of the existing CAS whilst conducting an arrival procedure.**

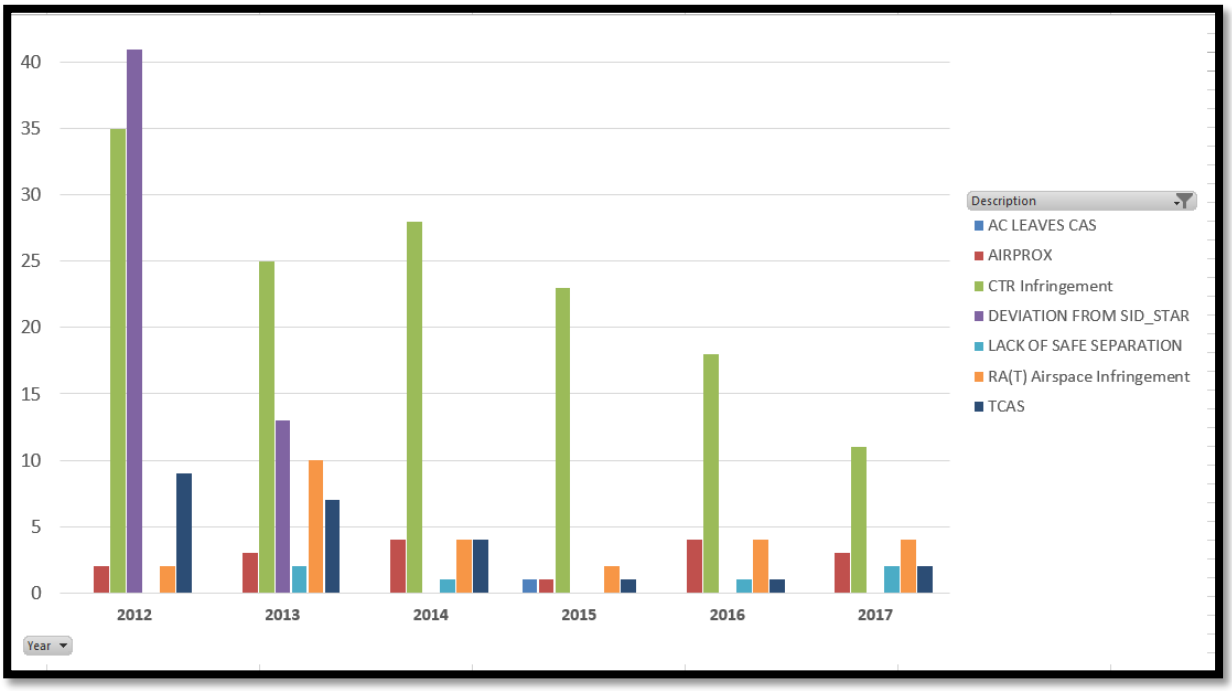

Figure 2. RAF Brize Norton Flight Safety Reports Submitted 2012 to 2017 (relevant to ACP)

Figure 2 also shows the number of CTR infringements that provided cause for concern, and the figures demonstrate the difficulty General Aviation (GA) pilots experience interpreting the boundary of the current airspace. Every effort has been made to ensure that the changes to the airspace incorporate alignment with geographical features to try to make it easier to interpret from the air.

3.3.2 Training Requirement within the CTR

As well as conducting operational flights to maintain their capability for deployment worldwide, RAF Brize Norton aircraft also have a significant training requirement and routinely conduct multiple training sorties including up to 30 Instrument Flight Rules (IFR) approaches each day. This is in addition to on average 20 route-inbound flights. Around 75% of these approaches are pilot-interpreted procedural approaches, utilising current published Instrument Approach Procedures (IAPs), rather than radar-vectored approaches under positive ATC instruction, and many of these route close to the edge or outside the existing CTR.

3.3.3 Implications of PANS-Ops Criteria

Since the MoD introduced the ICAO Procedures for Air Navigation Services - Aircraft Operations (PANS-OPS) to replace earlier APATC1 procedures, across all MoD airports, containment of pilot-interpreted procedural approaches within the existing CTR is not possible. PANS-OPS sets out the criteria for the design of SIDs and STARs and this often requires greater lateral dimensions of airspace than the APATC1 procedures that they replaced. At RAF Brize Norton, the existing CTR is too small to accommodate PAN-OPS procedures; aircraft routinely route close to the edge of CAS, and on occasions temporarily leave the CTR. The CTR does not meet the recommendations of the CAA CAS Containment Policy [Reference 2] para 3.2:

"Where competing airspace requirements preclude containment by primary area, containment of the nominal track defined by the procedure may be less than that afforded by the primary area but shall normally not be less than 3NMs from the edge of CAS."

RAF Brize Norton aircraft that temporarily leave the CTR whilst conducting an approach procedure risk conflicting with other aircraft legitimately operating adjacent to the CTR boundary within the busy Class G airspace. The number of CTR incursions (as shown at Figure 2) further compounds the potential risk of a collision between GA aircraft and RAF Brize Norton aircraft operating at the limits of CAS, or beyond. During the period between Nov 2012 and Jan 2014, 530 aircraft were unable to remain within the confines of the existing CAS whilst conducting a published PANS-OPS approach procedure, as shown at Figure 3. Full details are provided at Annex A3. These figures appear to have reduced, but it must be borne in mind that the UK was involved in operations in Afghanistan up to 2014. However, it is inevitable that the number of aircraft movements at RAF Brize Norton will increase in line with any UK government commitment to operations.

Figure 3. RAF Brize Norton PANS-OPS Arrivals Required to Route Outside of the CTR Nov 12 – Jan 14

Since early 2014, RAF Brize Norton has actively sought ways of modifying procedures in an effort to keep aircraft within the CTR throughout their approach. This includes a proactive engagement programme between ATC and pilots to alert them to the potential issues concerned with leaving CAS. There are a number of reasons why aircraft leave CAS, which include the experience and competence of the pilot and the speed of the aircraft, but ultimately the current procedures that have been designed in accordance with PANS OPS criteria no longer 'fit' within the existing CTR. Some of the measures that have been implemented to mitigate this include reducing the speed flown by the aircraft concerned, and also by implementing proactive actions by controllers such as providing vectors to ensure that the aircraft remains inside the protection of the CAS. This somewhat defeats the purpose of a pilot instrumented approach if controller intervention is required to ensure that the

aircraft remains inside the CAS. Whilst this has reduced the number of aircraft exiting the CTR, as shown at Figure 4 a significant number of aircraft are still unable to remain inside the existing airspace whilst making a PANS-Ops approach. Of the 102 excursions between November 2015 and December 2016, over 16% of aircraft encountered conflicting traffic operating outside the CTR.

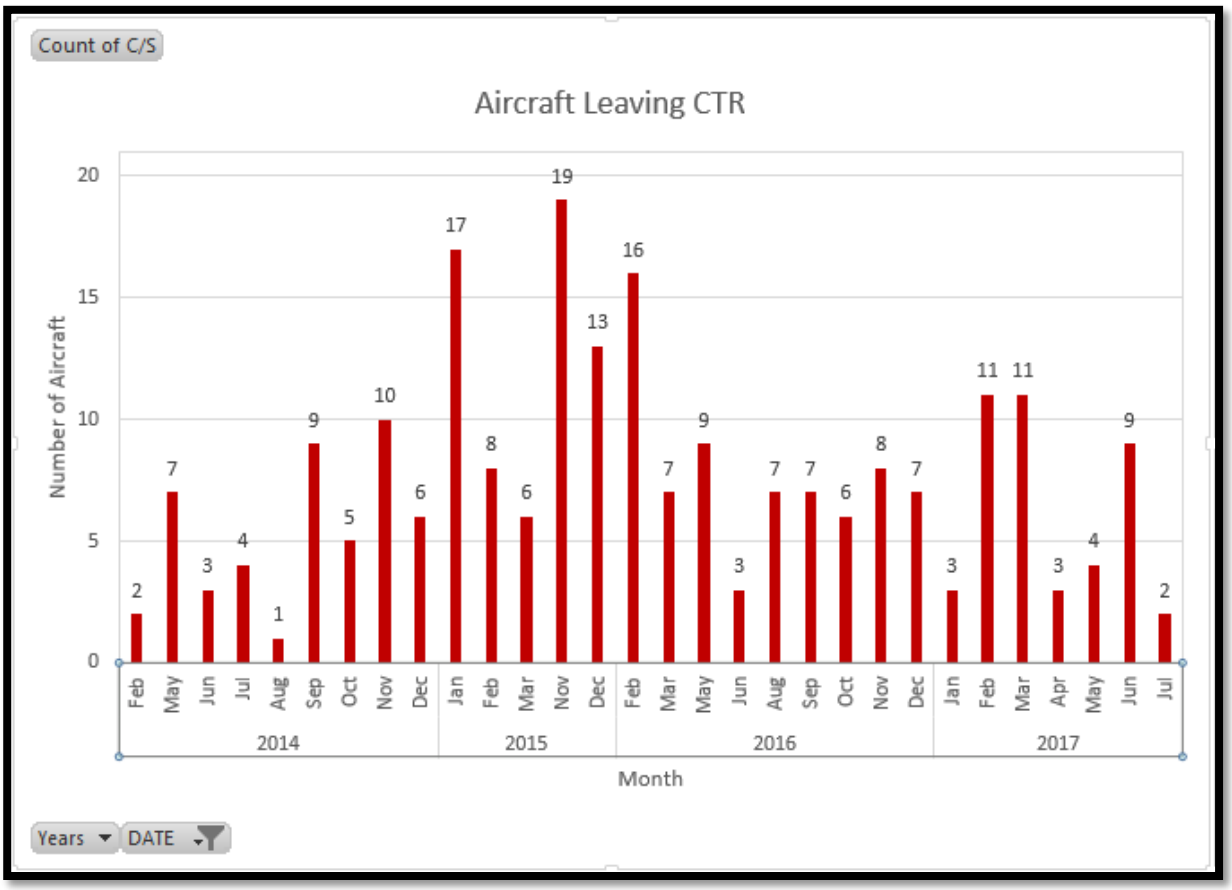

Figure 4. RAF Brize Norton PANS-OPS Arrivals Required to Route Outside of the CTR
Feb 14 – Jul 17

In summary, the existing CTR does not provide sufficient protection to aircraft in the critical stages of flight after departure and prior to landing within the busy AIAA. These aircraft often carry passengers (troops and some fare paying[9] passengers) who are not currently afforded the same level of protection as civil aircraft operating within controlled airspace. In addition, the CTR does not conform to 'best practice' in that it does not provide adequate containment for the types of procedures now flown at RAF Brize Norton.

3.3.4 What Happens when Aircraft Leave the CTR?

When a RAF Brize Norton aircraft leaves the CTR, responsibility for maintaining safe separation against other aircraft transfers from the controller to the pilot. When pilots are expecting to transit outside of controlled airspace, they can prepare for this by requesting the most appropriate level of service according to the overall flight conditions.

[9] The MOD Provides a service to civilians wishing to fly to the Falkland Islands under a commercial arrangement.

When an aircraft is flying a published Instrument Approach Procedure, particularly at the end of a long overseas flight, the pilot will expect to fly the procedure fully contained within the confines of the controlled airspace. This is intended to protect aircraft and passengers during a critical stage of the flight when a high level of concentration is required to position and configure the aircraft for its final approach.

If the dimensions of controlled airspace are too small, as is the case at RAF Brize Norton, aircraft may be forced to fly close to the edge of the CTR or even cross the boundary of controlled airspace into Class G. The aircraft will then be exposed to a potentially greater level of risk from other aircraft operating autonomously within Class G (Uncontrolled) airspace. In this case, the pilots of each aircraft are responsible for ensuring that safety margins are maintained. This switch of responsibility at a critical stage of flight increases cockpit workload for RAF Brize Norton aircraft. If the pilot considers that the safety of his aircraft has been compromised by the relative position of another aircraft, he is obliged to file an AIRPROX[10] report so that lessons identified from the incident can be shared with other airspace users. One such recent incident involved a RAF Brize Norton A400M with a C182 training aircraft operating outside of CAS. Details of the report are on the CAA website, which can be accessed by following the link below:

https://www.airproxboard.org.uk/uploadedFiles/Content/Standard_content/Airprox_report_files/2016/Airprox%20Report%202016165.pdf

3.3.5 How Does London Oxford Airport (LOA) Fit In with RAF Brize Norton's Operations?

The issues described in the paragraphs above are further exacerbated by the close proximity of LOA and its departure track (for their Runway 19)/arrival track (for Runway 01), both of which cross RAF Brize Norton's arrival route for Runway 25, as shown at Figure 5.

[10] An AIRPROX is a situation in which, in the opinion of a pilot or air traffic services personnel, the distance between aircraft, as well as their relative positions and speed, have been such that the safety of the aircraft involved may have been compromised. (ICAO Doc 4444: PANS-ATM).

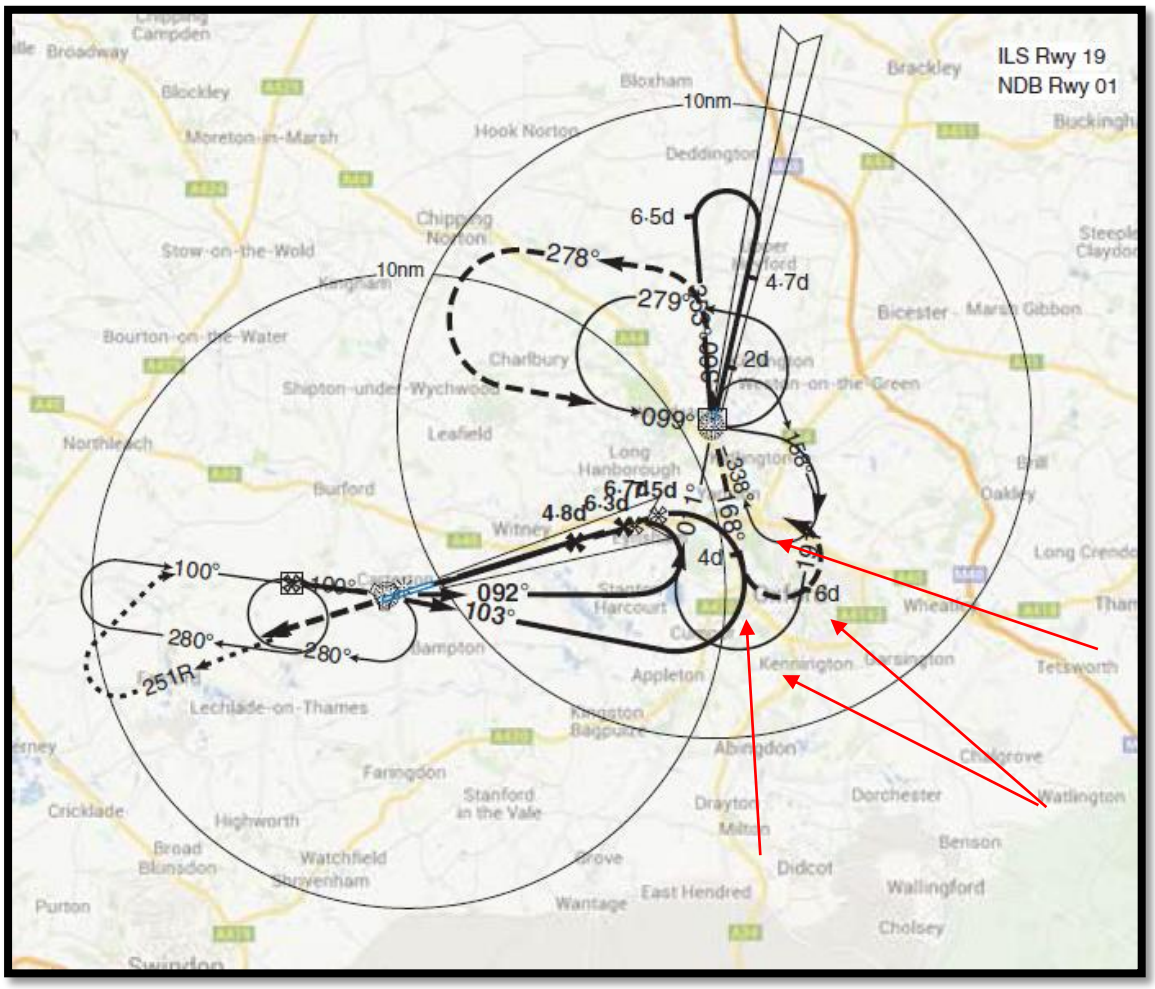

Figure 5. Current Procedure tracks for RAF Brize Norton Runway 25 arrivals and London Oxford Airport Runway 19 departures / Runway 01 arrivals *(red arrows show points at which the tracks cross)*

The current procedures require extensive co-ordination between ATC at the two airports in order to de-conflict aircraft. This proposal aims to enhance safety by reducing the need for co-ordination in as many instances as possible, by designing new airspace and procedures that are compatible for both aerodromes. The changes will ensure simultaneous operations can continue with a high degree of confidence that aircraft are appropriately separated by design. Additionally, the coordination required will reduce, increasing capacity for controllers to provide a service to other aircraft crossing or transiting close to the RAF Brize Norton and Oxford airspace.

3.4 Future-Proofing

The development of Global Navigation System (GNSS) Required Navigation Performance 1 (RNP1) is aligned with UK policy and is a cornerstone of the Future Airspace Strategy (FAS). At the 2007 36th Internation Civil Aviation Organisation (ICAO) General Assembly, States agreed to Resolution 36/23, which urges all States to implement routes and airport procedures in accordance with the ICAO PBN criteria. EU Leglislation, through the Common Pilot Project, instructs States to

implement PBN through RNP1 by 2024. All RAF Brize Norton-based aircraft (with the exception of the C-130J fleet, which is not suitably equipped) have, or will soon have, a requirement to fly RNAV procedures in order to maintain a capability to deploy worldwide. For example, the Bahrain FIR has a requirement for RNP-1 and, since November 2012 RNAV 1 has been mandatory for aircraft operating at Amsterdam Schiphol. More specifically, at Kabul airport, the climb gradients attached to RNAV SIDs are less than the conventional SIDs, which allows C-17 aircraft to carry more freight when returning from an operational mission.

