Cotswold Airport (Kemble) Airspace Change Proposal – Defined Approach Procedure

B777 Landing at Kemble on runway 26. (Photo credited to Brent Maartens Aircraft Photography)

CAP 1616 Stage 2 Develop and Assess

Step 2a Design Options (and Engagement)

KEMBLE APPROACH AIRSPACE CHANGE PROPOSAL

CAP 1616 STAGE 2a - DESIGN OPTIONS

1. This document forms part of the Airspace Change Proposal process as defined in CAP 1616 for the Proposed Kemble Arrival Procedures. For ease of reading, the Statement of Need and Design Principles (DPs) are reiterated before the document outlines the various options considered to meet the Statement of Need. The Airport's submission of Step 1b of this CAP 1616 process, was accepted by the Civil Aviation Authority (CAA) on the 26 October 2018 at the Define gateway. The prioritisation of the DPs, at this link[1], was based on the feedback received.

2. The airport received no suggestions for amending any of the proposed principles. With most stakeholders awaiting the 'meatier' step of airspace design and consultation, only a few of the stakeholder groups ranked the principles and many local groups only offered their 'top 3' principles. Despite little feedback received on 'ranking', the airport ranked the DPs based on all ranking responses using judgements formed by experience. However, it must also be noted that many aviation stakeholders, particularly based commercial helicopter operators, expressed a strong view that the approach should not be limited to a few approved jet operators as they feel under significant pressure from the CAA to move to the new CPL(H) syllabus. This requires training on RNAV(GNSS) approaches but is imbalanced against a paucity of approved approaches in the south of England.

3. As a result of the open engagement, most stakeholders thanked the airport for the level of engagement and the process, for enabling their views to be incorporated into the DPs and that engagement has been open and communicative. With most stakeholders waiting for the next stages, where the principles are developed into design options prior to formal consultation. However, engagement remains throughout the process, including the options developed in this stage.

4. The next stage is to develop options for the approach and this document form parts of the Airspace Change Proposal process, as defined in CAP 1616. The list of options should address the Statement of Need (SoN) and the Design Principles (DPs); these are stated below. Now at Stage 2a, the options are macro in scale – 'big lumps of airspace on the map' and do not have the micro detail of exact routing or descent profiles. That will be developed in Stage 2b and defined in Stage 3a, ready for consultation.

Statement of Need.

5. Cotswold Airport (Kemble) is a large aerodrome 4.5 nm SW of Cirencester near RAF Fairford (10nm) and RAF Brize Norton (19nm). It is licensed by the CAA and an air traffic zone (ATZ) 2nm radius is established around it with an air traffic service (ATS) provided during notified hours by qualified aerodrome Flight Information Safety Officers (FISOs). Operations are limited due to the lack of ground-based navigation aids to Visual Meteorological Conditions (VMC) by day and, at certain times of the year, in the dark. The airfield logged 32,698 movements in 2017 which equates to a non-seasonally-adjusted average of 2500 take-offs and landings per month, the majority of which are made by based general aviation (GA) light aircraft. Year on year increases of

[1] https://airspacechange.caa.co.uk/ProposalArea?pID=19

larger airliner aircraft, arriving for end of service recycling, and corporate/VVIP jet aircraft are changing the traffic mix; this trend is expected to continue as major stakeholders' business increases for inter alia airliner salvage, ongoing maintenance under an EASA approved Part 145 scheme and private flying.

6. **Issue**: Currently, without a defined instrument approach procedure (IAP), suitably equipped larger aircraft, including those operated by The Royal Flight, determine their own approach path onto either end of our runway 08/26 whilst flying under instrument flight rules (IFR) in poor weather and/or in the dark. Their crews rely on Air Traffic Control radar service from RAF Brize Norton to position them on to a visual final approach to the runway in use at Kemble. This generates an inherent safety risk, which without a defined approach cannot be fully mitigated.

7. **Opportunity**: Satellite technology managed by Europe and the USA, which provides GPS navigation freely available to all, can deliver internationally recognised all weather IAPs. Whilst these Signals in Space (SiS) can be used by many of our customers' aircraft with new technology equipment on board, to make good use, a design for IAPs has to be created, validated and published internationally. Defined IAPs would help enable greater regularity and enable existing mitigated risks to be reduced further to as low as reasonably practicable (ALARP). The route which inbound aircraft follow will be the same as at present but with greater accuracy laterally and vertically through improved descent angles thus bringing a new level of assurance to the approaches. Benefits including reducing the effect of noise on surrounding residents and the reduction in C02 emissions will be published. This proposed change is not intended to increase traffic, extend opening hours nor provide GPS instrument approach training.