Whilst some training requirements can be met in a synthetic environment, there is no substitute for 'live' training. The MoD AT fleet pilots need to train, practice and fly RNAV procedures to retain the high levels of expertise that are required when accessing other nations' airspace during times of conflict or when supporting humanitarian relief operations. RAF Brize Norton therefore requires all SIDs and STARs to be RNAV compatible, alongside its conventional procedures to each runway.

Although RAF Brize Norton is not required to consult on the implementation of the new procedures, it is the procedures themselves that dictate the shape and dimensions of the revised airspace design. More information about RNAV approaches is provided within Annex A7.

3.5 Key Benefits of a New Airspace Design

The existing volume of traffic and added complexity of controlling aircraft at other adjacent airfields, means that controller capacity is being stretched. Revised airspace arrangements with the establishment of additional CAS would:

- Provide aircraft with additional protection to mitigate the risk of mid-air collision.
- Contain PANS-OPS procedures within Class D airspace.
- Decrease the number of avoiding action turns at a critical stage of flight.
- Provide additional protection to other IFR airspace users in the vicinity; for example aircraft joining airways from LOA, Gloucestershire Staverton and Cotswold Airport (Kemble).
- Allow aircraft more direct routings which will have a positive environmental benefit[11].

[11] No environmental modelling has been conducted. This benefit should be counterend with a potential dis-benefit of aircraft that choose to avoid the airspace.

4 Options Considered

RAF Brize Norton has undertaken a detailed design process that minimises the volume of new airspace required and takes into account other airspace user requirements. This section outlines some of the considerations that have shaped the many iterations of the proposed airspace design.

4.1 Overview

Although the current proposal is to extend the volume of Class D airspace surrounding RAF Brize Norton, a number of other options were considered in determining this course of action. Options were developed in consideration of not only the needs of RAF Brize Norton, but also how best to meet the needs of other stakeholders. (Details of Stakeholder Engagement activity is included within Section 6.5 and 6.6).

4.2 Option 0. Do Nothing

Having identified a range of flight safety issues through routine Defence Aviation Safety Management System (DASMS) processes, in 2012 the MoD commissioned an independent Scoping Study to assess options to enhance flight safety within the vicinity of RAF Brize Norton. The Study looked at existing operations and considered a range of activities to mitigate the issues identified. It confirmed that RAF Brize Norton employs all standard operating measures to mitigate risk as defined within CAA Policy Statement *Flight Outside Controlled Airspace* [Reference 3[12]] and identified in the RAF Brize Norton Aviation Support Risk Register (ASRR) and the Battlespace Management Safety Management Manual (BM SMM) Risk Registers. Whilst accepting that current levels of service are safe, the risk of a Mid-Air Collision within 20 NM of RAF Brize Norton is assessed as HIGH. In addition, ten AIRPROX incidents since 2012 demonstrate the busy nature of the local airspace; full details are provided at Annex A5. The relatively low number of AIRPROX events in relation to the high number of aircraft movements is due to the effective service provided by RAF Brize Norton ATC; however, controller capacity is being stretched and could be breached in the near future because of the high number of aircraft movements operating both inside and outside the CAS that controllers are required to handle.

The standard operating measures employed include:

- A DS or TS is available from RAF Brize Norton ATC;
- When the Primary Surveillance Radar (PSR) is not available, ATC informs the pilot that reduced traffic information using Secondary Surveillance Radar (SSR) only is being provided; pilots must then intensify their lookout (any planned outage or anticipated failure of the PSR for more than 3 hours results

[12] CAA Policy Statement *Flight Outside Controlled Airspace* has since been withdrawn, but CAP 493 [Reference 4] Section 1, Chapter 6, 1B.2(5), Chapter 11, 5, and Chapter 12, 1B are also applicable.

in the implementation of contingency plans and deployment of RAF Brize Norton controllers to RAF Benson);

- RAF Brize Norton ATC offers the provision of Lower Airspace Radar Service (LARS) seven days a week; one controller is specifically established to provide a LARS service between 0900-1700 local, which also provide an ATS to Tutor aircraft based at RAF Benson at weekends;
- RAF Brize Norton ATC provides an ATS to London Oxford inbound and outbound IFR aircraft when an Oxford radar service is unavailable;
- Use of Traffic Collision Avoidance Systems (TCAS) by all RAF Brize Norton-based aircraft;
- Publication of Safety Information relating to the Unit procedures; Aeronautical Information Circular and General Aviation Safety Information Leaflet; and,
- The principle of 'See and Avoid'.

4.2.1 Summary

As illustrated in Annex A5, despite employing 'best practice' procedures, including the high standard of ATS provided by ATC staff, the mitigations put in place have not resulted in a reduction in the classification of the risk of mid-air collision identified in the Station Risk Register. Without further mitigation the situation will not change, therefore the DASMS dictates that something further must be done. The Scoping Study then considered a range of additional mitigations to address the issues identified; these are discussed in the following paragraph as 'Do Minimal'. The option to 'Do Nothing' has therefore not been pursued.

4.3 Option 1. Do Minimal

4.3.1 Revision of SIDs and STARs

To avoid known Class G 'hotspots' such as Kemble the Scoping Study first considered revising the SID to route direct to a CAS reporting point (eg SIREN, MIMBI or KENET) rather than routing via NAXAT to MALBY. However, in order to be above civil aircraft inbound to Southampton and Bournemouth routing through the London Terminal Control Area (TMA) from the North, the en-route sector controllers require outbound aircraft to be at, or above, FL 180 abeam reporting point MIMBI. If departing aircraft did not routinely fly via MALBY, but joined CAS at a point further to the east, yet were unable to climb above FL 180, they would be held at lower levels within the airway. Similar issues exist, but in reverse, for aircraft leaving CAS inbound to RAF Brize Norton. Thus, the conclusion was that revised SIDs and STARs would benefit neither the departing aircraft nor the very busy airways Sector controllers.

4.3.2 Improved General Aviation Liaison

To improve flight safety the Station implemented the following initiatives with local aviation stakeholders:

Date	Forum	Details
Since Project Inception	Oxfordshire AIAA Users Working Group	RAF Brize Norton ATC has been a driving force in the Oxford AIAA Users Working Group (WG), which is attended quarterly by all ATS providers and selected airspace users in (and adjacent to) the Oxford AIAA, together with an invitation to representatives from HQ Air, NATS and the CAA. The overall aim of the WG is to create a collaborative framework to improve flight safety within the Oxfordshire AIAA. The SATCO at RAF Brize Norton has held the Chair of the WG for the last year and has iniated the publication of an article aimed at the GA community to promote safety awareness.
28th March 2017	CAE	A number of RAF Brize Norton ATC representatives, including SATCO were invited to a meeting with CAE at London Oxford Airport to discuss interoperability issues between the aircraft at RAF Brize Norton and those of the Aviation Academy.
Ongoing	Cotswold Airport	Closer liaison with the aircraft operators at Cotswold Airport (Kemble) has been conducted, which is over and above the requirements contained within the Letter of Agreement (LoA) with Kemble Air Services Ltd, the operators of Cotswold Airport. One example was to encourage the use of transponders with Mode C by Cotswold Airport operators.
13th March 2017	Gloucester Airport	SATCO RAF Brize Norton ATC was invited to visit Gloucester Airport to discuss airways joining clearances for aircraft at MALBY. During the visit he took the time to speak to Gloucester Airport ATC personnel.
Ongoing	Oxford Aviation Academy	Aircrew Liaison by the Deputy Station Flight Safety Officer with Oxford Aviation Academy to address CTR infringements.
7th February 2015	Cotswold Gliding Club	RAF Brize Norton ATC presented to the Cotswold Gliding Club.
30th October 2014	Wellesbourne Mountford	A selection of aviators from Wellesbourne Mountford visited RAF Brize Norton ATC.

Date	Forum	Details
24 April 2014	'Visit ATC' Airspace Seminar and CTR Transit Guide.	"A guide to transiting through and around Controlled Airspace" has been produced by ATC at RAF Brize Norton, which is available on the internet, and local flying clubs are being engaged to visit the Station; Wellesbourne TAKEFLIGHT Flying Club visited RAF Brize Norton to brief and be educated on local airspace and air traffic flows.
Spring 2014	Gloucester Airport	Stakeholder engagement by RAF Brize Norton ATC personnel.
20th August 2014	Cotswold Airport	Vist by RAF Brize Norton ATC personnel arranged but was subsequently postponed.

Table 1 Summary of Local Aviation Engagement to Raise Awareness of RAF Brize Norton Operations

The additional airspace arrangements put in place for the London Olympics in 2012 provided the catalyst for several of these initiatives. Since then, there has been a small reduction in the number of CTR infringements and the working relationships with many adjacent airfields and flying clubs has improved. However, the requirement to take aircraft off the published procedure remains, and this means there are still instances where aircraft exit the CTR on approach and come into conflict with GA.

4.3.3 Listening Squawk

RAF Brize Norton introduced a 'Listening Squawk' in September 2017. This is intended to complement the LARS service that it provides, and will also serve to complement the Listening Squawk introduced by LOA in January 2016. This will allow RAF Brize Norton controllers to transmit to aircraft utilising the Listening Squawk in order to alert them to any potential conflict or proximity of CAS. It is too early to assess whether the implementation of this initiative will assist in reducing the number of CAS infringements; however this is one of the benefits that RAF Brize Norton is seeking to realise.

4.3.4 Summary

RAF Brize Norton has instigated a range of initiatives to enhance flight safety including local engagement and the introduction of a Listening Squawk. However, this does not alter the fact that the current airspace arrangements do not meet the needs of current or future operations and are considered to be unfit for purpose. This option does not fully resolve the issues that RAF Brize Norton is experiencing and has therefore been discounted.

4.4 Option 2. Other Airspace Design Options

4.4.1 Overview

CAS is not the only tool available to create greater situational awareness for controllers and pilots. Several alternative airspace constructs have been considered in the development of this proposal. These include an assessment of the suitability of Transponder Mandatory Zones (TMZs) and/or Radio Mandatory Zones (RMZs) [Reference 5] either of which could be introduced in conjunction with Class E Controlled Airspace. Class E airspace has different rules pertaining to it than Class D airspace. Aircraft operating under Visual Flight Rules do not need an ATC clearance to enter Class E airspace and aircraft operating under Instrument Flight Rules (IFR) are only separated from other IFR aircraft. VFR aircraft are responsible for maintaining separation from other VFR and IFR aircraft. (Further detail about airspace classifications can be found at Annex A8.) Each assessment takes into account relevant CAA Policy Statements, including the CAA policy for Controlled Airspace Containment [Reference 2].

4.4.2 Transponder Mandatory Zone (TMZ)

A TMZ is a volume of airspace within which aircraft are required to be equipped with and operate a Secondary Surveillance Radar (SSR) transponder[13]. TMZs are notified within the UK AIP for the purpose of Air Navigation Order 2016 [Reference 6] in relationship to Part 5, Chapter 1, Section 4, para 77 and Schedule 5 Articles 44(5) and 77(3). This equipment must include a pressure altitude reporting transponder capable of operating in Mode A and Mode C and has the capability and functionality prescribed for Mode S Elementary Surveillance. The pilot of an aircraft that wishes to operate in a TMZ without such serviceable transponder equipment may be granted access to the TMZ subject to specific ATC approval. A TMZ only is a change to the requirement for equipment carriage and operation; a TMZ could be established without any change to CAS dimensions.

The establishment of a TMZ aims to enhance safety, by providing a more 'informed ATC environment', allowing ATC and airborne safety systems to monitor the altitude of aircraft operating within it. This helps to reduce the possibility of infringements of CAS and to maintain safe separation standards. To inform the RAF Brize Norton airspace and determine if a TMZ would be suitable in meeting the aims of the project, an appraisal of existing TMZs was conducted, to establish the reasoning behind their introduction and the applicability of their benefits to the Brize operation.

Example 1 - London Stansted TMZ

The submission for the London Stansted TMZ was based upon a safety concern due to the large number of aircraft infringing the Stansted CAS. The TMZ was established in 2009 to provide a layer of protection to the CAS which wholly contains the Stansted arrival, departure and approach procedures. At RAF Brize Norton, the safety issue concerns aircraft on arrival, departure and approach procedures exiting CAS and coming into close proximity of aircraft operating autonomously outside the confines of the airspace; the procedures are not contained. Whilst a TMZ would provide more information to air traffic control and would potentially result in a higher rate of TCAS activations, pilots operating within a TMZ are not required to be in radio contact with air traffic control. Therefore, air traffic controllers will be unable to communicate information relevant to any perceived potential hazard.

The conditions that led to the establishment of the Stansted TMZ are dissimilar to those at RAF Brize Norton and the use of a TMZ only would not resolve the issues identified at Section 3.

Example 2 - London Array TMZs

The London Array TMZ was established in 2011 to mitigate for the effects of wind turbines on air traffic control primary surveillance radars (PSR). The movement of the turbine blades within the large offshore wind farm reflects the radar beam, creating what appears to be tracks on the air traffic control Radar Display Screen; this can lead to controllers being unable to distinguish between turbines and aircraft, as well as creating significant clutter on the radar display. It is possible to suppress the PSR within specified areas to reduce the impact, but that would also remove the legitimate aircraft tracks from the display. In order to be able to track aircraft

[13] Secondary surveillance radar (SSR) is a radar system used in air traffic control (ATC), that not only detects and measures the position of aircraft i.e. bearing, but also requests additional information from the aircraft itself such as its identity and altitude.

through the suppressed area, air traffic controllers have to rely on secondary surveillance radar (SSR), requiring aircraft to carry and operate a transponder.

The concerns at RAF Brize Norton do not relate to radar clutter or unwanted radar returns on the display. The conditions that led to the establishment of the London Array TMZ do not resolve, nor do they apply to the issues identified at RAF Brize Norton.

4.4.3 Class E + TMZ

ICAO intends Class E airspace to be notified at specified locations where a known traffic environment is only necessary for IFR operations. Unlike Class D, clearance to operate VFR flight within Class E airspace is not required. Therefore Class E airspace does not provide a known traffic environment. Within Class E airspace, controllers are only required to provide separation between IFR aircraft; they do not provide separation between IFR and VFR aircraft although they will provide traffic information about VFR aircraft to IFR aircraft under their control when it is practicable to do so. Class E airspace, as defined in ICAO Annex 11, is insufficiently different in nature from G airspace in terms of the protection afforded to IFR aircraft against unknown aircraft operating VFR. This is especially the case when the provision of Air Traffic Services Outside of Controlled Airspace (ATSOCAS) is taken into consideration (specifically, where a Deconfliction Service can be guaranteed). As a result, Class E airspace categorisation does not confer any operational or safety benefits over that provided within G airspace; this is also the case if combined with a TMZ.

Aircraft crossing Class E+TMZ airspace under VFR do not require an ATC clearance to do so. However, they are required to carry and operate a serviceable SSR transponder. If an aircraft is not equipped with a SSR transponder, the pilot would need to establish radio contact with the controlling authority (but would not require a clearance to enter or cross) or would proceed in accordance with agreed crossing procedures.

Class E airspace in the UK mostly comprises Advisory Route (ADR) airspace in the Scottish FIR[14]. Much of this airspace can be referred to as 'Low Density, Low Complexity Airspace', with relatively few commercial IFR movements. Although there is no specified criteria laid down by the CAA about where Class E airspace should be established, it is not likely to be considered suitable for use within AIAAs or for the protection of aerodromes surrounded by complex CAS.

Evidence of its unsuitability can be found from the analysis of AIRPROX No2011085, which occurred in the Class E Glasgow CTA between a B757 inbound to Glasgow and a glider en route to Portmoak. The CAA SARG considered that a safety critical risk existed and introduced a reclassification of the airspace to Class D in order to mitigate the risk. This solution prevents the recurrence of a similar event because the airspace is now a known traffic environment where all aircraft are required to remain in contact with ATC.

4.4.4 Radio Mandatory Zone (RMZ)

A RMZ is airspace of defined dimensions within which the carriage and operation of suitable radio equipment is mandatory. An RMZ may be used in conjunction with

[14] ADRs were reclassified from Class F airspace to Class E airspace in July 2014. See https://www.caa.co.uk/WorkArea/DownloadAsset.aspx?id=4294972711 for more details.

other measures to enhance situational awareness. For example, an RMZ could be combined with a TMZ. However, since an RMZ does not alter the classification of airspace; the extant rules under Class G airspace would still be applicable. Within an RMZ there would be no obligation for a pilot to undertake any requested course of action in order to maintain deconfliction minima from RAF Brize Norton arrivals or departures. Whilst the existence of 2-way communications between aircraft operating within the RMZ would enable timely warnings to be provided, the potential number of occurrences of scenarios where conflictions arise would not be reduced, as an RMZ would not enable flight procedures to be contained nor would it afford them any enhanced protection.

4.4.5 Summary

In summary, taking into account traffic density, airspace complexity, surrounding environment and airborne equipage, the introduction of a TMZ, Class E airspace + TMZ or an RMZ would be inadequate in meeting the aims of the proposal. Therefore, Option 2 has been discounted in its entirety.

4.5 Option 3. Minimal Change to Current Class D

4.5.1 Overview

This option considers an increase to the size of the RAF Brize Norton CTR without the associated CTAs and airways connectivity.

4.5.2 Detail

RAF Brize Norton is the only UK MoD base that routinely operates large transport aircraft; it is therefore applicable to look to civil aviation operations for industry best practice in terms of equivalence of passenger-carrying capacity and manoeuvrability of aircraft. Industry standard practice and regulatory documents support the containment of approach procedures and connectivity between the airport and airways structure with CAS. CAP 493 *Manual of Air Traffic Services* Section 1, Chapter 6, para 13A.3 states:

> *"Unless an aircraft has planned to leave controlled airspace, it is not to be vectored outside the horizontal or vertical limits"*

Furthermore, CAP 493, Section 1, Chapter 6 para 13A.4 also states:

> *"Although IFR flights within class A-D airspace, and VFR flights within B/C airspace, are deemed to be separated from unknown aircraft flying in adjoining uncontrolled airspace, controllers should aim to keep the aircraft under their control at least two miles within the boundary."*

CAA Policy Statement *Controlled Airspace Containment Policy* dated 17 January 2014 [Reference 2] suggests that it is possible to establish SIDs outside CAS on a case-by-case basis supported by a safety case.

4.5.3 Summary

Whilst an option to increase the size of the existing CTR will address some of the safety concerns regarding aircraft positioning for final approach, it does not satisfy all of the areas that RAF Brize Norton is seeking to address. Restricting the change to an airspace design that does not contain SIDs and STARs and/or approach

procedures with connectivity to the UK airways network has therefore, been discounted.

4.6 Option 4. Initial Class D Concept

4.6.1 Overview and Concept

RAF Brize Norton already has a Class D CTR within which its aircraft are offered a degree of protection as the procedures are not currently fully contained. Most UK civil airports operating a significant number of fare-paying passengers have Class D CTRs and associated Control Areas (CTAs) to protect aircraft during the critical stages of flight. Many airports also have direct connectivity with the airways system ensuring direct routes are utilised when transiting to and from the airport. Whilst the majority of RAF Brize Norton flights are military or state flights, the airport does provide a service to fare paying members of the public travelling to the Falkland Islands. However, RAF Brize Norton aircraft are renowned for carrying troops to and from operational theatres and these flights are therefore deserving of the same level of protection as those carrying members of the public. Furthermore, the aircraft themselves are state owned assets and are required to support state directed activities in support of government objectives.

As outlined within Section 3, safety studies at RAF Brize Norton have established that the current dimensions of CAS are not sufficient to contain aircraft conducting IFR approaches. Consideration has therefore been given to extending the existing CTR, and developing associated CTAs to ensure aircraft are contained during all phases of flight, including the transit to the airways joining point at MALBY and from the leaving point at SIREN.

Class D airspace is the option that offers the best protection to RAF Brize Norton aircraft whilst continuing to allow safe access to other airspace users operating within the Oxfordshire AIAA. This is the option that has been pursued in order to meet the aims of this project. Several design solutions have been considered.

New RNAV Instrument Flight Procedures are required to be designed in accordance with criteria laid down by ICAO and are known as PANS-OPS. This criteria allows for an area around the procedures know as primary protection areas. It is normal practice for procedure designers to establish the IFPs protected by full PANS-OPS primary protection areas; this would require large volumes of airspace. It is often impractical to pursue the airspace design based on full PANS-OPS containment due to the requirements of other airspace users. The initial full PANS-OPS primary protection areas associated with the proposed procedures for RAF Brize Norton are shown at Figure 6. It was recognised at an early stage in the project that full containment would require a disproportionate volume of airspace that would have a significant impact on other airspace users.

The initial Class D conceptual design based on the full primary containment areas of the PANS-OPS IFP designs is shown at Figure 7. A full description of the airspace and the reasoning behind the dimensions of the initial concept is provided at Annex A6. Furthermore, RAF Brize Norton recognised that this design was extremely complex and was still likely to affect other airspace users. This conceptual design was presented to other airspace users that operate from airfields in proximity to RAF Brize Norton at an early stage in the project in order to capture the issues that it may generate.

4.6.2 Summary

It was clear that whilst full PANS-OPS containment would address the concerns of RAF Brize Norton, the volume of airspace required would be detrimental to many other airspace users. This led to a decision to modify the designs where possible in order to reduce the volume of airspace required for containment, and also to keep to an absolute minimum the airspace required to protect aircraft, which would not necessarily be fully PANS-OPS compliant. This Option, in its current state, is discounted; Section 5 explains how this option has been modified to develop into Option 5 - the proposal.

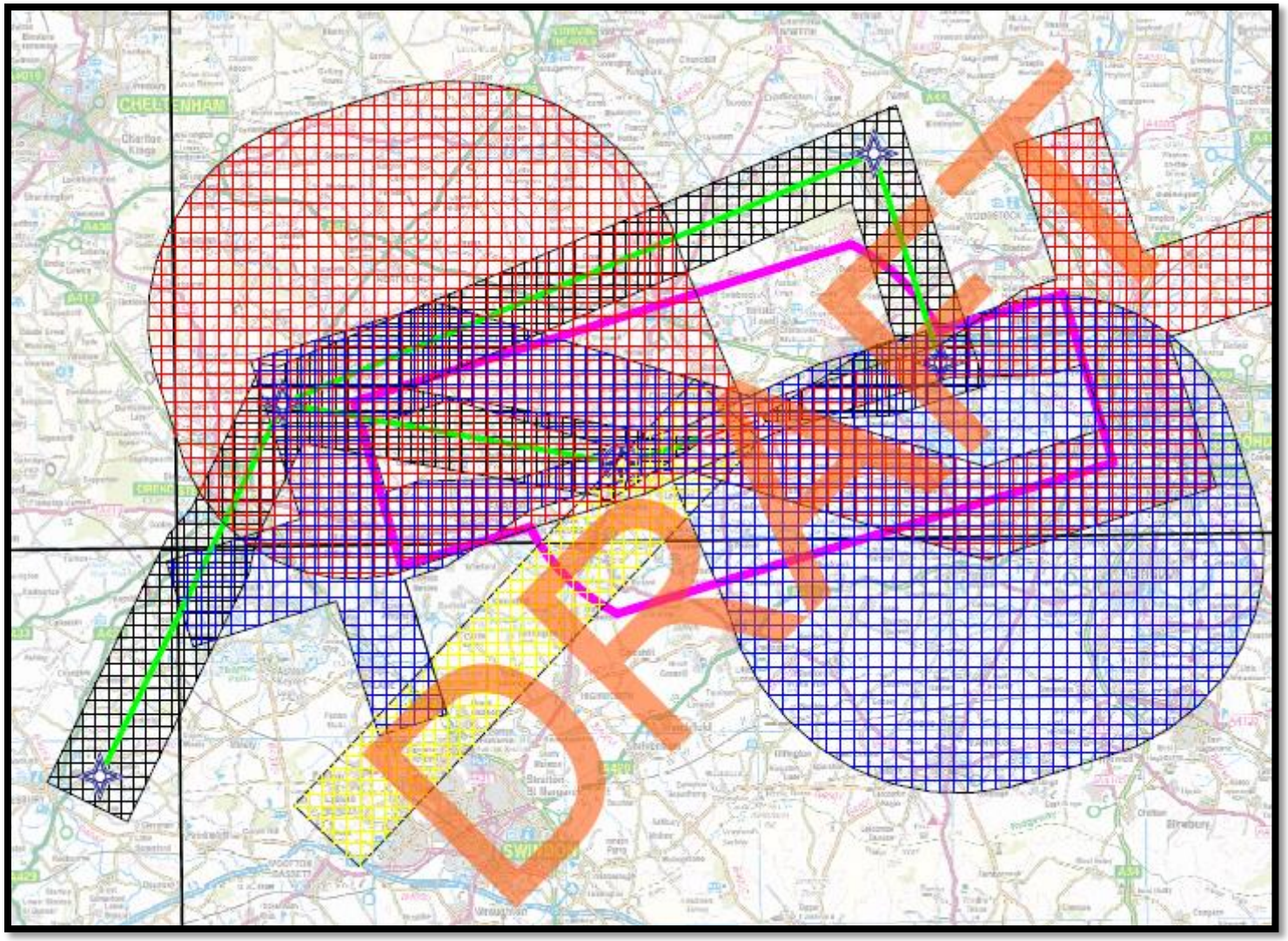

Figure 6 Primary Protection Areas for RAF Brize Norton Conceptual Procedure Designs

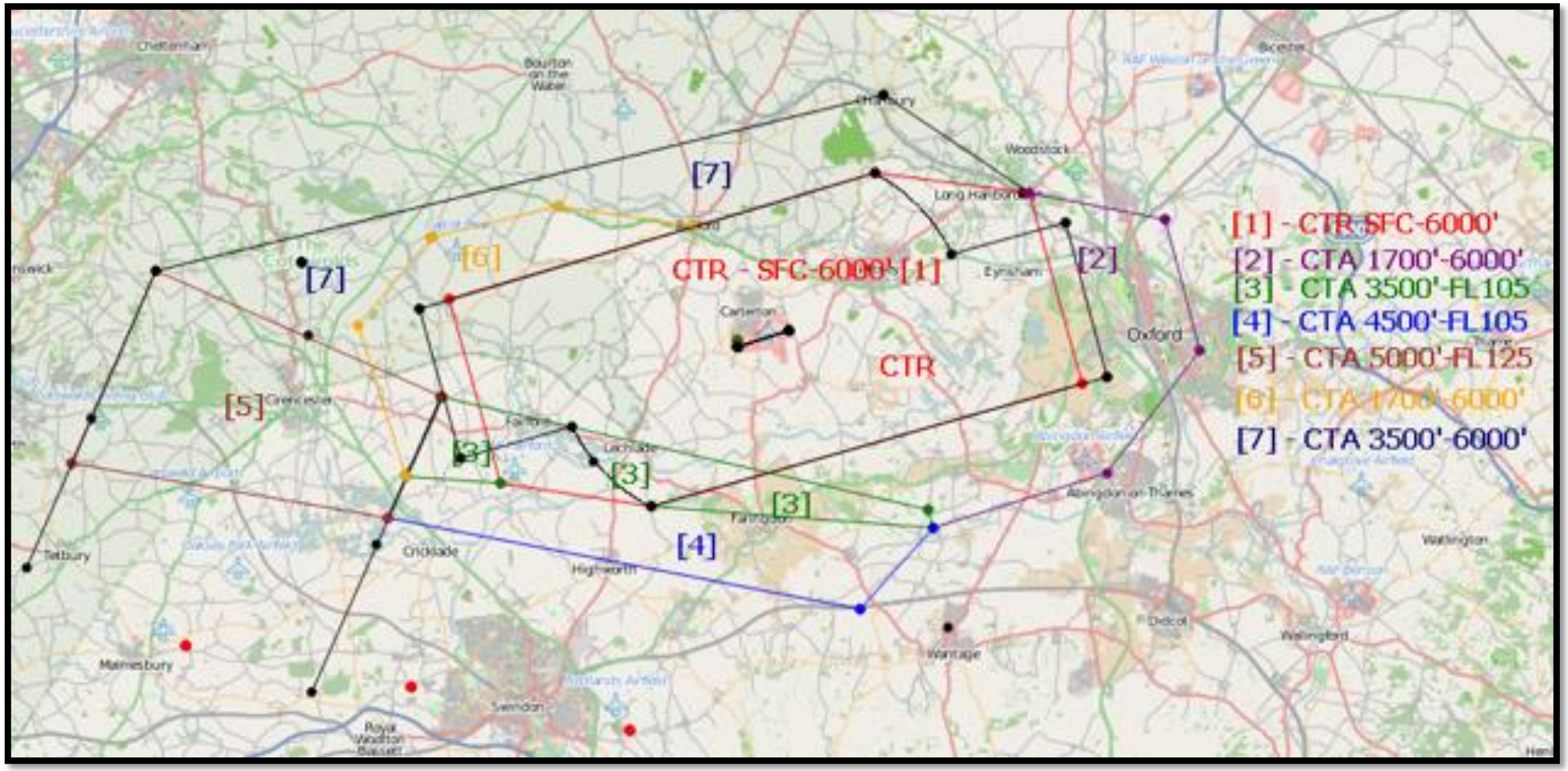

Figure 7 Initial Conceptual Design for RAF Brize Norton Revised Class D CTR and CTAs

5 The Proposal – Option 5

The previous Section (4) of this document outlined the options considered during this project. This section defines the option that is being proposed and describes in more detail how this option, (Option 5) which is a refined version of Option 4, has developed to the final option considered.

5.1 Overview

Whilst this section is notionally to introduce the option to be presented by RAF Brize Norton in response to the safety assessments, it is important to recognise the wider implications of any change to the Class D airspace in the Oxfordshire area, particularly in close proximity to London Oxford Airport (LOA). LOA is pursuing its own ACP in order to protect aircraft on the final approach to RW 19. Both Airports have attended Framework Briefings with the CAA earlier in their respective projects; the CAA made it clear that the development of each proposal was to consider the other airport. This section will introduce the proposed airspace requirements to support the implementation of the new RNAV (GNSS) IFPs at RAF Brize Norton, and most importantly, support the safety requirements that are the key drivers for this proposed change.

5.2 RAF Brize Norton Preferred Option

RAF Brize Norton accepts that containing all of the existing IFPs and the new RNAV GNSS IFPs within CAS in accordance with full PANS-OPS criteria (Option 4) would simply not be practicable due to the potential adverse impact on other aviation stakeholders within the area. Great consideration has been given to areas where full containment could be reduced, whilst still meeting the aims of the project in providing protection to aircraft operating at RAF Brize Norton in the critical stages of flight; these areas incorporated within the proposed airspace design will be fully supported by safety assessments in the submission to the CAA.

RAF Brize Norton has engaged the support of a UK CAA approved organisation to design the airspace and the RNAV (GNSS) IFPs. The airspace design that RAF Brize Norton wishes to consult on is provided at Figure 8. This figure also includes an area labelled 'OX CTR 2' that would form part of a joint airspace agreement if successful, with LOA. Further details about the separate consultation that LOA is conducting for its airspace and procedures can be found by visiting the London Oxford Airport website (www.oxfordairport.co.uk) and by following the link to the consultation. The volume of airspace depicted below is considered to be the minimum required to safely contain both the existing and the new flight procedures that will provide connectivity to the airways network and for aircraft to make an approach to the runway.

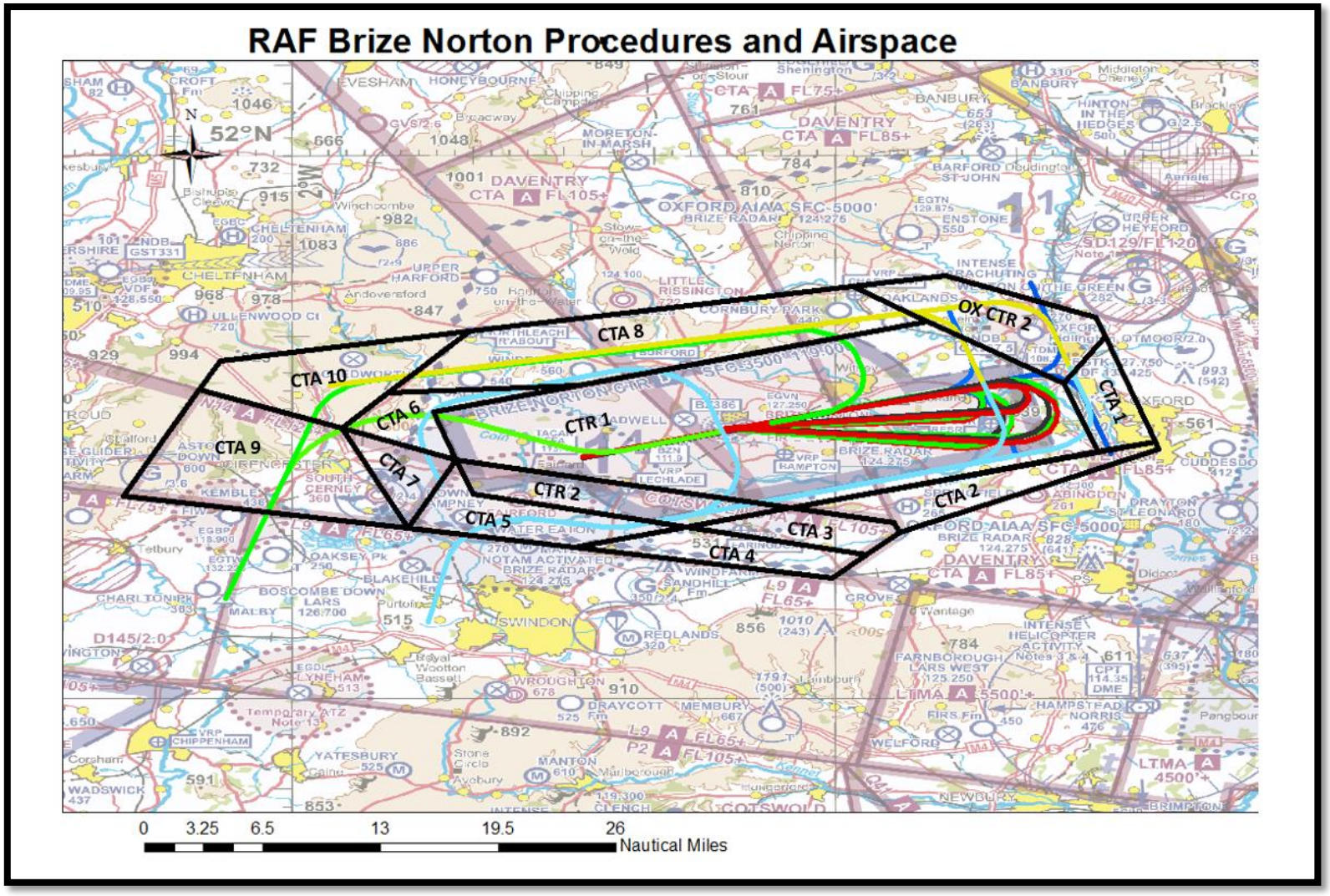

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Figure 8 Proposed Airspace (and Procedures) for RAF Brize Norton

Airspace Area Name	Vertical Values
CTR 1	Surface to 6,000 ft
CTR 2	Surface to FL105
OX CTR 2	Surface to 6,000 ft
CTA 1	2,000 ft to 6,000 ft
CTA 2	2,300 ft to 6,000 ft
CTA 3	3,500 ft to FL105
CTA 4	4,500 ft to FL 105
CTA 5	1,800 ft to FL 105
CTA 6	1,800 ft to 6,000 ft
CTA 7	1,800 ft to FL 125
CTA 8	2,300 ft to 6,000 ft
CTA 9	5,000 ft to FL 125
CTA 10	3,500 ft to 7,000 ft

Table 2 Details of Vertical Limits of Proposed Airspace

The airspace design was primarily driven around the containment of the proposed procedures; a further requirement was to ensure that the proposed designs would allow both RAF Brize Norton and LOA to operate with minimal coordination. Both Figure 8 and Figure 9 below show how the airspace has been designed to 'fit' around the procedures. The airspace has also considered the existing airspace structure and some CTAs have been designed to fit within the lateral lines to simplify the arrangement. It should be noted that the volume of airspace is not fully compliant with the PANS-OPS criteria which suggests the airspace volume should contain the Primary Protection Areas (see Figure 6). However, aircraft flying the procedures will be contained within the proposed airspace.