Design Principles

8. The Design Principles derived through analysis of the Statement of Need and best practice and refined through wide engagement are listed below in priority order[2].

a. The Design must be technically flyable and enhance existing operational performance and levels of safety.

b. The design must integrate with the NATS airspace network and RAF Brize Norton Standard Arrival Routes (STARS).

c. The design should regularise approach paths onto predetermined, published routes to bring certainty to local residents and airspace users.

d. The design should help ensure aircrew can plan their arrival using defined routes, laterally and vertically, so permitting low-power, constant descent, thus reducing noise and emissions.

e. The design should respect existing noise abatement/sensitive areas, as detailed within KAOP 38 (our noise abatement, as listed on our website).

f. The design should reduce the amount of people overflown.

g. The design must reduce the scattering effect of aircraft arrival tracks resulting from pilot managed visual navigation, including overhead joining of the circuit.

[2] As defined in the output summary of Stage 1b

h. The design should take account of local planning policy with regards to future urbanisation in the vicinity of the airfield, so that no future communities are overflown (and that our agreed local government safeguarding remains extant).

i. The design should achieve a reduction in visual intrusion.

9. Although not specified as a design principle in the CAP 1616 sense, cost is a major internal factor which must also be considered; an option which meets all design principle criteria but is unaffordable to a small airport is not a viable option. This ACP is an evolutionary product of previous work under CAP 725 and CAP 1122; initiated with a view to harnessing evolving GPS solutions to provide a low-cost instrument approach alternative for smaller airfields. This is not a statement to 'solutionise' but amplify why cost benefit remains a key internal driver.

Strategy

10. As articled through engagement at Stage 1, the technology used for all options will be a GPS based approach, of which there are several options. This is will be the technology used on all options which fit the criteria listed below. After nearly 11 years of previous developmental work, the airport strategy opted not to utilise older technology due to imbalance and integration issues between the intended aircraft and the older technology[3], combined with the European (EASA[4]) and British (CAA[5]) guidance on implementation of GNSS, and removal of ADF from IFR requirements. Equally, a full Instrument Landing System (ILS) used by major international airports, and now being replaced and supplemented by GPS, was ruled out on cost.

11. The strategy used by the airport through this airspace change process is to ensure each design option is measured for compliance with our agreed Design Principles and conformance with applicable Government and CAA policy, in particular:

Department for Transport's (DfT) Air Navigation Guidance 2017.

The CAA's CAP 1616 Publication on the Airspace Change Process.

The Governments' Green Book and DfT WebTAG[6] environmental appraisal models

12. Any options developed, must also be coherent with future aviation strategies, such as the draft; Airspace Modernisation Strategy[6], London Airspace Management Programme (LAMP), other local ongoing airspace change programmes and aerodrome developments, local council strategies and planning developments. Geographically, this will include, engagement with local Cotswolds Area of Outstanding Natural Beauty (AONB), the Cotswold District and Wiltshire Councils other relevant airfield and airspace users and effected ground stakeholders. Although within SW England it is not anticipated that either Bristol or Gloucester Airport will be affected by this airspace change. However, they will remain informed, rather than intimately engaged. Similarly, the local GA community, local glider sites and RAF Brize Norton remain key stakeholders for continued engagement. As options mature throughout the process, so will the engagement list; consequently, the list of engaged and informed stakeholders may change throughout this CAP 1616 process.

---

[3] A Non-Directional Beacon (NDB) is an old technological solution, but no longer used by commercial jet aircraft.

[4] European Aviation Safety Agency

[5] Civil Aviation Authority, which acts as the aviation regulator for the UK Government's Department for Transport.

[6] Transport Analysis Guidance

[6] CAP 1690

Current Situation – Operational and Environmental Effect

13. To set context, in November 2018[7], the monthly movement data recorded by the airport's tower shows: 6 airliner arrivals; 12 corporate jets/complex aircraft, 556 helicopters and 1091 light aircraft used Kemble. Within this fourth quarter of the year, the movements are at a low point, the highest movements are recorded in the summer months. However, the variation is most keenly noted for light aircraft; the Airport's jet movements remain consistent throughout the year, accounting for approximately, 200 movements per annum. Within November, the Airport also recorded 38 diversions due to bad weather, which this proposal aims to help resolve through a defined approach. The Airport has 78 permanently based aircraft, of which 2 are corporate jet aircraft. This figure does not include the airliners in storage or in various states of salvage.

14. **Light Aircraft and Helicopters.** These approach from all directions, yet all join the airport's landing circuit, shown at Fig 1.0. For the 30k light aircraft movements a year, this already provides a predictable approach for good weather[8] operations, which respects our noise abatement guidance. Nearly 70% of all those movements are training flights from the four aeroplane and two helicopter flying schools based at Kemble. The remainder are visiting light aircraft from throughout the UK and Europe. This type of circuit is frequently used by airports for light aircraft. The aircraft will join the circuit either overhead at 2000ft and descend into the 1000ft circuit or join any of the legs directly. They will descend to around 500ft on the turn onto final approach for either end of the runway (Kemble or Culkerton) and avoid the noise abatement guidance (shown as areas in red). This is also available on commonly used electronic flight planning and navigation applications[9] used by private pilots in flight. With approach airspeeds of between 60 and 100 kts[10], this best fits the performance capabilities of light aircraft. The very small number of noise complaints[11], suggest this is working well.