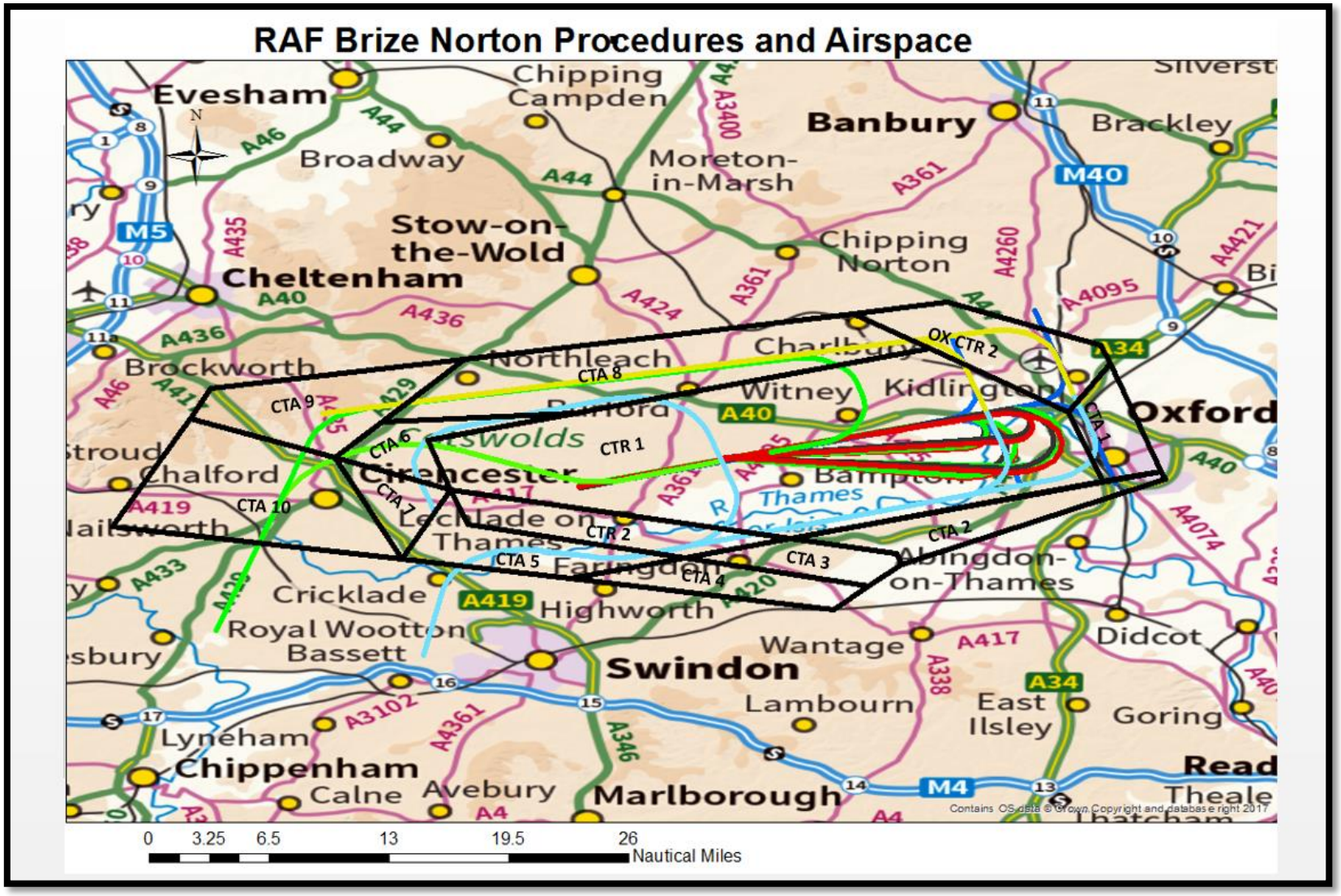

Figure 9 Proposed Procedures and Airspace for RAF Brize Norton

5.3 Close Proximity of LOA – Combined Patterns

The airspace described within Figure 8 labelled "OXF CTR 2" is airspace required for the protection of aircraft operating from both airports; RAF Brize Norton aircraft on arrival to Runway 25 and those departing Runway 07 to the north will be contained by this segment of airspace. It is proposed that if successful, RAF Brize Norton would be appointed Control Authority for the airspace as it is open 24 hours a day. However, since this section of the airspace encompasses the LOA ATZ it is likely to be more heavily utilised by aircraft operating at LOA during their opening hours. Therefore, it is proposed that RAF Brize Norton would delegate control of that section of airspace to LOA during LOA published opening hours. When LOA is closed the airspace would revert to RAF Brize Norton control.

On initial engagement with LOA, it became apparent that the existing IFPs at RAF Brize Norton do not meet the needs of both airports and it became apparent that there is a high volume of tactical coordination between the Air Traffic Controllers at each of the aerodromes to safely facilitate each aircraft movement. Extensive work followed to develop new procedures that allowed safe operations at both airports to occur simultaneously.

The procedure redesign work identified that in order to enhance separation between RAF Brize Norton arrivals to Runway 25 and those aircraft operating at or departing from LOA, the RAF Brize Norton aircraft need to be on a converging heading in order to intercept the extended centreline to Runway 25 at approximately 8 miles from touchdown, which is closer to the runway threshold than is currently the case. This will also allow LOA aircraft to depart from their main instrument runway, Runway 19, without undue delay and ensure that any aircraft undertaking a Missed Approach Procedure are safely separated from RAF Brize Norton aircraft. Figure 10 below shows how the aircraft at RAF Brize Norton intercept the centreline; in order to establish on a final approach closer to the touchdown point, a wider turn is required from the downwind to base leg to final approach; therefore the airspace to the south and east needs to increase to contain the aircraft as it turns.

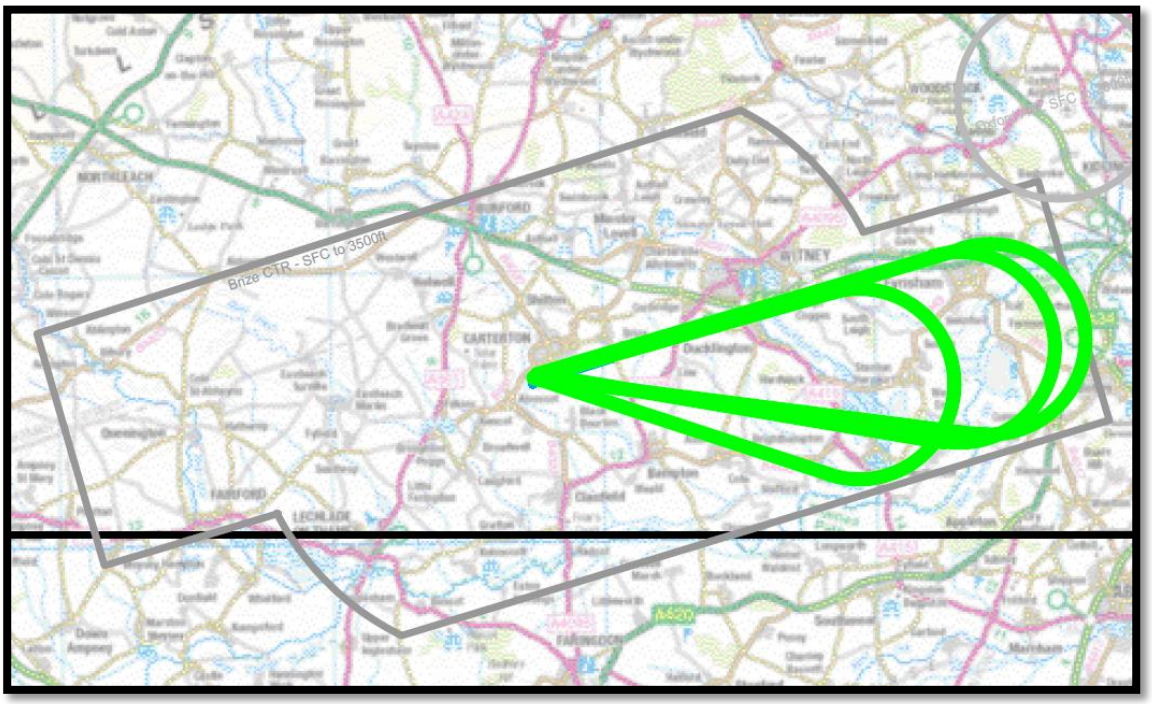

Figure 10. Modelling of Tracks for Runway 25 Approach Procedures

Based on the modelling at Figure 10, whilst the wider turn would not necessarily cross the boundary of the current airspace, it would not achieve the recommended minimum of 3 NM inside CAS[15]. Hence, the procedure design requires an extension of the CTR to the south east of RAF Brize Norton. The shorter procedure (shown with the inner pattern), greatly enhances the safety of operations between LOA and RAF Brize Norton by reducing the level of controller intervention between the coordination of Runway 25 arrivals at RAF Brize Norton against aircraft executing a Missed Approach Procedure (MAP) at LOA from Runway 19. Figure 11 shows that approximately 2 NM lateral separation will be built in between the two airports' procedures.

[15] If the primary protection areas for the procedures are fully used, then ICAO recommends that the airspace provides a minimum of 3 NM protection to contain the aircraft.

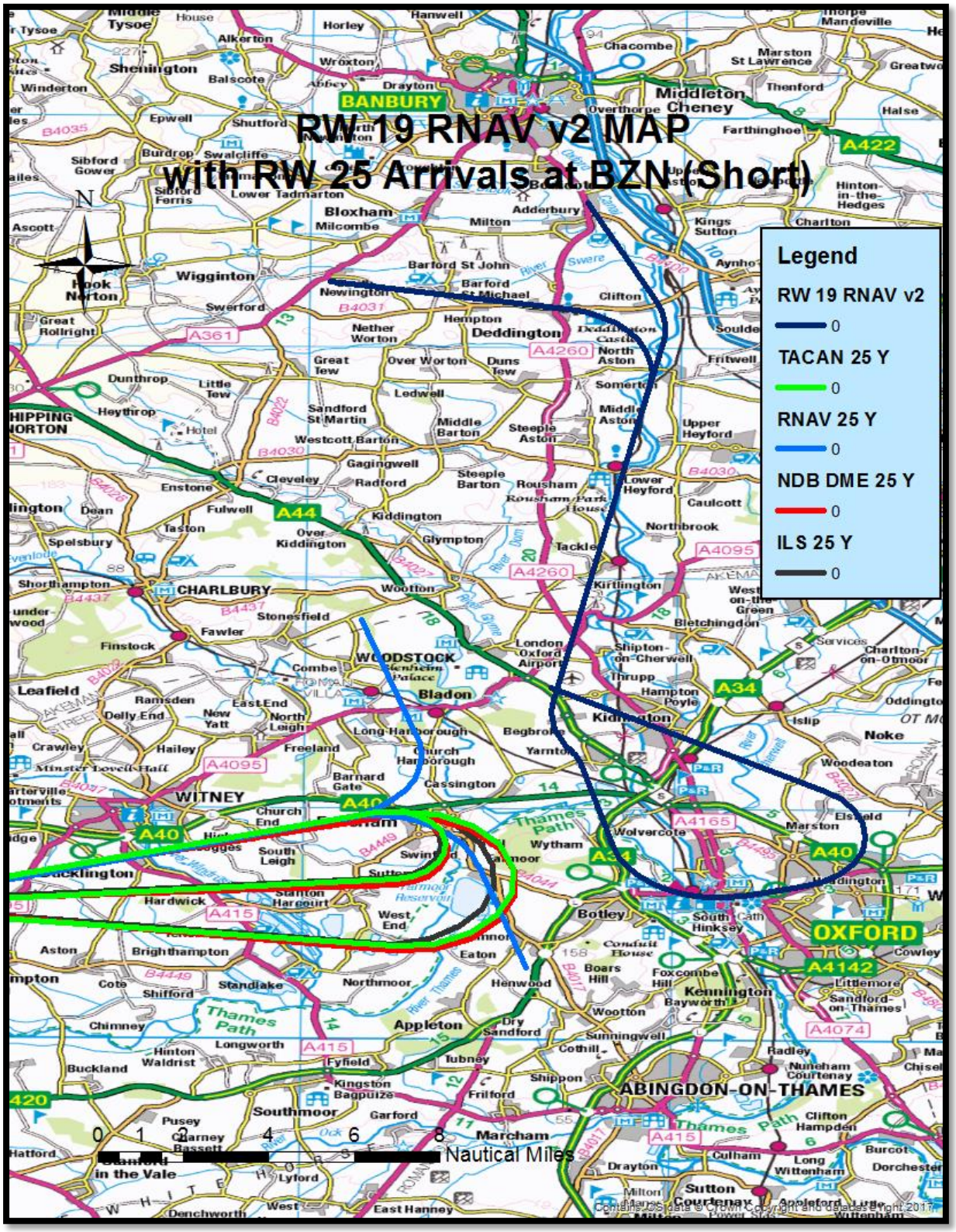

Figure 11. Nominal Tracks for Brize Runway 25 Approach Short Procedures and LOA Runway 19 Approach RNAV Procedure

Whilst the airspace design at Figure 8 has been devised to provide protection to RAF Brize Norton flight procedures, the proposed structure will also encompass part of the LOA Runway 01 arrivals procedure. The two airports already operate under an extensive Letter of Agreement; if the ACP is successful, this agreement will require amendment to ensure that neither party is overtly advantaged or disadvantaged by the proposed new airspace and procedures, and that there is clarity of responsibilities and methods of operation. Every effort has been made to attempt to deconflict aircraft positioning for an arrival at LOA for Runway 01 against aircraft operating at RAF Brize Norton to Runway 25. If successful, there will be more certainty about where aircraft can be expected to fly, and the procedures have been designed to separate aircraft. There will still be an enduring requirement for controllers to agree a course of action to ensure that separation is maintained between the aircraft but the situation will be greatly improved. Figure 12 below shows the complex arrangement that is Runway 01 arrivals and Runway 25 procedures for RAF Brize Norton.

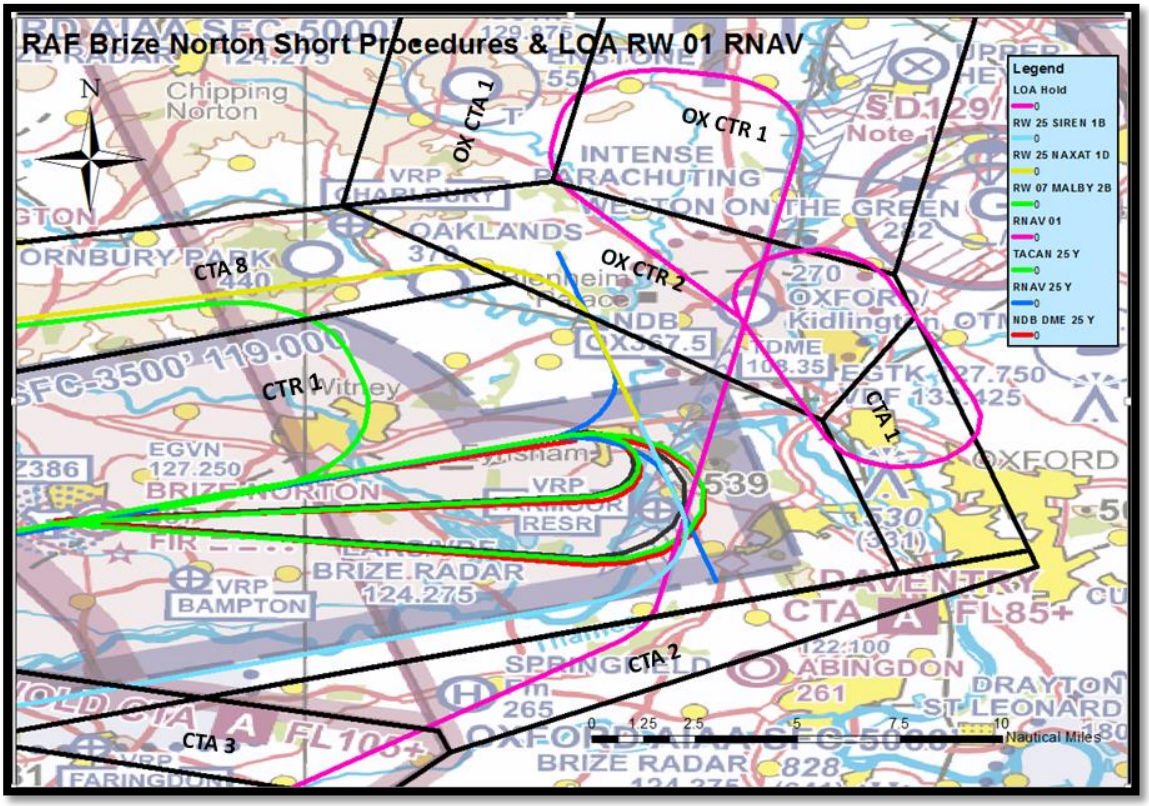

Figure 12. Nominal Tracks for Brize Runway 25 Approach Short Procedures and LOA Runway 01 Approach Procedures

6 How Could the Change Affect Me?

The new flight procedures have been designed to replicate the current operations as far as practicable. This consultation concerns the new airspace design, which is based on the containment of the new procedures, but not the procedures themselves. Whilst it is understood that there will be an impact on other airspace users, every effort has been made to keep this to a minimum.

6.1 Overview

Any change to airspace operating arrangements will produce an effect on those under the operating procedures and those that share the airspace in question. This section summarises the changes that we anticipate will be experienced as a result of this proposal, along with the measures that RAF Brize Norton has taken to minimise any adverse effects. It also aims answers some of the generic questions that you may have about the Consultation including the proposal and the process.

6.2 Is this Proposal Designed to Increase the Number of Aircraft at RAF Brize Norton?

The new flight procedures and airspace proposed for RAF Brize Norton are not intended to increase the number of aircraft operating at the Station. As detailed at Section 2, the proposed changes are intended to address concerns over safety for aircraft using the airways structure from/to RAF Brize Norton and on approach to the runway. These issues have become more prevalent since the closure of RAF Lyneham and the relocation of the RAF Lyneham aircraft to RAF Brize Norton. However, there are no plans to increase the number of aircraft at the Station.

6.3 What Will I Notice on the Ground?

Within Class G airspace, pilots do not have to be in radio contact with an Air Traffic Control agency and many General Aviation (GA) pilots prefer to operate autonomously. Whilst RAF Brize Norton is committed to providing a service to aircraft that wish to cross or enter their controlled airspace by providing a separate control position to facilitate this, there is likely to be a reluctance by a large proportion of the GA community to use this service. Hence, they will likely elect to route around the new airspace, rather than requesting to cross it. This is already the case with the existing controlled airspace, but with new airspace boundaries, the flow of general air traffic may change. Any pilot with an aircraft equipped with a radio will be able to speak to controllers to obtain a clearance to enter to CAS. However, where there is a reluctance for the pilot to do this, the flow of traffic might be expected to follow the new boundary as depicted within Figure 8.

6.4 What will RAF Brize Norton do to Help GA Pilots?

RAF Brize Norton already publishes a guide suggesting the best routings to deconflict with their main traffic flows in order to facilitate timely and efficient routings through the existing airspace. The areas and altitudes that best allow aircraft to cross RAF Brize Norton airspace are unlikely to change significantly with the new airspace design, so the current traffic routings through the airspace are unlikely to change. The guide to transiting through and around Controlled Airspace will be updated to reflect the new airspace and any minor changes to enable access to the airspace. RAF Brize Norton is happy to provide assistance to any GA pilots that would benefit from guidance on transiting CAS; the Air Traffic Controllers will continue to engage with the local aviation stakeholder community to ensure there is a full awareness and understanding.

6.5 What Are the Anticipated Effects on Other Airspace Users?

RAF Brize Norton has conducted extensive work to engage with local aviation stakeholders, including other airfield operators, the General Aviation community and local gliding clubs. The aim of the engagement was to explain the rationale behind the proposed changes, and, more importantly, to capture any concerns on the initial conceptual airspace design, with a view to incorporating their requirements into subsequent design iterations as far as practicable. RAF Brize Norton carefully considered the potential impacts and analysed the concerns raised, but it has not been possible to mitigate for the impacts in all instances within the design process.

Aviation stakeholders engaged are:

- Cotswold Airport;
- Gloucestershire Airport;
- RAF Fairford;
- Redlands Airfield;
- Sandhill Farm Airfield;
- Nympsfield Gliders;
- Aston Down Gliders;
- NATS Sector 23 and London Airspace Management Project; and
- Oxfordshire AIAA User Working Group

The issues captured during the engagement work are presented in Sections 6.5.1 to 6.5.4; the mitigation measures devised to minimise the impact of the airspace design are outlined at Section 6.7.

6.5.1 Extension of Airspace North of RAF Brize Norton

Two main issues were presented during discussions concerning the possible extension of the controlled airspace to the north of RAF Brize Norton:

- There was likely to be a confliction with the Gloucestershire Airport Initial Approach Fix (IAF) REKLO for the RNAV (GNSS) approach to Runway 27. Although the IAF would be located below the airspace of the initial proposal, a second altitude allowing 1,000 ft separation above was required to allow Gloucestershire Airport to sequence multiple aircraft; if this was not possible

the RAF Brize Norton airspace boundary would need to be moved south to achieve lateral deconfliction minima from the IAF.
- To facilitate glider flying, a base level of CAS no lower than 5,000 ft above ground level would be required. Without this vertical airspace to allow soaring, gliders would be required to avoid laterally.

RAF Brize Norton has consulted internally with the operators at Little Rissington who now operate winch launch gliders up to 2,722 ft AMSL, which would potentially be inside the newly proposed airspace (CTA 8 has a proposed base level of 2,300 ft which would affect Little Rissington). RAF Brize Norton is keen to investigate the use of a Letter of Agreement that would permit the Little Rissington to operate under specific parameters with the approval of RAF Brize Norton.

6.5.2 Extension of Airspace West of RAF Brize Norton

Cotswold Airport and Gloucestershire Airport would be the most directly affected by an extension of RAF Brize Norton Class D airspace to the west. Both airports had no concerns with such airspace providing that RAF Brize Norton ATC continued to provide a surveillance service to aircraft operating in and out of the airports, and that clearances to join the airways system would continue to be facilitated.

The base level of the CAS would need to be no lower than 5,000 ft to minimise impacts to glider operations. In the proposed airspace design, CTA 9 (Figure 8) base level is 5,000 ft.

6.5.3 Extension of Airspace South of RAF Brize Norton

RAF Fairford and Redlands Airfield would be the most directly affected by an extension of RAF Brize Norton Class D airspace to the south. RAF Fairford expressed no concerns regarding additional airspace as their aircraft already receive a good level of service from RAF Brize Norton. The operators of Redlands Airfield had no major concerns as they considered the requirement to have their aircraft under the control of RAF Brize Norton, potentially within the protection of CAS, to be advantageous.

The base of the airspace would need to be no lower than 5,000 ft to minimise impacts to glider operations. It was not possible to contain the procedures within airspace to the south of RAF Brize Norton with a base level of 5,000ft. There is a stepped base ranging from 1,800 ft to 4,500 ft as depicted within Figure 8.

RAF Benson expressed concern that they may not be able to utilise the existing CD route following a successful ACP. There are no plans to alter this route as it allows aircraft to fly VFR through the airspace. The only potential change for the future may be that the pilot may be transferred to a controller at London Oxford Airport.

6.5.4 Extension of Airspace East of RAF Brize Norton

Extending the current RAF Brize Norton CTR to the east requires extensive agreements with London Oxford Airport and perhaps produces the greatest impact on other airspace users. The route between Abingdon and Bicester is currently very popular with GA pilots, and a funnelling effect already exists between the current Brize Norton CTR and the RAF Benson Military Air Traffic Zone. Extending the Brize Norton airspace east would potentially increase that funnelling.

6.6 Effects on the Wider GA Community

During preparation for consultation a number of meetings were held with key aviation stakeholders in order to understand their views on the proposed changes to procedures and airspace at LOA and BZN. The following meetings were held to invite comment on the impacts of the proposed changes:

- Oxfordshire AIAA 6th July 2017.
- BGA 15th August 2017.
- BMAA 15th August 2017.
- GAA 28th September 2017.

The issues raised were often the same across these groups and the comments relevant to the RAF Brize Norton ACP are summarised in the table below.

No	Points Raised or Discussed
1.	There appears to be no flight safety basis for the ACP.
2.	There has been no increase in the numbers of aircraft in the local area and so the risk has not changed.
3.	Introduction of Class D airspace will reduce the flexibility of local flying routes and profiles.
4.	Frequency availability and controller capacity will limit the aircraft numbers in the area.
5.	A large volume of airspace will be unavailable to non-radio equipped aircraft.
6.	Lack of certainty regarding timely clearances will encourage aircraft to route around airspace through choke points adding environmental dis-benefits.
7.	Appreciation of the requirement to solve historic confliction issues between LOA and BZN.
8.	Proposals are a threat to gliding operations in the South of England.
9.	The proposed airspace would transfer risk of an incident to the GA community.
10.	The majority of GA traffic will avoid controlled airspace rather than request access – this would funnel traffic into known choke points.

Table 3 Details of Comments and Feedback Raised During Stakeholder Engagement

6.7 Mitigation Measures

The initial stakeholder engagement meetings conducted with aviation stakeholders to discuss the airspace concept, raised a few concerns. The measures that RAF Brize Norton has developed to reduce the impact of these issues, as far as practicable, are described below.

6.7.1 General Measures to Reduce Volume of Airspace

The original requirement provided to the flight procedure designers was to develop the procedures directly in line with ICAO PANS-OPS requirements. In accordance with the CAA Controlled Airspace Containment Policy Statement [Reference 2], which states:

"The lateral dimensions of Terminal CTAs associated with CTRs (as opposed to en-route CTAs) are to be sufficient to permit the effective integration of flights to and from any adjoining route structure where appropriate or the containment of published terminal, holding and instrument approach procedures where necessary. Containment of such procedures should in the first instance be predicated upon primary obstacle clearance areas used in the design. Where competing airspace requirements preclude containment by primary area, containment of the nominal track defined by the procedure may be less than that afforded by the primary area but shall normally not be less than 3NMs from the edge of CAS. In exceptional circumstances, proposals for procedures resulting in less than 3NMs may be acceptable, but such proposals must be completely justified and supported by a safety case."

These differences were assessed to ensure that military aircraft and the nature of their operations would safely support their use, and were subsequently adopted and supported by the safety analysis.

6.7.2 Reduction of Funnelling Effect Between RAF Brize Norton and RAF Benson

Whilst one of the main areas of safety concern is to the east of the Airport, where aircraft position for final approach to Runway 25, RAF Brize Norton has always remained conscious of the enhanced funnelling effect that any extension of airspace to the east may have for GA aircraft. In developing the new procedures for use in conjunction with London Oxford Airport operations, the need to minimise additional airspace in this area was uppermost within the design requirements.

In order to reduce the RAF Brize Norton airspace requirements to the east whilst deconflicting as far as possible with the approach procedures for London Oxford Airport, shorter feed-ins for Runway 25 arrivals have been devised. By shortening the final approach, a wider turn must be accommodated, thus requiring some extension of airspace to the southeast. The proposed southern boundary of the CTR is therefore moved slightly to the south of its current position within the vicinity of Abingdon, and slightly to the east towards Oxford. The increase in volume is deliberately small to try to minimise disruption to GA traffic. In order to accommodate the wider procedures and provide the protection that is required, CTAs have been added, with base levels of 2,000 ft and 2,300 ft above mean sea level (amsl) in order to allow GA to fly beneath (elevation is approximately 230 ft and 350 ft respectively beneath these CTAs).

Analysis of GA traffic has shown that the majority of aircraft route between Didcot and Bicester or Abingdon and Bicester. The proposed CTR would not affect these routes, but the new CTAs are on these routes. This means that pilots can elect to either fly at a lower altitude in order to remain below the controlled airspace, or alternatively, if the aircraft is equipped with a radio, the pilot could request permission from RAF Brize Norton controllers to transit the Controlled Airspace.

6.7.3 Airspace Access for Other Airspace Users

RAF Brize Norton is fully committed to providing services to aircraft that wish to cross its airspace. Unlike most civil airports, RAF Brize Norton employs an air traffic controller specifically to provide a Lower Airspace Radar Service (LARS) daily between the hours of 0900 and 1700 (L) **and** a controller to provide a Zone crossing service available 24 hrs a day. Although LARS provision can become stretched at times, RAF Brize Norton will always provide a Zone crossing service. Whilst no guarantee can be given that aircraft will achieve the requested crossing route and/or level, RAF Brize Norton has no record of any refusals of access to CAS; any clearance will of course depend on the prevailing traffic situation. If the ACP is successful, the RAF Brize Norton Guide to Transiting Through and Around Controlled Airspace will be updated to provide appropriate guidance on the most appropriate areas and/or levels to successfully achieve a CTA/CTR crossing. Furthermore, RAF Brize Norton will update any existing Letters of Agreement, to assist with access arrangements with adjacent local aerodromes.

6.8 Where Can I Find Out More Information About the LOA ACP?

Although intricately linked with the operations at RAF Brize Norton, the LOA ACP is a separately managed proposal. For information specifically regarding the LOA ACP, please refer to the LOA website and follow the link at:

http://www.oxfordairport.co.uk.

7 Who is Being Consulted and How Can I Participate?

Our aim in this consultation is to reach as many people as possible that may be affected by our proposal and to make it simple for those affected to provide their views and opinions of any potential impacts.

7.1 Who is Being Consulted?

It is RAF Brize Norton's aim to consult as many potentially affected stakeholders as possible. A full list of the individual organisations being contacted directly is provided at Annex A2. We intend to make the consultation document available to other stakeholders through the RAF Brize Norton website (advertised through local media), public meetings and hard copy by post, on request.

7.2 How Do I Submit my Response?

There are several ways to submit your response:

- Through a dedicated email address;
- By post;
- During public meetings.

7.2.1 Email

Osprey Consulting Services Limited (Osprey) are supporting RAF Brize Norton to deliver the Airspace Change. They have created a dedicated email address for responses, as follows:

rafbrizenortonconsultation@ospreycsl.co.uk

Please entitle your email RAF Brize Norton Consultation Response.

7.2.2 Post

Please send your responses to:

RAF Brize Norton Consultation Response
Osprey Consulting Services Ltd
Suite 10, The Hub
Fowler Avenue,
Farnborough Business Park,
Farnborough
GU14 7JP

7.2.3 Public Consultation Events

RAF Brize Norton will hold a series of public consultation events to present information on the proposals. The submission of written feedback during these

meetings would be welcome. Details of exact locations and times will be published on the RAF Brize Norton website.

7.3 What Do I Need to Include in My Response?

We welcome any comments that you have to make on the proposals, both positive and negative. We would also like to know if you have read the consultation material, but have no comments to make; we need to be sure that we have reached a representative proportion of consultees.

7.4 What Will Happen to My Response?

We will treat all responses confidentially; details of respondents will be passed only to our consultants Osprey, and to both the Military and Civil Aviation Authorities. These authorities require a full report on the consultation process and its results, together with copies of responses from all key stakeholders as part of the formal Airspace Change Proposal submission.

We will record, collate and analyse all responses in order to identify any key issues and themes that emerge from the consultation process. An assessment will be made to determine if the proposal can be modified to take these issues into account.

7.5 How Will I Know the Results of the Consultation?

We will collate the results of the Consultation within a Feedback Report. We intend to publish the Feedback Report on the RAF Brize Norton website within one month of the closure date of the Consultation Period. An overwhelming level of responses may lead to a slight delay in publication.

7.6 Deadline for Responses

This Consultation will close at 5pm on **22nd March 2018** and we request that all responses are submitted by that date.

8 Why Consult?

RAF Brize Norton is seeking to change the design of the surrounding airspace. Any change must be balanced against the needs of other airspace users and in order to achieve that balance, we need to know your views.

8.1 Overview

In 2011, RAF Brize Norton commissioned a study to identify how the Station might reduce the risk to aircraft operations to As Low As Reasonably Practicable (ALARP). A risk is ALARP when it has demonstrated that the cost of any further risk reduction (where the cost includes the loss of Defence capability as well as financial or other resource costs) is grossly disproportionate to the benefit obtained from that risk reduction. The study showed that the current level of risk is not ALARP and the main areas of concern are focussed on:

- The risk of collision between aircraft leaving Controlled Airspace (when positioning for final approach) and aircraft operating autonomously outside of Controlled Airspace.
- The risk of collision between RAF Brize Norton aircraft during the transit between the RAF Brize Norton Class D airspace and the airways structure, and aircraft operating autonomously outside of Controlled Airspace.

The reduction of the risk to RAF Brize Norton aircraft has to be balanced against the needs of other airspace users. Whilst every care has been taken to achieve this balance, we understand that there may be aspects that we are not aware of. Therefore, we are actively seeking the views of those people that may be affected, in order to ensure that we have a full understanding of the potential implications of the proposed changes. The aim is to minimise any adverse impacts where possible.

8.2 Consultation Requirements and Legislation

In developing this Airspace Change Proposal, RAF Brize Norton is following a detailed process laid down by the Civil Aviation Authority (CAA) within CAP 725 *CAA Guidance on the Application of the Airspace Change Process* [Reference 1]. Stage 4 of that process requires the Airport to consult widely, allowing a minimum of 12 weeks for written consultation. Feedback from this consultation will inform the final airspace design submitted to the CAA for approval.

In determining whether the proposal should be approved, the CAA must also follow legislation and guidance set by the Government, through the DfT. Its principal functions and duties are set out in primary legislation within the Civil Aviation Act 1982, the Airports Act 1986, the Transport Act 2000 and the Civil Aviation Act 2012[16]. In exercising its air navigation functions, the CAA must give priority to maintaining a high standard of safety in the provision of air traffic services in

[16] https://www.caa.co.uk/Our-work/Corporate-reports/Strategic-Plan/Our-statutory-duties/ [Accessed 29th August 2017].

accordance with those statutory duties, particularly concerning Section 70(1) of the Transport Act 2000. This requires the CAA to:

- Secure the most efficient use of airspace consistent with the safe operation of aircraft and the expeditious flow of air traffic.
- Satisfy the requirements of operators and owners of all classes of aircraft.
- Take account of any guidance on environmental objectives.
- Facilitate the integrated operation of air traffic services provided by or on behalf of the armed forces of the Crown.

In addition, the CAA will also consider Government policies on the future development of air transport.

In order for the CAA to make an informed, evidence-based decision concerning the RAF Brize Norton proposal, it is essential that the views of those who may be affected are fully considered.