15. Light aircraft, with the largest number of movements, have the largest environmental impact, in terms of noise, visual intrusion and emissions, with the focus of their effect concentrated within the ATZ and particularly within the publicised circuit. This proposal does not seek to change the way light aircraft and helicopters arrive at Kemble, nor their annual movements and thus this airspace change will not change the current environmental effect, in terms of air quality, noise and visual intrusion as quantified in Govt guidance[13].

---

[7] A significant drop against average numbers due to poor weather and high winds and compounded by a temporary closure of the airport restaurant, a key attraction for pilots.

[8] Called Visual Meteorological Conditions (VMC) – this equates to visibility of over 7000m and a local cloud base of 2500ft above sea level. This precludes fog, night-time (unless the pilot is rated) and all conditions less than those minimum VMC described above.

[9] Such as Runway HD or Sky Demon, which are applications run on tablets that provide awareness of controlled airspace and allow accurate route planning and in-flight navigation, as defined by the pilot.

[10] In zero wind, this equates to a ground speed of 69 to 115 mph. Landing into wind will reduce the ground speed whilst maintaining the same airspeed.

[11] 3 complaints in 2018 of aircraft allegedly flying within the noise abated areas.

[13] Department for Transport Web TAG and Air Navigation Guidance 2017.

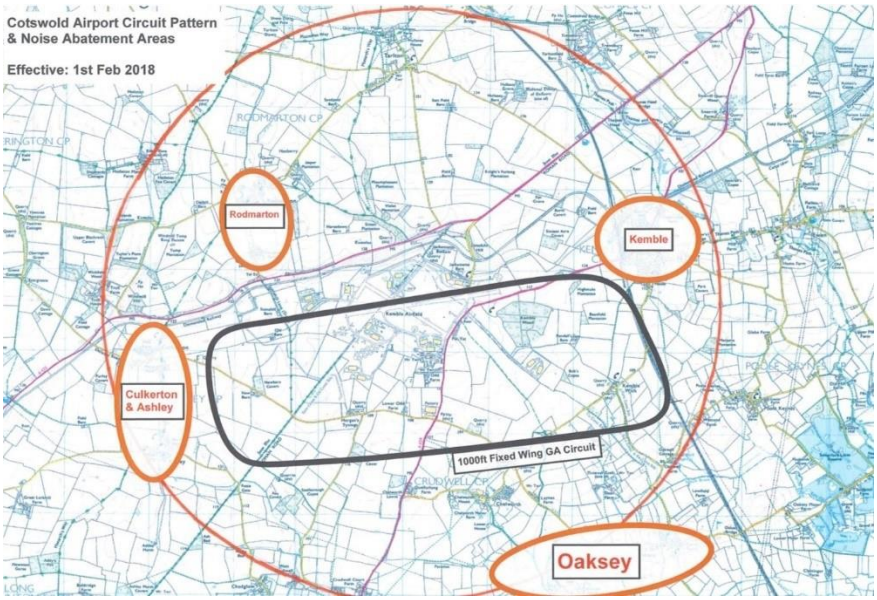


Fig 1.0 – Kemble's (Cotswold Airport) Noise Abatement and Circuit Guidance

16. **Jets and Commercial Helicopters**. The diagram at Fig 2.0 is a snap shot of airliner and large corporate jet arrivals in the month of November 2018. It is not a snap shot in time and thus does not represent an average day. Additionally, for clarity, it does not include the much higher numbers of smaller corporate jets, light aircraft and helicopters, many of whom fly their own predetermined and unapproved GPS arrival routes, under the auspices of Performance Based Navigation (PBN). The picture at Fig 2.0 has been extracted from a publicly available aircraft tracking website and shows the approach tracks[12] of these aircraft. It should be noted that, although their routes demonstrate consistency in the last 4-6 miles of the approach, over the hamlets of Kemble and Culkerton, beyond this the aircraft are routing over most of SW England. The performance capabilities of these aircraft[13], normally flying at 220kts, and their turning circle mean that they cannot conform to an established light aircraft circuit pattern and require a longer final approach. The airliners are either arriving direct on ferry flights from major airports in the UK and overseas, flying in the airways between 9000 and 40,000ft, or are private/corporate jets, from as close as Oxford and Farnbourgh and as far away as Switzerland.