8.3 Consultation Process Concerns

The CAA's Safety and Airspace Regulation Group will oversee this consultation to ensure that RAF Brize Norton adheres to government guidelines and the process detailed within CAP 725. Should you have any complaints regarding our adherence to the consultation process, they should be referred to:

Airspace Regulator (Coordination)
Airspace, ATM and Aerodromes
Safety and Airspace Regulation Group
CAA House
45-59 Kingsway
London
WC2B 6TE

Email: airspace.policy@caa.co.uk

Please note that you should not use these contact details to respond to the consultation itself. These contact details should **only** be used to submit a complaint about **non-adherence to the consultation process.**

Responses to the consultation content (the proposed airspace) should be sent to the RAF Brize Norton Consultation, Osprey Consulting Services Ltd; details for how to do so are provided within Section 7.

9 What Happens Next?

9.1 Overview

Once the consultation process closes, we will analyse the responses and produce a Consultation Feedback Report. Consideration will be made to the consultation responses whilst finalising the Proposal Document that will be submitted to the CAA. The finalised Consultation Report will be available to the public on the RAF Brize Norton website.

The final proposal and consultation feedback report will be submitted to the CAA together with the supporting safety assessments that are required to demonstrate that the changes will be safe.

9.2 CAA Actions

The CAA will use a team of experts to scrutinise the documentation that RAF Brize Norton submits throughout a period that is likely to last at least 17 weeks. We will remain responsive throughout this period by submitting further supporting documentation upon request in order to provide any further evidence required by the CAA. Once the CAA has concluded this process RAF Brize Norton will be informed and the CAA will publish its decision on the CAA website.

10 References

Reference	Name	Origin
1	CAP 725 Airspace Change Process Guidance Document Issue 4.1 dated 15 March 2016	CAA
2	Controlled Airspace Containment Policy Dated 17 January 2014 https://publicapps.caa.co.uk/docs/33/20140117ContainmentPolicyFinal.pdf	CAA
3	CAA Policy Statement *Flight Outside Controlled Airspace*[17] Issue 1	CAA
4	CAP 493 Manual of Air Traffic Services – Part 1 Sixth Edition, Amendment 1, Corrigendum, 2 April 2015 http://publicapps.caa.co.uk/docs/33/CAP493%20Edition%206%20Amendment%201%20Corrigendum%20(April%202015).pdf	CAA
5	Policy for Radio Mandatory Zones and Transponder Mandatory Zones Dated 14 August 2015 https://publicapps.caa.co.uk/docs/33/20150814PolicyStatementRMZAndTMZ.pdf	CAA
6	CAP 393 The Air Navigation Order 2016 and Regulations Fifth edition Amendment 2 19th June 2017 https://publicapps.caa.co.uk/docs/33/CAP393Ed5Am2_JUN2017_BOOKMARK(e).PDF	CAA

Table 4 Table of References

[17]CAA Policy Statement Flight Outside Controlled Airspace has since been withdrawn, but CAP 493 [Reference 4] Section 1, Chapter 6, 1B.2(5), Chapter 11, 5, and Chapter 12, 1B are also applicable.

A1 Glossary of Terms

A1.1 Organisationsal Terms

Abbreviation	Term	Comment
AR	Airspace Regulation	The section of the CAA that is responsible for the regulation of changes to UK airspace and airspace agreements.
ATCO	Air Traffic Control Officer	An air traffic controller suitably qualified and experienced to provide air traffic services to aircraft when requested or mandated.
ATZ	Air Traffic Zone	Airspace of defined dimensions established around an aerodrome for the protection of aerodrome traffic.
CAA	Civil Aviation Authority	A specialist body appointed by the Government to regulate and oversee all aviation activities within the UK. The CAA has the responsibility to develop and monitor airspace to provide for safe and sustainable usage.
CAS	Controlled Airspace	Airspace of defined dimensions within which ATC services are provided. The level of control varies with different classes of airspace. Controlled airspace usually imposes higher weather minimums than are applicable in uncontrolled airspace. It is the opposite of uncontrolled airspace.
CTA	Control Area	A volume of airspace within defined lateral boundaries that extends from a specified limit above the surface to a specified upper limit.
CTR	Control Zone	A volume of airspace within defined lateral boundaries that extends from the surface to a specified upper limit.
DAATM	Defence Airspace and Air Traffic Management	A MoD organisation tasked with the role to monitor and influence international and domestic Air Traffic Management issues, anticipating the risks and opportunities arising from these issues and identifying and coordinating a common Defence response.

Abbreviation	Term	Comment
DA	Danger Area	Airspace of defined dimensions within which activities dangerous to the flight of aircraft may exist at specified times (ICAO Annex 11: Air Traffic Services) Most danger areas are operated by military authorities.
EUROCONTROL	European Organisation for the Safety of Air Navigation	An intergovernmental organisation consisting of 39 member states. EUROCONTROL seeks to support its member states in achieving safe, efficient and environmentally-friendly aviation operations throughout Europe, through the harmonisation of air navigation services for both civil and military operators.
FAA	Federal Aviation Administration	The United States equivalent of the CAA; a national authority with powers to regulate all aspects of civil aviation.
FAF	Final Approach Fix	A specified point on a non-precision instrument approach which identifies the commencement of the final segment.
IAF	Initial Approach Fix	The point where the initial approach segment of an instrument approach begins.
IF	Intermediate Fix	A point between the IAF and FAF.
GA	General Aviation	Civil aviation other than large-scale passenger or freight operations.
GNSS	Global Navigation Satellite System	The standard generic term for satellite navigation systems that provide autonomous geo-spatial positioning with global coverage.
GPS	Global Positioning System	A "constellation" of approximately 30 well-spaced satellites that orbit the Earth and make it possible for people with ground receivers to pinpoint their geographic location. The location accuracy is anywhere from 100 to 10 meters for most equipment.
IAP	Instrument Approach Procedure	A series of predetermined manoeuvres by reference to flight instruments, with specified protection from obstacles, from a specified point to a point from which a landing can be completed and thereafter, if a landing is not completed, to a position at which holding or other obstacle clearance criteria apply.

Abbreviation	Term	Comment
ICAO	International Civil Aviation Organization	A specialized agency of the United Nations. It codifies the principles and techniques of international air navigation and fosters the planning and development of international air transport to ensure safe and orderly growth
IFR	Instrument Flight Rules	One of two sets of regulations governing all aspects of civil aviation aircraft operations; the other is visual flight rules (VFR). It is also a term used by pilots and controllers to indicate the type of flight plan an aircraft is flying, such as an IFR or VFR flight plan
MAA	Military Aviation Authority	Regulator for Military Aerodromes within the UK and overseas.
MAP	Missed Approach Procedure	A procedure followed by a pilot when an instrument approach cannot be completed to a full-stop landing. The missed approach procedure normally includes an initial heading or track to follow, and altitude to climb to, typically followed by holding instructions at a nearby navigation fix.
MEDA	Military Emergency Diversion Aerodrome	The only designated military aerodrome to accept at short notice any military aircraft suffering an emergency.
NDB	A non-directional (radio) beacon	A radio transmitter at a known location, used as an aviation or marine navigational aid.
PSR	Primary Surveillance Radar	A conventional radar sensor that illuminates a large portion of space with an electromagnetic wave and receives back the reflected waves from targets within that space.
RMZ	Radio Mandatory Zone	A volume of airspace of defined dimensions wherein the carriage and operation of radio equipment is mandatory
RNAV	Area Navigation	A method of navigation which permits the operation of an aircraft on any desired flight path; it allows its position to be continuously determined wherever it is rather than only along track
SSR	Secondary Surveillance Radar	A radar system used in air traffic control (ATC), that not only detects and measures the position of aircraft i.e. bearing, but also

Abbreviation	Term	Comment
		requests additional information from the aircraft itself such as its identity and altitude.
TMZ	Transponder Mandatory Zone	A volume of airspace of defined dimensions wherein the carriage and operation of transponder equipment is mandatory
UK IAIP	United Kingdom Integrated Aeronautical Information Publication	This is static information, updated every 28 days, which contains information of lasting (permanent) character essential to air navigation.
VFR	Visual Flight Rules	A set of regulations under which a pilot operates an aircraft in weather conditions generally clear enough to allow the pilot to see where the aircraft is going. It is also a term used by pilots and controllers to indicate the type of flight plan an aircraft is flying, such as an IFR or VFR flight plan

A2 Stakeholders

A2.1 Aviation Consultees

A2.1.1 Civial Aviation Authority (CAA)

The CAA is being consulted at various stages of the proposal, in line with requirements of the process we are required to follow.

A2.1.2 National Aviation Organisations

The following will be contacted through National Air Traffic Management Advisory Committee (NATMAC) in accordance with advice from the regulator.

Consultee	Also known As
Aircraft Owners and Pilots Association	AOPA UK
Airport Operators Association	AOA
Aviation Division Navy Command Headquarters	NCHQ
All Party Parliamentary Group for GA	APPG
Aviation Environment Federation	AEF
British Air Transport Association	BATA
British Airline Pilots' Association	BALPA
British Airports Association	BAA
British Airways	BA
British Association of Balloon Operators	BABO
British Balloon and Airship Club	BBAC
British Business and General Aviation Association	BBGA
British Gliding Association	BGA
British Hang Gliding and Paragliding Association	BHPA
British Helicopter Association	BHA
British Microlight Aircraft Association	BMAA
British Model Flying Association	BMFA

Consultee	Also known As
British Parachute Association	BPA
Civil Aviation Authority	CAA SRG
Defence Airspace and Air Traffic Management (including (MUAWG)	DAATM
Euro UAV Systems Centre Ltd	
European Low Fares Airline Association	ELFAA
General Aviation Alliance	GAA
General Aviation Safety Council	GASCo
Guild of Air Pilots and Air Navigators	GAPAN
Guild of Air Traffic Control Officers	GATCO
Headquarters Director Army Aviation	HQ DAAvn
Heavy Airlines	
Helicopter Club of Great Britain	HCGB
Light Aircraft Association	LAA
Light Airlines	
Low Fares Airlines	
Military Aviation Authority	MAA
Military Aviation Users Working Group	MAUWG
Ministry of Defence	MoD
MoD Flight Test Regulator	
NATS (NSL)	NSL
NATS En-Route Ltd	NERL
PPL/IR Europe	PPL/IR
The British Business and General Aviation Association	BBGA
UK Airprox Board	UKAB
UK Flight Safety Committee	UKFSC
3 AF-UK/A3	

A2.2 Aerodromes/Local Aviation Consultees

Consultee	Also Known As	Point of Contact
London Oxford Airport	Kidlington, EGTK	ATSM Ms A Evans
Dalton Barracks, Abingdon		MAUWG
637 VGS, Little Rissington		Wg Cdr Hobson
RAF Benson (Elementary Flying Training Squadron (EFTS), Air Experience Flight (AEF) and Support Helicopters (SH))		DAATM
Aston Down Airfield	Cotswold Gliding Club	Aston Down Airfield, Cowcombe Lane, Chalford, GL6 8HR.
Gloucestershire Airport Limited	EGBJ	Staverton, Cheltenham, Gloucestershire GL51 6SR (01452 857700)
Husbands Bosworth Glider Site	The Gliding Centre	Husbands Bosworth Airfield, Lutterworth, Leicestershire, LE17 6JJ
Cotswold Airport	Kemble, EGBP	Nick Howard, Ops Director / Airport Manager. The Control Tower, Kemble Airfield, Cirencester, GL7 6BA.
Enstone Airfield		Enstone Flyign Club; Oxfordshire Sport Flying; Pegasus Flight Training Microlights
Lasham – Glider Site and 2Excel Aviation Ltd		2Excel Aviation Ltd, Lasham – Chris Norton, Accountable Manager Lasham Airfield, Lasham, Hampshire, GU34 5SP
Nympsfield Glider Site	Bristol & Gloucester Gliding Club	Nympsfield, Stonehouse, Gloucestershire GL10 3TX
Oaklands		Robert Stobe, Operator (01993 891226)
Redlands Airfield		Joe and Sarah Smith

		Redlands Airfield Ltd, Redlands Farm, Wanborough, Swindon SN4 0AA (01793 791014)
Rendcomb Airfield		Aerosuperbatics The Engine Shed, RFC Rendcomb Airfield, The Whiteway, Cirencester, Gloucestershire, GL7 7DF,
South Cerney	Silver Stars RLC Parachute Team	RLC Silver Stars, Duke of Gloucester Barracks, South Cerney, Gloucestershire GL7 5RD info@silver-stars.co.uk 07749 134849
Wellesbourne Airfield	Take Flight Aviation Ltd, EGBW	Take Flight House, Wellesbourne Mountford Airfield, Wellesbourne, Warickshire CV35 9EU (01789 470424)
Weston-on-the-Green		Parachuting and Gliding Clubs.
Bicester Gliding Centre	Windrushers Gliding Club	Roger Wilson, Chairman Bicester Airfield, Skimmingdish Lane Bicester, Oxfordshire, OX26 5HA.

A2.3 Non-Aviation Consultees: National Bodies

Consultee	Point of Contact
Campaign to Protect Rural England	Helen Marshall, Oxfordshire Director Oxfordshire Branch, Unit 1, London Road, Wheatley, Oxfordshire, OX33 1JH
Friends of the Earth	Friends of the Earth, 26-28 Underwood Street, London, N1 7JQ.
National Trust	yne.customerenquiries@nationaltrust.org.uk Buckinghamshire and Oxfordshire Region 20 Grosvenor Gardens, London, SW1W 0DH

Consultee	Point of Contact
Natural England	Consultations@naturalengland.org.uk Natural England, Consultation Service Hornbeam House, Electra Way, Crewe Business park, Crewe, CW1 6GJ
UK Association of National Park Authorities	126 Bute Street, Cardiff Bay, Cardiff, CF10 5LE.
UK National Commission for UNESCO	https://www.unesco.org.uk/contact-us/

A2.4 Information Organisations: Regional Council Authorities

Consultee	Point of Contact
Oxford City Council	Council Leader: Bob Price Deputy Leader: Ed Turner
South Oxfordshire District Council	Council Leader: John Cotton Chairman: Jeannette Matelot
Gloucestershire County Council	Council Leader: Mark Hawthorne Deputy Leader: Ray Theodoulou
Swindon Borough Council	Council Leader: David Renard Deputy Leader: Russell Holland

A2.5 Information Organisations: Council Wards/Local Authorities

Oxford City Council

Consultee	Point of Contact
Barton and Sandhills	Mark Ladbrooke, Mike Rowley
Blackbird Leys	Rae Humberstone, Linda Smith
Carfax	Ruthi Brandt, Alex Hollingsworth
Churchill	Susan Brown, Mark Lygo
Cowley	David Henwood, Christine Simm
Cowley Marsh	Mohammed Abbasi, Sajjad Malik
Headington	Mohammed Altaf-Khan, Ruth Wilkinson

Consultee	Point of Contact
Headington Hill and Northway	Farida Anwar, Nigel Chapman
Hinksey Park	Bob Price, Marie Tidball
Holywell	Dan Iley-Williamson, David Thomas
Iffley Fields	Steven Curran, Richard Tarver
Jericho and Osney	Colin Cook, Susanna Pressel
Littlemore	Gill Sanders, John Tanner
Lye Valley	Pat Kennedy, Ben Lloyd-Shogbesan
Marston	Mary Clarkson, Mick Haines
North	James Fry, Louise Upton
Northfield Brook	Jennifer Pegg, Sian Taylor
Quarry and Risinghurst	Chewe Munkonge, Dee Sinclair
Rose Hill and Iffley	Michele Paule, Ed Turner
St. Clement's	Jamila Begum Azad, Tom Hayes
St. Margaret's	Tom Landell Mill, Elizabeth Wade
St. Mary's	Craig Simmons, Dick Wolff
Summertown	Jean Fooks, Andrew Gant
Wolvercote	Stephen Goddard, Angie Goff

South Oxfordshire District Council

Consultee	Point of Contact
Benson and Crowmarsh	Felix Bloomfield, Richard Pullen
Berinsfield	John Cotton
Chalgrove	David Turner
Chinnor	Lynn Lloyd, Ian White
Cholsey	Pat Dawe, Jane Murphy
Didcot South	Anthony Dearlove, Mocky Khan, Anthony Nash

Consultee	Point of Contact
Didcot West	Ian Snowdon, Alan Thompson
Forest Hill and Holton	John Walsh
Garsington and Horspath	Elizabeth Gillespie
Goring	Kevin Bulmer
Haseley Brook	Caroline Newton
Henley-on-Thames	Joan Bland, Stefan Gawrysiak, Lorraine Hillier
Kidmore End and Whitchurch	Robert Simister
Sandford and the Wittenhams	Sue Lawson
Sonning Common	Will Hall, Paul Harrison
Thame	Nigel Champken-Woods, David Dodds, Jeannette Matelot
Wallingford	Elaine Hornsby, Imran Lokhon
Watlington	Anna Badcock
Wheatley	Tony Newman
Woodcote and Rotherfield	Charles Bailey, David Nimmo-Smith

Gloucestershire County Council

Consultee	Point of Contact
Cheltenham	
All Saints and Oakley	Colin Hay
Battledown and Charlton Kings	Matt Babbage
Benhall and Up Hatherley	Simon Wheeler
Charlton Park and College	Klara Sudbury
Hesters Way and Springbank	Suzanne Williams
Lansdown and Park	Tim Harman
Leckhampton and Warden Hill	Iain Dobie
Pittville and Prestbury	John Payne

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St Mark's and St Peter's	Chris Coleman
St Paul's and Swindon	Bernard Fisher
Cotswold	
Bourton-on-the-Water and Northleach	Paul Hodgkinson
Campden Vale	Lynden Stowe
Cirencester Beeches	Nigel Robbins OBE
Cirencester Park	Joe Harris
Fairford and Lechlade on Thames	Ray Theodoulou
South Cerney	Shaun Parsons
Stow-on-the-Wold	Nigel Moor FRTPI FRSA
Tetbury	Stephen Hirst
Forest of Dean	
Blakeney and Bream	Richard Boyles
Cinderford	Graham Morgan
Coleford	Carole Allaway Martin
Drybrook and Lydbrook	Terry Hale
Lydney	Alan Preest
Mitcheldean	Brian Robinson
Newent	Will Windsor-Clive
Sedbury	Patrick Molyneux
Gloucester	
Abbey	Andrew Gravells
Barnwood and Hucclecote	David Brown
Barton and Tredworth	Sajid Patel
Coney Hill and Matson	Kate Haigh
Grange and Kingsway	Dave Norman MBE

Consultee	Point of Contact
Hempsted and Westgate	Pam Tracey MBE
Kingsholm and Wotton	Jeremy Hilton
Longlevens	Kathy Williams
Quedgeley	Mark Hawthorne MBE
Tuffley	Dr Andrew Miller
Stroud	
Bisley and Painswick	Keith Rippington
Cam Valley	Brian Tipper
Dursley	Lorraine Vivenne Patrick
Hardwicke and Severn	Stephen Davies
Minchinhampton	Rachel Smith
Nailsworth	Steve Robinson
Rodborough	Brian Oosthuysen
Stonehouse	Lesley Williams MBE
Stroud Central	Eva Ward
Wotton-under-Edge	John Cordwell
Tewkesbury	
Bishop's Cleeve	Robert Bird
Brockworth	Robert Vines
Churchdown	Jack Williams
Highnam	Phil Awford
Tewkesbury	Kevin John Cromwell
Tewkesbury East	Vernon Smith
Winchcombe and Woodmancote	Roger Wilson

Swindon Borough Council

Consultee	Point of Contact
Blunsdon & Highworth	Alan Bishop, Maureen Penny, Steve Weisinger
Central	Junab Ali, Bob Wright, Julie Wright
Chiseldon & Lawn	Fionuala Foley, Eric Shaw
Covingham & Dorcan	Barbara Parry, Dale Heenan, Kevin Parry
Eastcott	Paul Dixon, Stan Pajak, David Wood
Gorsehill & Pinehurst	John Ballman, Ray Ballman, Carol Shelley
Haydon Wick	Oliver Donachie, Garry Perkins, David Renard
Liden, Eldene & Park South	Neil Heavens, Derique Montaut, Chris Watts
Lydiard & Freshbrook	Matthew Courtliff, Timothy Swinyard, Caryl Sydney-Smith
Mannington & Western	Stephanie Exell, James Robbins, Kevin Small
Old Town	Claire Ellis, Jane Milner-Barry, Nadine Watts
Penhill & Upper Stratton	Mark Dempsey, Teresa Page, Joe Tray
Priory Vale	Malcolm Davies, Toby Elliott, Emma Faramarzi
Ridgeway	Gary Sumner
Rodbourne Cheney	Jim Grant, Des Moffatt, Peter Watts
Shaw	Mary Martin, Nick Martin, Keith Williams
St Andrews	Mary Friend, Gemma McCracken, Vera Tomlinson
St Margaret & South Marston	John Haines, Russell Holland, Colin Lovell
Walcot & Park North	Steve Allsopp, Abdul Amin, Emma Bushell
Wroughton & Wichelstowe	Wayne Crabbe, Brian Ford, Cathy Martin

A2.6 Information Organisations: Members of Parliament

Consultee	Constituency
Robert Courts MP	Witney

Consultee	Constituency
Geoffrey Clifton-Brown MP	Cotswold
Justin Tomlinson MP	North Swindon
Laurence Robertson MP	Tewkesbury
Mark Harper MP	Forest of Dean
Alex Chalk MP	Cheltenham
Dr David Drew MP	Stroud
Layla Moran MP	Oxford West and Abingdon
Richard Graham MP	Gloucester
Robert Buckland QC MP	South Swindon
Anneliese Dodds MP	Oxford East

A2.7 Information Organisations: Civil Aviation Authority

Consultee	Also known As
Safety and Airspace Regulation Group	SARG
Safety and Airspace Regulation Group Head of Aerodrome & Air Traffic Standards Division	SARG Hd AATSD
Safety and Airspace Regulation Group Flight Ops Division	SARG Flight Ops Division
Safety and Airspace Regulation Head of Airspace Regulation	SARG Hd AR

A3 Aircraft Caused to Deviate from Published Arrival or Departure Procedures

This table is as complete as possible; however, it should be noted that there have been occasions where controllers have not been able to log aircraft that depart from the arrival or departure procedure due to workload. This is in addition to the information contained within the graph at Figure 2.

Date	Callsign	Type	Arrival/Departure	Reason for Deviation	Sector 23 Join Agreement
18 Feb 16	DIPCC	C25A	MALBY SID	S23 issued higher level	On track MALBY FL140
18 Feb 16	RRR4030	A400	MALBY SID	S23 chg clr	Right turn FL110
22 Feb 16	RRR6602	C17	MALBY SID	7004 at NAXAT	On trk MALBY FL80
20 Feb 16	NOW335D	C130	MALBY SID	Non sqk overhead BP	On track SIREN FL80
27 Feb 16	RRR2300	A330	MALBY SID	Redlands para FL100	FL140
8 Mar 16	PLF040	C295	MALBY SID	Non sqk at BP	On track SIREN FL100
8 Mar 16	RRR4530	A400	MALBY SID	Good rate of climb	Hdg 220 FL220
9 Mar 16	RRR2144	A330	MALBY SID	Good rate of climb	Hdg 240 FL160
15 Mar 16	RRR2152	A330	MALBY SID	Good rate of climb	Fl 110
18 Mar 16	RRR2108	A330	MALBY SID	Non sqk at BP	FLL110 SIREN

Date	Callsign	Type	Arrival/Departure	Reason for Deviation	Sector 23 Join Agreement
25 Mar 16	RRR2146	A330	MALBY SID	Non sqk at MALBY	FL120 SIREN
25 Mar 16	RRR6690	C17	MALBY SID	LOA traffic to affect	MALBY FL110
30 Mar 16	RRR2310	A330	MALBY SID	Non sqk at BP	Early left turn
30 Mar 16	RRR4524	A400	MALBY SID	Good rate of climb	FL120
31 Mar 16	RRR4528	A400	MALBY SID	Multiply primary contacts at BP	MIMBI FL120
2 Apr 16	RRR4000	A400	MALBY SID	Non sqk N of MALBY	DCT BCN FL110
3 Apr 16	RRR2320	A330	MALBY SID	Non sqk Sof NAXAT	MALBY FL150
8 Apr 16	RRR6204	C17	MALBY SID	Redlands at FL110	MALBY FL120
11 Apr 16	RRR5980	C130	MALBY SID	Good rate of climb	MALBY FL110
13 Apr 16	PEGAN	B757	MALBY SID	Non sqk N of MALBY	MALBY FL120
17 Apr 16	RRR2320	A330	MALBY SID	Traffic N MALBY	MALBY FL120
17 Apr 16	RRR6412	C17	MALBY SID	Non sqk at BP	SIREN FL110
18 Apr 16	RRR2784	A330	MALBY SID	Non sqk at BP	MALBY FL110
20 Apr 16	RRR2858	A330	MALBY SID	Non sqk at BP	MALBY FL120
22 Apr 16	CKS506	B747	MALBY SID	Non sqk at NAXAT	DCT MALBY
23 Apr 16	RRR2300	A330	MALBY SID	Multiple tracks at BP	FL100 KENET

Date	Callsign	Type	Arrival/Departure	Reason for Deviation	Sector 23 Join Agreement
25 Apr 16	RRR2722	A330	MALBY SID	Non sqk 3nm Nof NAXAT	DCT MALBY
27 Apr 16	RRR6602	C17	MALBY SID	Non sqk NAXAT	DCT MALBY
28 Apr 16	RRR6442	C17	MALBY SID	Clutter in NAXAT area	Std join
1 May 16	RRR5617	C130	MALBY SID	Non sqk NAXAT	DCT MALBY
8 May 16	RRR2320	A330	MALBY SID	Non sqk at BP	MALBY FL150
15 May 16	RRR6600	C17	MALBY SID	Non sqk at BP	MALBY FL140
16 May 16	IRL253	CN35	MALBY SID	Non sqk contacts outside CTR	Climb in OH and DCT SIREN at FL80
18 May 16	RRR2310	A330	MALBY SID	Traffic at BP	SIREN FL110
19 May 16	RRR2122	A330	MALBY SID	Traffic at NAXAT	Hdg 180 SIREN
25 May 16	KRH32	E35L	MALBY SID	Non sqk at BP	SIREN FL80
26 May 16	RRR6682	C17	MALBY SID	Non sqk at BP	MALBY FL110
7 Jun 16	RRR2310	A330	MALBY SID	Non sqk at BP	MALBY FL110
12 Jun 16	RRR2320	A330	MALBY SID	Wx	Hdg 275
19 Jun 16	RRR1628	C17	MALBY SID	Non sqk at BP	MALBY FL180
20 Jun 16	PLF251	C130	MALBY SID	Non sqk at BP	
24 Jun 16	RR6362	C17	MALBY SID	Multiple contacts btw BP and NAXAT	SIREN join at FL100

Date	Callsign	Type	Arrival/Departure	Reason for Deviation	Sector 23 Join Agreement
26 Jun 16	RR2719	A330	MALBY SID	Nonsqk at BP N 2nm	SIREN join at FL80
5 Jul 16	CEF879	C295	MALBY SID	Non sqk at BP	SIREN join at FL110
7 Jul 16	RR2140	A330	MALBY SID	Non sqk NW of FFD	On trk MALBY FL100 –went TS
13 Jul 16	RR4506	A400	MALBY SID	Non sqk at BP	MALBYjoin FL150
24 Jul 16	RR6600	C17	MALBY SID	Wx	SIREN FL160
28 Jul 16	Lion King 8 AMB	LJ45	MALBY SID	Non sqk at BP	SIREN join
30 Jul 16	RR2300	A330	MALBY SID	Multiple non sqk and 7000 BP	SIREN join
6 Aug 16	RR2779	A330	MALBY SID	Multiple non sqk and 7000 BP	SIREN join
18 Aug 16	RRR5018	C130	MALBY SID	Lon Ctl traffic to affect	FL120 and turn hdg 115 asap
4 Oct 16	RRR6440	C17	MALBY SID	More expeditious routing	Climb FL240 and join at BCN
2 Dec 16	RRR6628	C17	MALBY SID	DS Clutter showing in area of MALBY	Cimib FL120
28 Jan 17	TUN01	C130	MALBY SID	TK traffic working BRS at FL80	DCT MALBY FL110
28 Jan 17	RRR4610	A400	MALBY SID	Wx avoidance	OT MALBY FL80
29 Jan 17	RRR2320	A330	MALBY SID	Non Sqk at BP	DCT MALBY FL80
18 Mar 17	RRR2300	A330	MALBY SID	Non sqk at NAXAT	On track MALBY FL120

Date	Callsign	Type	Arrival/Departure	Reason for Deviation	Sector 23 Join Agreement
1 Apr 17	RRR2300	A330	MALBY SID	Non sqk south of Northleach	DCT SIREN FL80
2 Apr 17	RRR6360	C17	MALBY SID	Non sqk traffic N of MALBY	On track SIREN FL80
5 Jun 17	RRR6396	C17	MALBY SID	Wx avoidance	On track SIREN FL80
9 Jun 17	RRR6628	C17	MALBY SID	Traffic SE of NAXAT non sqk	Climb FL110
15 Jun 17	RRR4010	A400	MALBY SID	Traffic on the track	On track MALBY
6 Jul 17	RRF63	A330	MALBY SID	Non sqk at BP	On track SIREN FL80
18 Jul 17	RRR2472	A330	MALBY SID	TK ac joining at MALBY	On tarck SIREN FL120
29 Jul 17	RRR6600	C17	MALBY SID	Non sqk at BP	Hdg 180 FL130

A4 Aircraft Leaving CAS on Approach Procedure

This table is as complete as possible; however, it should be noted that there are occasions where controllers have not been able to log aircraft that depart from the arrival or departure procedure due to workload.

Date	Predominant Runway in Use	Number of Aircraft	Aircraft Types	Type of Approach	Number of Incidences with Traffic to Affect	Distance Outside CAS / NM
Feb 2016	25	12	C130, A330, A400M, C17	TAC, NDB	1	0.5 - 2
Feb 2016	07	3	C130, Hawk	TAC, TAC Hold	1	0.5 - 3
Mar 2016	07	7	A330, A440M, KC135	TAC	0	1 – 1.5
May 2016	07	9	E3D, A400, AN30	TAC, TAC Hold, NDB hold	2	0.25 - 2
Jun 2016	07	3	C130	TAC, NDB	0	1 - 2
Aug 2016	07	7	RJ10, C130, A400, A330	TAC, NDB	0	0.5 - 2
Sep 2016	07/25	6	C130, A400, C17	NDB, TAC, TAC hold	1	0.5 – 1.5
Oct 2016	07/25	6	A400, A330, C130	NDB, TAC Hold	1	0.5 – 1.5
Nov 2016	07	8	AJet, A330, A400	TAC, NDB	2	0.5 - 1
Dec 2016	25	7	C130, C17, A400	TAC, NDB	2	0.25 - 1
Jan 2017	07	3	A400, C130	TAC, NDB	0	1

Date	Predominant Runway in Use	Number of Aircraft	Aircraft Types	Type of Approach	Number of Incidences with Traffic to Affect	Distance Outside CAS / NM
Feb 2017	25	8	C130, A400, C17, A330	TAC, NDB/ILS, TAC/ILS,	4	0.5 – 2
Mar 2017	25	11	LJ45, A400, PA28, A330	NDB/ILS, NDB	4	0.5 – 1
Apr 2017	07	3	KC135, C17, A330	NDB, TAC	1	0.5 – 2
May 2017	07	4	C17, C130	TAC, NDB	1	0.25 – 2
Jun 2017	25	9	C17, RJ10, A330, C130	NDB, TAC	2	0.5 – 1
Jul 2017	25	2	A330, C17	NDB/TAC	2	0.5

A5 Reportable Safety Events

This table includes the reports filed under the Defence Aviation Safety Occurrence Report (DASOR) system.

ASOR	Mil/Civ	Data	Date	BZN Remarks
			2012	
asor\Brize Norton - RAF\ATC - BZN\\12\13844	**AIRPROX** - Mil vs Mil	AIRPROX - Vigilant vs Tutor (ivo Abingdon) [UKAB 2012030 Risk C]	10 March 2012	HF - Both late visual
asor\Brize Norton - RAF\ATC - BZN\\12\18205	**AIRPROX** - GA vs GA	AIRPROX - GA vs GA (4nm NNW of Ox) [UKAB 2012142 Risk C]	09 September 2012	BZN TS / Oxford Proc control; Gulfstream Ac above, descended through level (0', 1.5nm Horiz)
			2013	
asor\Brize Norton - RAF\ATC - BZN\A109\13\5396	**AIRPROX -** Mil vs GA	UKAB 2013043 - Airprox - A109 v Civ A109	29 May 2013	Civ A109 on BS whilst VMC
asor\Brize Norton - RAF\ATC - BZN\\13\7246	**AIRPROX** - Mil vs GA	UKAB 2013109 - Airprox - Hercules v PA28 (1800')	07 August 2013	500' coordinated above, TCAS RA down given (250' and 250m)

ASOR	Mil/Civ	Data	Date	BZN Remarks
asor\Brize Norton - RAF\ATC - BZN\Merlin\13\7317	**AIRPROX** - Mil vs Mil	UKAB 2013107 - Airprox - Merlin v Tornado	09 August 2013	Tornado descending from Dav Corridor vs Merlin @ FL50
asor\Brize Norton - RAF\ATC - BZN\\13\9213	**AIRPROX** - GA vs GA	UKAB 2013137 Vigilant vs GA (1000' @ Northleach Roundabout) (100' x 400m)	22 September 2013	Class G see and avoid clear of Little Rissington
asor\Brize Norton - RAF\ATC - BZN\Merlin\13\11339	**AIRPROX** - Mil vs GA	UKAB 2013168 - Airprox - Merlin v PA28 (100m Sep) [Class G]	26 November 2013	100m exiting Low Level at Northampton
asor\Brize Norton - RAF\ATC - BZN\\14\3902	**AIRPROX** - Mil vs Glider	Airprox-BDN11	15 April 2014	Boscombe Alpha jet v glider 7 miles sth of BZN
asor\Brize Norton - RAF\ATC - BZN\\14\5685	**AIRPROX** - Mil vs GA	A330 vs. Civil Rotary Airprox	05 June 2014	Aircraft reported that it 'may of had an Airprox' with a civil rotary ac that was outside Brize Controlled Airspace
asor\Brize Norton - RAF\ATC - BZN\\14\7733	**AIRPROX** - GA vs GA	Dakota Airprox	13 July 2014	Dakota Airprox - not reported on frequency.
			2015	
Asor\Brize Norton\RAF\ATC – BZN\\15\5998	Civ v Civ	2015075	21 May 2015	Penetrated Oxford ATZ