17. They usually arrive from an airway[14] departure point called MALBY, which is overhead an area to the east of Malmesbury, at between 9 and 11,000ft. RAF Brize Norton, operating under an agreement with Kemble, provides a radar service to some[17] of these aircraft until they are established on an approach into Kemble. However, without a defined approach, RAF Brize Norton will manage these in with the rest of their own air traffic. This combined with both the airliners requirement to maintain a speed of around 220kts and to descend from approximately 11,000ft into Kemble, means the area covered by these types of aircraft is significantly more than any other Kemble traffic. This explains the large loops and area covered as the pilot manually flies the aircraft to safely reduce altitude and airspeed as he/she plans their arrival into Kemble. The track in orange (in this case a 737 from Germany to Kemble) is a good example of an aircraft flying in marginal visual meteorological conditions (reduced visibility and cloud base) and with high winds. Without a defined approach (descent rate and direction), the pilot attempted to set up the approach twice, before landing. In doing so, he increased the area in which the aircraft was flying, with the resultant

[12] The direction followed by the aircraft on route after descending into low level airspace (below 7000ft).

[13] Based on the A320 and B737-777 airliners, which this proposal must be designed to support.

[14] The major East-West airway taking air traffic in and out from the London airports towards Ireland and the US. [17] Mostly the airliners; the bulk of corporate jets fly their own routes.

increase in environmental effect. It is worth noting that these approaches all required greater and fluctuating power settings than an established low power, constant descent found on all approved approaches.

18. You will note on the map at Fig 2.0, this extends as far north as Gloucester and Bicester and as far East as Oxford and Didcot, most are north of the M4. This entire transitional route, from the airways to Kemble is done so without any defined navigational approach aid; the pilot is hand flying the aircraft using visual references and in VMC only. The bulk is also within Class G (uncontrolled) airspace and affects other airspace control areas (shown in Blue). From left to right (Fig 2.0) Nympsfield Gliding Site, Aston Down Gliding Site, RAF Fairford and RAF Brize Norton. In general, Gloucester Airport to the north and Bristol Airport to the south are not affected, although they have defined routes within this uncontrolled airspace. Additionally, all aircraft[15] flying within Class G airspace in SW England, some of which have no radio or location transponder device are affected. Whilst in Class G airspace, all aircraft are flying visual and on the premise of 'see and avoid' requires these fastest moving[19] and less manoeuvrable large jet aircraft to visually avoid a collision with all other aircraft and to give way to gliders and hot air balloons[16].

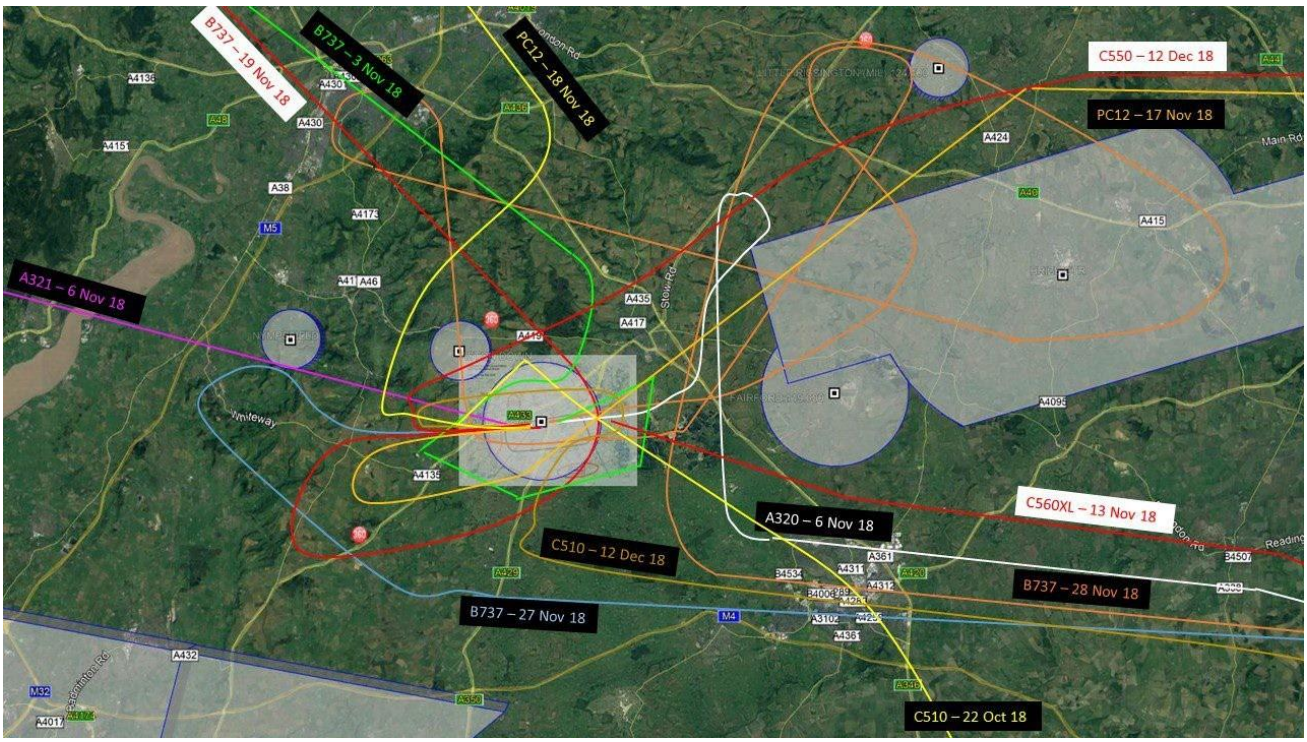


Fig 2.0 – FlightRadar24 extracted arrival routes for large (Cat D) airliners arriving into Kemble in November 2018.

19. Although the variation of approach tracks is evidently vast, it may also be noted that for this performance of aircraft, the last 4-6 miles of final approach allows little variation from alignment with either runway 26, approaching from the East or to Runway 08, approaching from the West. In both cases, this proposal is unlikely to change the effect on the residents of both Kemble and Culkerton hamlets; essentially, the same houses overflown by these jets now are unlikely to notice a change. This proposal will reduce this variation from beyond 4-6 miles out from Kemble, from the point at which the aircraft descends through 7000ft and focus all aircraft onto a defined arrival path. This

[15] Military aviation, Small jets, light aircraft, helicopters, gliders and hot air balloons [19]

Less any low-level military fast jets.

[16] Standard European Rules of the Air (SERA). https://www.caa.co.uk/Commercial-industry/Airspace/Rules-of-the-air/Standardised-European-Rulesof-the-Air/

may, inevitably, deliver either some areas with significantly concentrated traffic, or new areas overflown, dependent upon the options developed in accordance with the Design Principles.

20. In terms of the environmental effect, the scatter of routes, dispersion and varying heights make quantification difficult. Against the 30,000+ movements of light aircraft and helicopters in this area that operate from Kemble and the wider context of additional aircraft transiting through this area to other aerodromes, including large military transports, these low numbers of jets are deemed to have negligible impact. The cost benefit of a separate study into air quality is, at this stage, deemed inappropriate for this small amount of aircraft. However, it is worth noting that this scattered dispersion of aircraft, visual flown 'hands on' by their pilots is likely to create proportionately more emissions through constant throttle adjustment, than a defined approach would, where the international standards would require the aircraft to fly a constant low power descent, in accordance with the Design Principles. Although the outcome of a defined approach would reduce the scatter and deliver the aircraft over a specific area, it is likely to reduce the overall CO2 emissions and noise for these small numbers of aircraft, even when taking into account an increase of aircraft flying the approach.

Current Situation – Economic Effect

21. The operational limitations of only allowing aircraft to use good weather arrivals and the operator's procedural acceptance allowing their pilots to self-define a visual approach, has significant effect on the economic model of the Airport. This is noted through either weather cancellations or diversions; in this proposal, lost revenue is the only quantifiable cost, since the normal metrics used concentrate on passenger-based revenue, which is not applicable for Kemble. For example, one small jet operator accounts for 8 of our annual jet movements. A further 19 planned arrivals were either cancelled or diverted due to bad weather or due to the operators own operational limitations of landing aircraft without a defined and approved approach. This example accounts for nearly £24,000 of lost revenue. If this is extrapolated across all known and predicted diversions, it is a significant amount of lost annual revenue in the region of £170,000, based on landing fees, fuel uplifts, parking charges and ground handling service.

22. To put into context, 200 annual jet movements generate the same amount of income for the Airport as 26,000 light aircraft movements; many academic assessments of General Aviation airfields suggest supporting light aircraft alone is economically tenuous[17]. With the economically driven closure of many light aircraft airfields, capability development to better support the current jet customers is simply good business economics; ensuring continued airport viability (for all) and avoiding the risk of the airfield becoming another housing development project.

Desired Outcome of this Airspace Change Proposal

23. In accordance with the strategy stated above and the description of the current situation, this proposal seeks to deliver an approved approach that allows jet aircraft and commercial helicopters to land at Kemble, despite the weather. It will also reduce the scatter of where these aircraft currently fly, deliver a more efficient use of airspace and concentre them onto a defined approach, that best meets the Design Principles. Furthermore, this proposal seeks to address the significant missed income for these types of aircraft and allow operational expansion to encourage more jets and commercial helicopters to either use, or base themselves, at Kemble.

24. As stated in Stage 1b, this proposal does **not** seek to start commercial air transport operations at Kemble (airliners taking people on holiday). Operating hours remain the same for the

[17] Such as the CAA's own General Aviation Policy Framework. https://www.caa.co.uk/General-aviation/Safety-information/General-Aviation-Policy-

foreseeable future; there is no intent in the current Airport 5-year Strategy to move to a 24hr hour per day operation as part of this proposal.