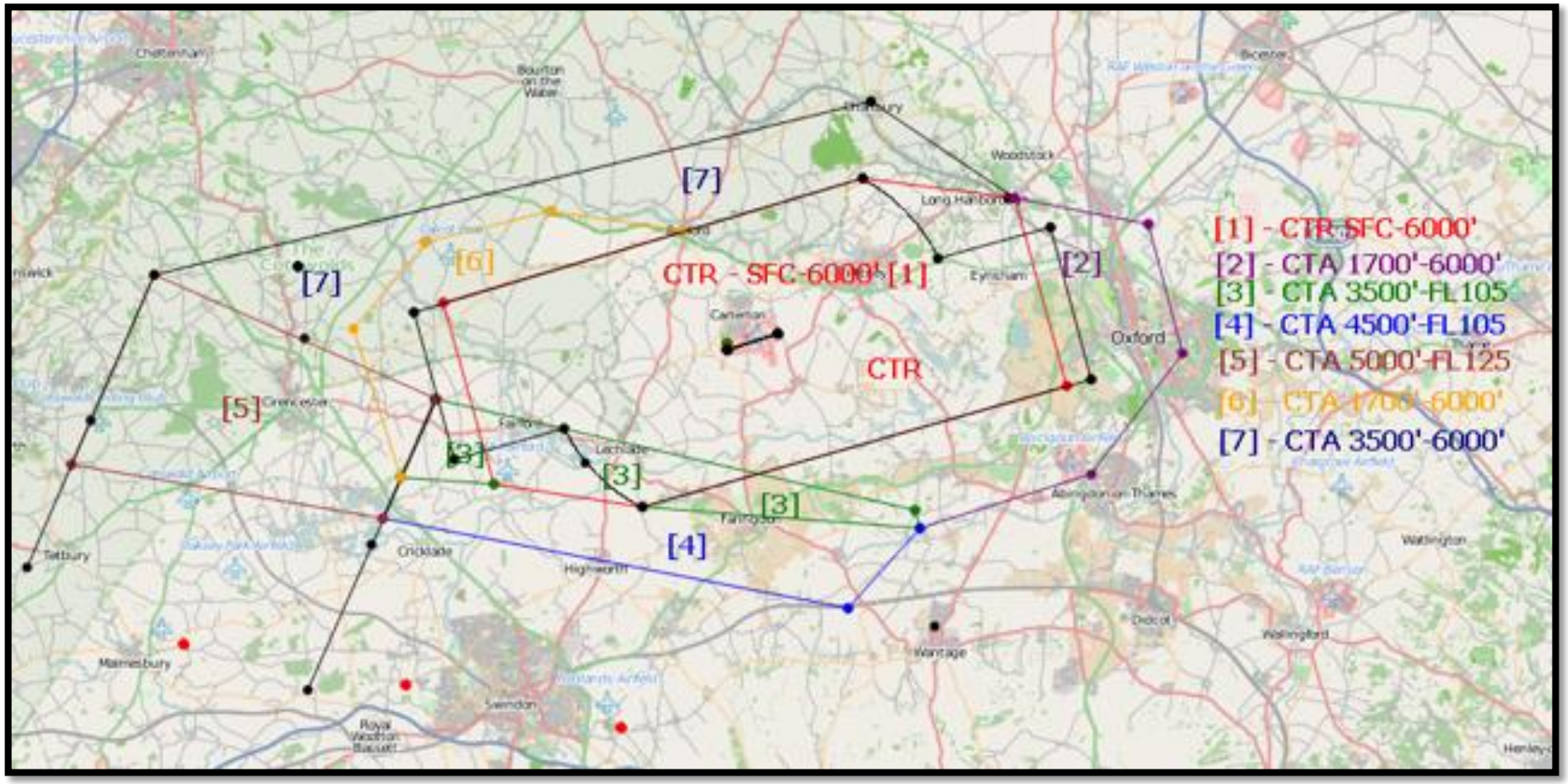
ASOR	Mil/Civ	Data	Date	BZN Remarks
Asor\Brize Norton\RAF\ATC – BZN\\15\7375	Civ v Civ	2015133	18 July 2015	North of Brize, late sighting by pilots
Asor\Brize Norton\RAF\ATC – BZN\\15\7421	Civ v Civ	2015094	24 May 2015	North of Brize at 2,300', late sighting by pilots
Asor\Brize Norton\RAF\ATC – BZN\\15\7481	Civ v Civ	2015088	10 June 2015	North of Brize at 2,200', late sighting by pilots
Asor\Brize Norton\RAF\ATC – BZN\\15\9148	Civ v Civ	2015171	6 September 2015	North of Brize at 3,000', late sighting by pilots
Asor\Brize Norton\RAF\ATC – BZN\\15\37	Mil v Mil	TCAS RA	5 January 2015	Only 500' separation applied
			2016	
Asor\Brize Norton|RAF|ATC – BZN\\16\4492	Mil v Civ	Loss of Separation	22 April 2016	LARS transit at 4,000' v A330 outbound at 3,800'
Asor\Brize Norton|RAF|ATC – BZN\\16\8122	Mil v Civ	2016143	23 July 2016	A400 inbound at 2,800 v Glider GH

ASOR	Mil/Civ	Data	Date	BZN Remarks
Asor\Brize Norton|RAF|ATC – BZN\\16\8391	Mil v Civ	2016179	31 July 2016	A400 inbound 3,800' v unknown traffic similar lvl
Asor\Brize Norton|RAF|ATC – BZN\\16\8763	Mil v Civ	2016165	8 August 2016	A400 BASE LEG Rwy 25 v Oxf Traffic
Asor\Brize Norton|RAF|ATC – BZN\\16\5839	Mil v Mil	2016094	27 May 2016	C130 in BZN overhead v Tutor GH in Overhead
Asor\Brize Norton|RAF|ATC – BZN\\16\1425	Civ v Civ	2016004	16 January 2016	In Oxford Overhead 3,500'
Asor\Brize Norton|RAF|ATC – BZN\\16\6640	Mil v Civ	2016090	24 May 2016	CH transit SE of BZN at 3,000'
Asor\Brize Norton|RAF|ATC – BZN\\16\11896	Mil v Civ	TCAS RA	4 November 2016	A400 outbound v Oxf inbound (visual with A400)
Asor\Brize Norton|RAF|ATC – BZN\\16\3213	Mil v Civ	TCAS RA	16 March 2016	Ctr CROSS 1,300' v C17 descending from 2,300'
			2017	

ASOR	Mil/Civ	Data	Date	BZN Remarks
Asor\Brize Norton|RAF|ATC – BZN\\17\7483	Mil v Civ	2017148	8 July 2017	C17 climbed out below Glider
Asor\Brize Norton|RAF|ATC – BZN\\17\417	Mil v Civ	2017003	5 January 2017	CH47 low level v Oxf Inbound 1,500’
Asor\Brize Norton|RAF|ATC – BZN\\17\7786	Mil v Civ	2017147	5 July 2017	Rotary v Glider at 3,500’
Asor\Brize Norton|RAF|ATC – BZN\\17\1539	Mil v Civ	Separation	8 February 2017	NDB out bound v Oxf inbound at 2,300’
Asor\Brize Norton|RAF|ATC – BZN\\17\2417	Mil v Civ	TCAS RA	1 March 2017	Hold at 2,800’ v transit 500’ below
Asor\Brize Norton|RAF|ATC – BZN\\17\3582	Mil v Civ	TCAS RA	28 March 2017	Base leg turn v Oxf traffic
Asor\Brize Norton|RAF|ATC – BZN\\17\6517	Mil v Civ	TCAS RA	15 June 2017	Transit at 5000’ triggered RA for a/c outbound
Asor\Brize Norton|RAF|ATC – BZN\\17\8279	Mil v Civ	TCAS RA	27 July 2017	C17 Radar Pattern with CTR cross 500’ below

A6 Initial Conceptual Designs

This Annex explains the original airspace design concept and explanation of each airspace segment.



A6.1 Notes on Initial Airspace Design Concept for RAF Brize Norton

These notes accompany Design V1.0 of the BZN airspace design, in support of the ACP under development to contain BZN approach procedures and provide connectivity between the airfield and en-route structure. Following Stakeholder Engagement meetings, it became clear that the volume of airspace required would have a disproportionate effect on other airspace users. This Annex provides notes on each proposed CTA; this shaped to proposed design Option 5 described in Section 5 of this document.

A6.1.1 CTR [1] – SFC – 6000 feet (')

The proposal includes shortening the two stubs by about 1 NM, however, CTA areas have been placed extending beyond. This will enable non-participating aircraft to route closer without entering controlled airspace on a low level transit. The exisiting curved areas of the CTR has been filled in with a diagonal cut off. This is because an existing approach would come within 0.8 NM of the edge of CAS and this is belived to be insufficient.

A6.1.2 CTA [2] – 1700' – 6000'

For the current airspace an aircraft carrying out the base turn procedure on the nominal track passes along the edge of CAS. This additional area provides a buffer so that there is some distance between an aircraft on the procedure and other aircraft outside of controlled airspace. It may be possible to limit the speed of aircaft further on the base turn procedure so that the offset angle is reduced and further improve the containment. Although 220 knots is currently used, consideration should be given to reducing this. These areas have been designed to be as small as possible to limit the impact on Oxford Airport.

The area to the South East also provides additional protection for the missed approach procedure from RWY 07. Some consideration could be given to having the missed approach altitude restriction increased to 3000' which may allow this area to be reduced in size.

Arrangements will need to be put in place to allow for parachute dropping at Abingdon. The area impinges on the Oxford ATZ and this portion of it will likely need to be delegated back to Oxford.

A6.1.3 CTA [3] – 3500' – Flight Level (FL) 105

This quadrilateral airpace lies under the area already defined by the Cotswold CTA (FL105+). It allows aircraft to descend out of the enroute controlled airpsace system via SIREN while remaining inside controlled airpace. It has sufficient volume to ensure that an aircaft kept high by S23 can be given additional track miles to descend, or simply radar vectored downwind right hand pattern for the predominate RWY 25 . It merges with the CTR between 3500' and 6000' and some thought will need to given if it can be promulgated like this or if it will need to be promulgated in separate chunks. Fairford will need to have agreed access to this portion of airspace.

A6.1.4 CTA [4] – 4500' – FL105

This quadrilateral airpace with [3] makes up the area below Cotswold CTA (FL105+). It allows an aircraft to descend out of the enroute CAS structure intially down to 5000' arriving from

SIREN and then once reaching the northern boundary [4] the aircraft can be descended to 4000'. It extends up to FL105 so that if an aircraft is kept high it can be handed over from Sector 23 to Brize and descended in this portion.

A6.1.5 CTA [5] – 5000' – FL125

This portion provides for an aircraft to follow an SID joining the enroute controlled airspace system while remaining inside CAS. It lies below the quadrilateral of airway N14 (FL125+). An aircraft on the MALBY SID would enter this portion at 5500' and then be given climb to FL80. The area is taken all the way up to FL125 so that the aircraft can remain inside controlled airspace if a higher climb is given by Sector 23. South Cerney will want agreements for access to this airpace to parachute drop. There is also the possibility that Aston Down gliding may want some access to the West part. Civilian Historic Fast Jet aircraft from Kemble may also want some access.

A6.1.6 CTA [6] – 1700' – 6000'

This portion provides greater containment for an aircraft flying the procedural base turn to RWY 07 and for aircraft flying the missed approach from RWY 25. Calcot lies under this area but should not be overly impacted as CTA [7] is close with a higher base altitude.

A6.1.7 CTA [7] – 3500' – 6000'

This portion provides protection for SIDs that turn out to the North of the aerodorome from RWY 07 and allows the necessary track miles for the departure from RWY 25 to gain altitude on the MALBY SID. At the East end it is unusually cut off, this is to reduce the impact on Oxford operations to the maximum extent. The North East corner is placed on Charlbury as a recognisable feature for aircraft wishing to avoid the airspace. The A40 and A49 provide line features for the boundary between this CTA [7] and CTA[6].

A6.1.8 Holding

The need to hold at 3 levels drives having the majority of the CTR up to 6000'. The hold for RWY 25 to the West of the aerodrome may need to be moved closer to the overhead to improve containment. If the number of holding levels were reduced it may be that the top of the easterly areas of CTRs could be reduced to lower levels. This could allow aircraft to transit over the CTR to the west of Oxford town and Airport. It could be considered if a higher hold could be provided in areas [3], [4], & [5].

A6.1.9 Proposed RNAV Procedures

This proposal is sympathetic with the conceptual RNAV SID, STAR, and RNAV(GNSS) approach procedures. It is believed the procedures could be amended to to fit these proposals to provide adequate containment, if not full PANS-OPS primary area containment for all of the procedures. The volume of airspace that would be required to fully contain the draft RNAV procedures within the primary containment area is unrealistic given the variety of airspace user demands in this area.

A7 What is RNAV (GNSS) Technology?

A7.1 General

Traditionally, aircraft navigate a route by flying to, or away from a sequence of ground-based navigation beacons. When they reach the destination airport, they pass over the beacon located at the airfield, flying a tear-drop shaped path to turn around and make their final approach to the runway.

RNAV (derived from aRea NAVigation) allows an aircraft to navigate using GNSS instead of the ground-based beacons. GNSS refers to a constellation of satellites providing signals from space that transmit positioning and timing data to GNSS receivers on board equipped aircraft. The receivers use this data to determine the aircraft's precise location. We are all familiar with 'GPS' and many of us use this system on our mobile phones and 'satnavs' every day. The USA's NAVSTAR GPS is an example of GNSS technology.

RNAV allows aircraft to navigate more direct paths between locations and allows them to fly IAPs into an airport without the need to use navigation beacons which are old and expensive to maintain. See Figure 13 below:

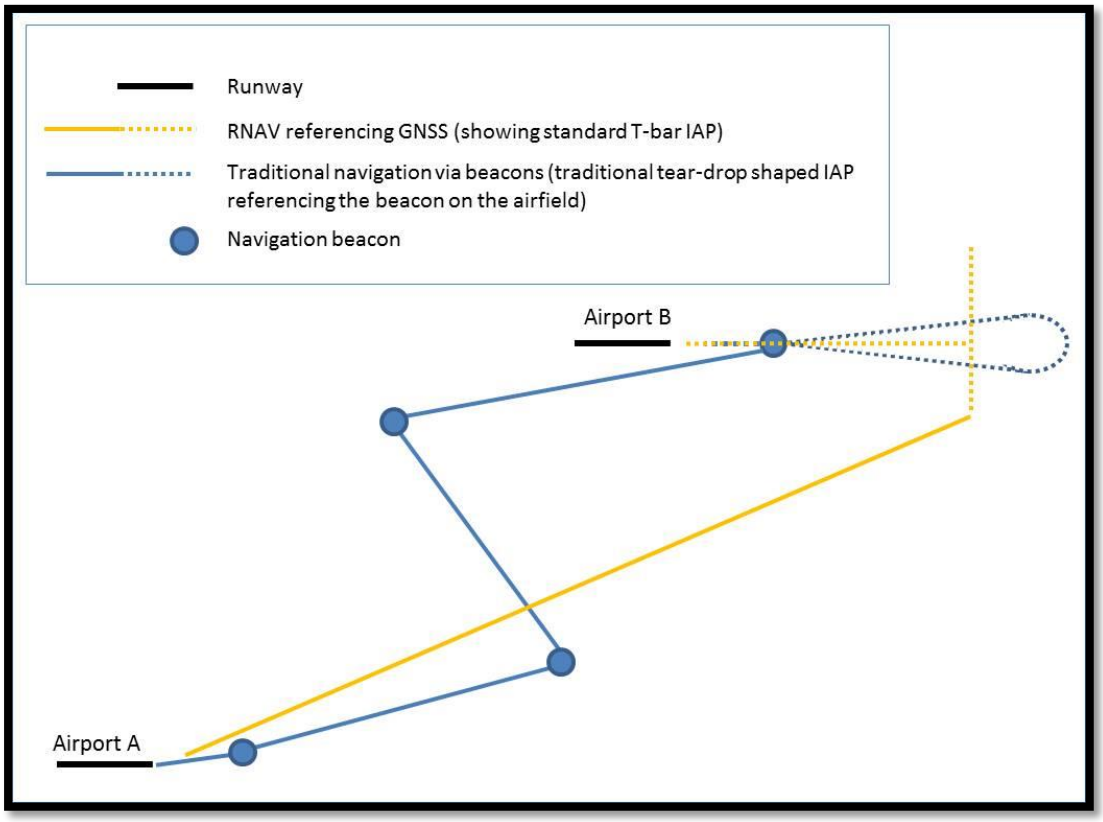


Figure 13 - Ground-Based Beacon Navigation versus RNAV

A7.2 Why Implement RNAV (GNSS) Flight Procedures?

The move to RNAV technology was directed at the 2007 36th International Civil Aviation Organization (ICAO) General Assembly where States agreed to Resolution 36/23 which urged them to implement routes and airport procedures in accordance with the ICAO PBN[18] criteria. EU legislation requires the implementation of RNP1[19] performance through the Common Pilot Project by 2024. ICAO resolution A37-11 also stipulated that by 2016 States complete a PBN implementation plan for en-route and terminal areas. In line with these directions, the CAA Future Airspace Strategy (FAS) sets out the plan to modernise UK and Irish airspace by 2020 in line with the legislative framework of the Single European Sky[20].

There are inherent safety and cost benefits to the use of RNAV technology:

- Safer and more efficient Air Traffic Control (ATC) services because fewer controller interventions are required to separate and re-route aircraft that have come into conflict with one another.
- More accurate routes are flown making it easier to predict flight patterns and providing improved stabilisation of aircraft on approach. More stabilised approaches are safer and can generate less noise as aircraft perform fewer corrections to their vertical and lateral flight profile.
- Greater operational efficiency; accurate track keeping means less fuel burned, fewer flying hours, lower CO_2 emissions and an improved chance of a successful first approach during bad weather conditions.

A7.3 Where Can I Find Out More About RNAV (GNSS)?

Detailed technical information on the principles of RNAV and other Performance Based Navigation (PBN) concepts is available on the EUROCONTROL website at:

- http://www.eurocontrol.int/articles/performance-based-navigation-pbn-applications

and via the CAA Website at:

- https://www.caa.co.uk/Commercial-industry/Airspace/Future-airspace-strategy/Performance-based-navigation/http://www.caa.co.uk/

and via the European Global Navigation Satellite Systems Agency (GSA) which explains more about GNSS and its application to various business sectors:

- https://www.gsa.europa.eu/european-gnss/what-gnss

Information for private and general aviation aircraft pilots on flying RNAV procedures is available here in CAA Publication CAP773:

- https://publicapps.caa.co.uk/docs/33/CAP773FINAL.pdf

[18] Performance Based Navigation: specifies that navigation performance requirements are specified in terms of accuracy, integrity, availability, continuity and functionality when supported by the appropriate navigation infrastructure.
[19] Navigation performance of 1NM accuracy 95% of the time, with a defined level of integrity and continuous performance; all parameters monitored on board the aircraft with appropriate alerts.
[20] More information on the Single European Sky can be found at http://www.eurocontrol.int/dossiers/single-european-sky

A8 Definition of Airspace Classifications within the UK