25. Analysis of the Air Salvage International (ASI)'s business trend, suggests they should receive an average of 24 airliners per annum. Additionally, the predicted increase in corporate jet movements based on the current upward trend and known diversions and cancellation, suggest this will increase all jet movements by 100% within the first 2 years of a defined approach established. It is expected that this will be a gradual rise over this first 2-year period to a level of approximately 424 annual jet movements where the Airport expects an approximate average of 35 jets per month[18], Although the numbers of jet aircraft arriving at Kemble should increase, it will not affect the current levels of light aircraft and helicopters movements.

Comprehensive List of Options

26. An initial evaluation of the potential options is described below. Note, that although these articulate where we wish to place aircraft on their approach into Kemble, it should not be viewed as changing the airspace within that option. No airspace categorisation change is proposed; what is now Class G airspace, will remain Class G airspace.

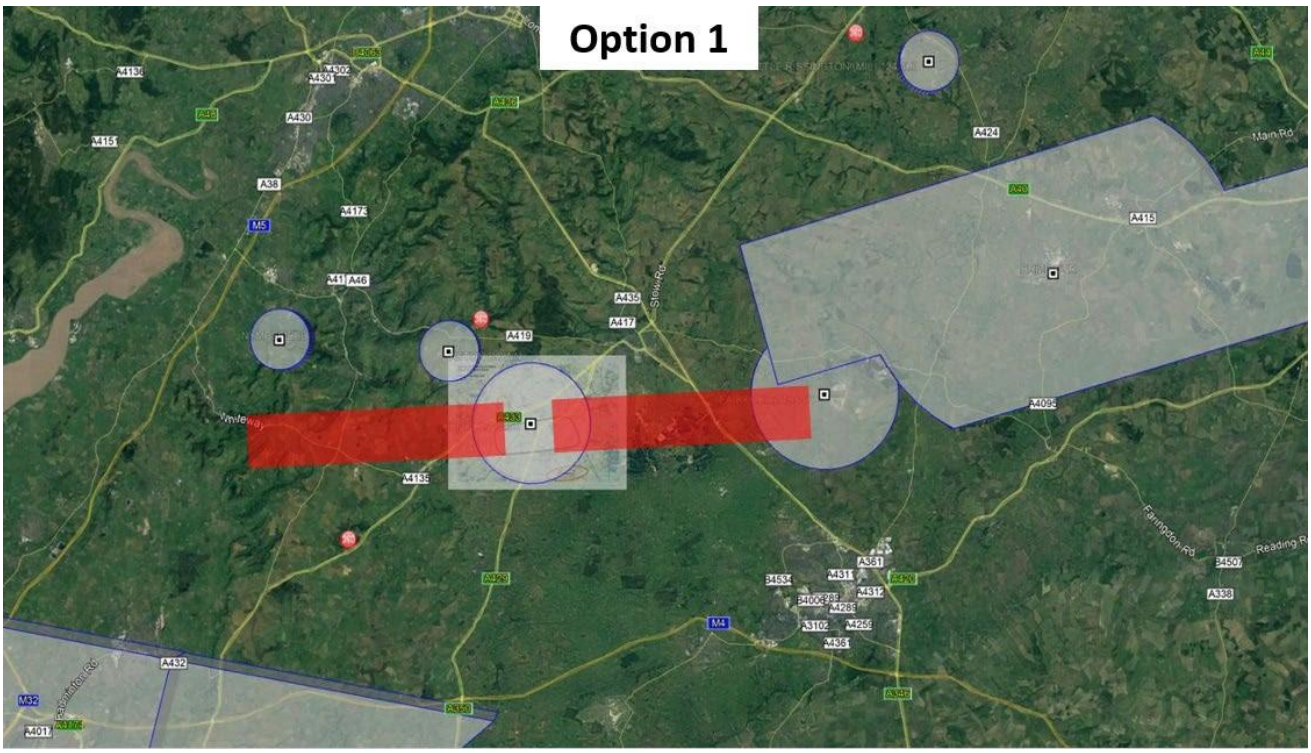
27. These have been developed to meet the criteria established by the Design Principles and supported by the strategy described in paragraph 10. The purpose of this document is to expose the content of this document and the following options to allow further engagement, both with those that stakeholders from Stage 1b and wider stakeholders that subsequent work in Stage 2 has revealed. At this stage, these options are at the macro level, simply chunks of airspace where we would like to move the aircraft to for an approach into Kemble. The feedback from engagement at this stage (2a) with stakeholders, will allow iterative development and qualitative analysis of these options, including an initial impact assessment of each viable options in the next stage (2b). Following CAA recommendations at the Develop and Assess gateway, the micro level of detail will then be developed at Stage 3a prior to formal consultation.

28. A short description of options is articulated below:

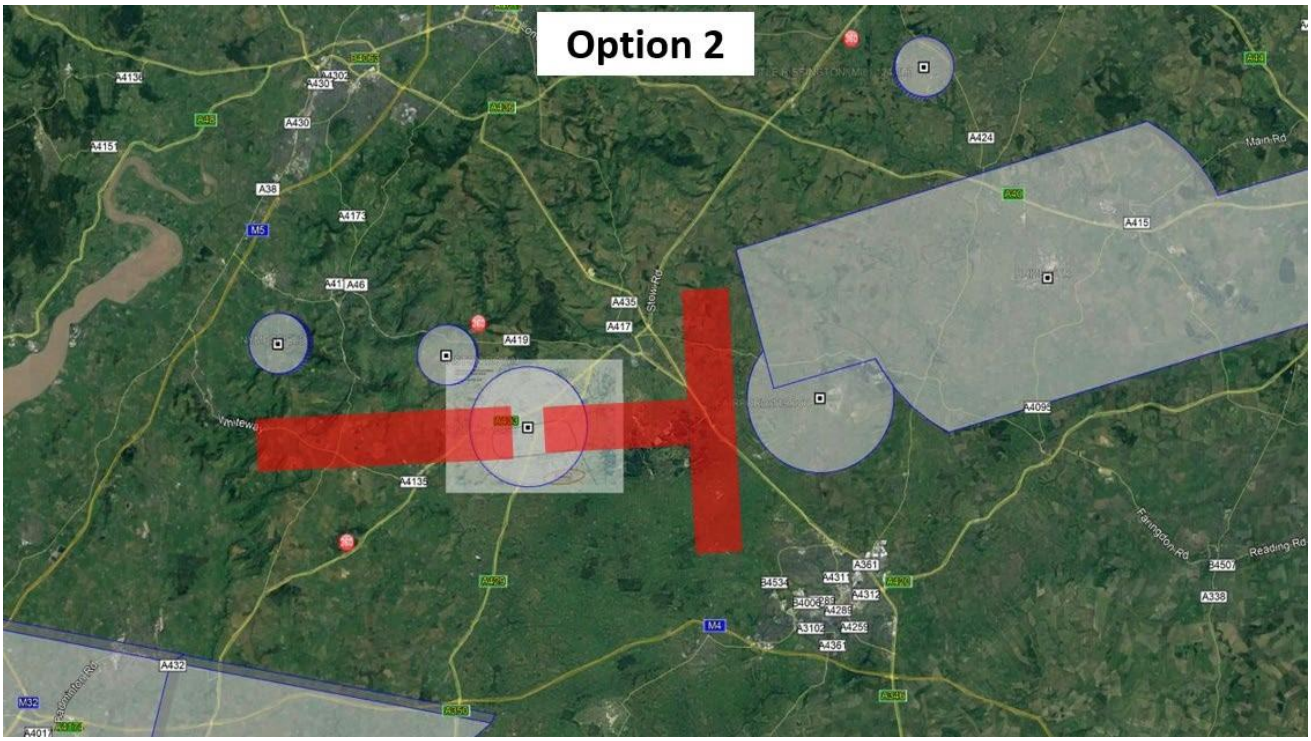
a. **Do Nothing**. As described under the Current Operations section of this document. Aircraft will continue to arrive at Kemble on self-defined approaches, either from low level (under 7000ft) route or from the airways. Their descent may be supported by a radar provided traffic service from neighbouring RAF Brize Norton under a Letter of Agreement (LOA) between RAF Brize Norton and Kemble. All aircraft will be following Visual Flight Rules (VFR) and define their own route to final approach into Kemble, as Fig 2.0 highlights; this applies to both Runway 26 and 08, dependent upon which runway is in use. This is the baseline option that does not meet the Statement of Need and will not be assessed against the Design principles; it's not considered a viable option. It does provide a baseline from which to assess other options against the Design Principles criteria.

b. **Option 1**. Extended linear approach from the centre line outwards 6 miles. This is the most basis option, that in addition to the Design Principles is compliant with GPS approach technical criteria. The is an interdependency with RAF Brize Norton (who control their own Class D airspace, and that of RAF Fairford, when activated). This interdependency with RAF Brize Norton as the air navigation service provider would need an enhanced Letter of Agreement. Aircraft will still need to self-determine transitional routes to join the approach in either the east or west, dependant on runway used.

[18] This could mean 4 in one day, and none for the next 3 days. Arrivals are not scheduled

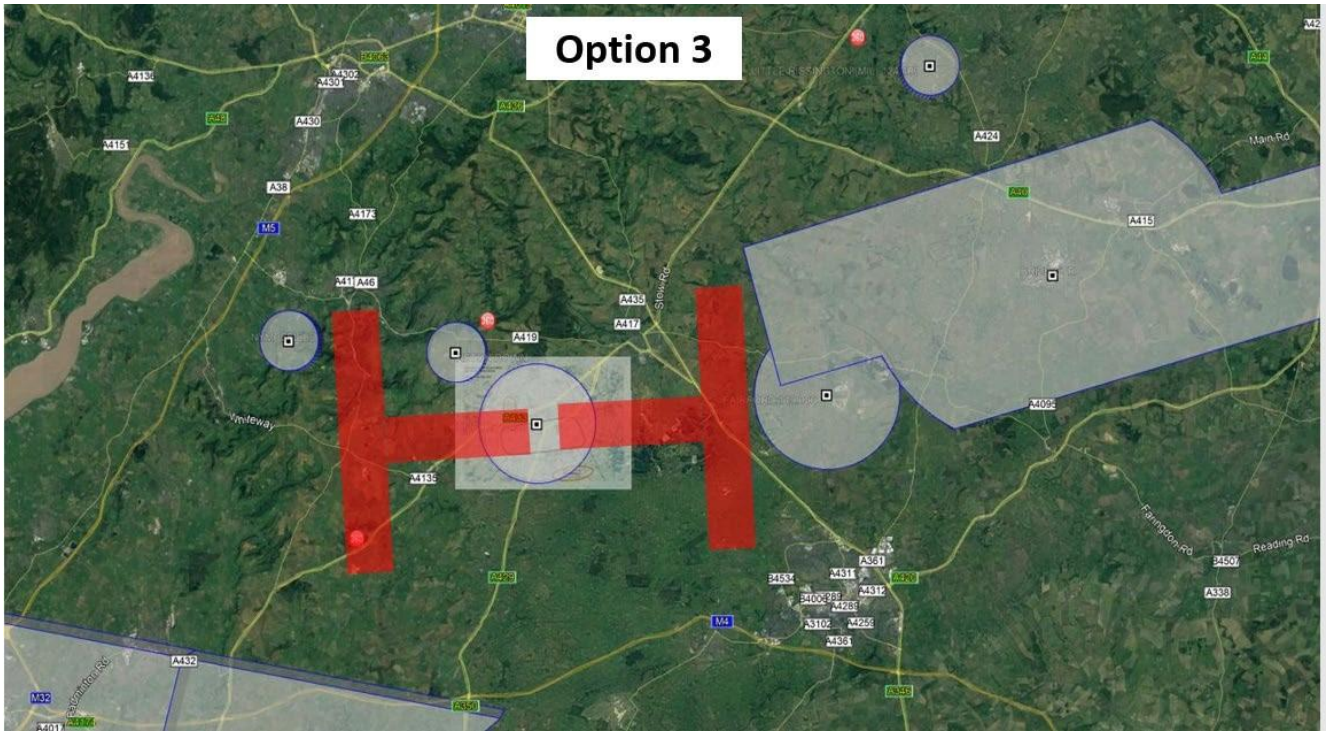


c. **Option 2**. Taking account of the routes flown by aircraft in Fig 2.0, this Option maintains a linear approach to the West (avoiding glider sites) but provides a north and South link on the eastern approach to enable aircraft to join from north and south and minimise the variation (fig 2.0) which is most prevalent to the east of Kemble. As in Option 1, it requires pilots to define their own transitional routing onto either the north or south T to the east, or linear join to the west.



d. **Option 3**. Option 3 enables aircraft to join an approach from the east or west by using northern and southern legs. This is the most common for GPS approaches and moving

aircraft into these areas provides maximum reduction in scatter due to less transitional routing and the most certainty to other airspace users.



29. **Summary of Options.** The do-nothing option is not feasible as it does not comply with the SON and does not fulfil Design Principles. Options 1-3 are for consideration and they would require the development of ICAO compliant designs, in Stage 3a.

30. The first Design Principle (*The Design must be technically flyable and enhance existing operational performance and levels of safety*) is crucial. Options 1-3 enhance the current uncontrolled (Class G airspace) airspace to safely protect complex and fast-moving jet traffic on approach to Kemble through a defined and published approach, which other airspace users will be aware of and should avoid. Option 1 or 2 will likely be more attractive to other airspace users, gliders and light aircraft as it appears less intrusive, albeit, it does still mean aircraft will still be defining their own transitional routes to join the approach, in either VMC or IMC.

31. **What Next?** I kindly ask the stakeholders to review the options and reply with any initial feedback you may have, by **18 Jan 2019**. I will then measure the options against the Design Principles (iaw CAP 1616) and present the findings to the CAA; in time for the Feb Gateway deadline.

Please note that the above options <u>are not set in stone</u> – airspace design and further fine-tuning will not occur until stage 3 of this process (several months from now). At this early stage, I am only seeking your initial thoughts on where (in airspace terms), we would wish to concentrate aircraft on the approach to avoid the scatter shown in Fig 2.0, or if you have any ideas that I may have missed.