# Cotswold Airport (Kemble) Airspace Change Proposal for a Defined Approach Procedure

## Full Options Appraisal

## CAP 1616 - Step 3a

**Document Details**

| Reference | Description |
|---|---|
| **Document Title** | Full Options Appraisal |
| | Cotswold Airport PBN (GNSS) ACP Stage 3a |
| **Document Ref** | ACP 3 /02 /003 |
| **Issue** | Issue 1 |
| **Date** | 20th December 2019 |
| **:lient Name** | Cotswold Airport |
| **Classification** | |

| Issue | Amendment | Date |
|---|---|---|
| Issue 1 | First formal issue | 7 January 2020 |
| | | |
| | | |

| Approval Level | Authority | Name |
|---|---|---|
| Author | Cotswold Airport | |
| Reviewer | Merlin Aerospace Consulting Ltd | |

**Table of Contents**

Key References:

A. Kemble Stage 2, Step 2a- Design Options [for engagement].
B. Stage 2, Step 2a – Post Engagement Options Design Principle Evaluation
C. Stage 2, Step 2a – Post Engagement Options Design Principle Evaluation Document Review.
D. Stage 2, Step 2b – Options Appraisal (Phase 1 Initial)
E. Civil Aviation Authority CAP 1616, 2nd Edition– Airspace Design dated Nov 2018.
F. Department for Transport - Air Navigation Guidance 2017 dated Oct 2017.
G. Department for Transport – TAG Unit A3 – Environmental Impact Appraisal dated Dec 2015.
H. Summary of Stage 2a Engagement Feedback.
I. Cotswold Area of Outstanding Natural Beauty Management Plan 2018-2023.
J. Civil Aviation Authority CAP 1524 - Information on aviation's environmental Impact dated 2017.
K. Stage 3, Step 3b – Consultation Strategy

## STEP 3A – FULL OPTIONS APPRASIAL

### INTRODUCTION

1. This document forms part of the document set created in accordance with the requirements of the CAP1616 Airspace Change Process. It aims to provide enough evidence to satisfy the Full Options Appraisal output for the Consult Gateway, Step 3b. For both brevity and clarity, only a summary of the analysis and outcomes of these stages is repeated in this document, where appropriate, to aid understanding or provide context. To understand the option appraisal work conducted prior to this Step, the primary reference is the initial appraisal document (Step 2b).

### Scope

2. The scope of this ACP is to develop a defined approach for use by approved Pilot Based Navigation (PBN) operators that currently use Cotswold Airport (Kemble). The aircraft in-scope, in order of movements/anticipated usage are:

a. Corporate/business jets ranging in size from a Pilatus PC12 or Eclipse Jet sized aircraft to Gulfstream 650 sized aircraft.

b. Commercial private/business helicopter operators, such as the Queens Helicopter Flight.

c. CAT B-D (A320/B737 to A340/B747) aircraft currently arriving at Kemble for a Maintenance and Repair Organisation (MRO).

3. It is worth highlighting that these aircraft already operate in and out of Kemble; this is not new traffic, although a published approach will allow these operators to increase movements where weather or operational safety limitations would otherwise preclude. There is no current plan for this ACP to allow a noticeable increase in overall movements, use for general instrument training, nor to expand on our current aerodrome licence into public use.[1]

[1] As in CAT use beyond the current MRO usage.

## BACKGROUND

4. The sole aim of this proposal is to develop and publish a suitable PBN approach to support existing arrivals, as described in the scope at paragraph 3. Although they comprise only 1.4%[2] of Cotswold Airport's annual movements, these aircraft have a disproportionate positive economic impact on the airport and surrounding area of Gloucestershire and Wiltshire, generating around one third of Kemble's revenue, based on 2019 financial data (not included); Jet A1 fuel sales alone account for 27%[3]. They are essential to the continued economic viability of the Airport and MRO businesses.

5. These aircraft already arrive at Cotswold Airport by determining their own approach route visually, with no instrument approach or GPS positioning onto a straight in visual approach to land at the airport. It is anticipated that for those aircraft arriving in Instrument Meteorological Conditions or unable to approach the Airport due to their own operational limitations precluding a non-defined approach, this proposed PBN GPS approach will marginally increase the Airports annual movements by 0.36%[4]; it is suggested, a statistically any analysis of this very small changes is meaningless.

6. The main aims of this proposal are:

   a. To increase the Airport's operational capacity by allowing in-scope aircraft to land at the airport in bad weather and/or when their own operational procedures would otherwise preclude a landing at an airport without a defined approach. This is an economic benefit to both the airport and the local councils [5]own economic development plans.

7. The associated effect of these changes is to:

   a. Increase operational safety by reducing the potential risk of a mid-air collision by placing arriving in-scope aircraft onto a defined (and thus published) arrival route, which other aircraft will be aware of (through air chart markings) and thus should avoid the area, when active.

   b. Provide an obstacle cleared approach to the runway, which can be flown by suitably equipped in-scope aircraft.

   c. Reduce the scatter effect, and thereby the distribution of any environmental impacts, of in-scope aircraft arrivals to those areas overflown by the aircraft on this procedure.

8. From the original high-level requirement identified and articulated in the Statement of Need[8], the Design Principles (DPs) were developed and tested through engagement with identified local and aviation stakeholders during Stage 1 of the CAP 1616 process, which was agreed by the CAA at the Define gateway on the 26 Oct 2018. Continued engagement with stakeholders during Step 2a, allowed four options to be identified that met the Statement of Need and DPs. These were then analysed as part of an Initial Options Appraisal in Step 2b against the requirement and wider mandated criteria.

[2] Based on 2019 data of 28,598 movements of which 396 were in-scope movements: 1.384%.

[3] The bulk of which is in-scope aircraft.

[4] See Full Appraisal details at Page 8.

[5] Cotswold District, Wiltshire, Swindon Borough and Gloucestershire.

[8] The CAA agreed the stated need, which then became formal airspace change proposal in 2017.

9. Any options developed, must also be coherent with other localised changes of strategies. Geographically, this will include, engagement with the 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 Gloucestershire Airport will be affected by this airspace change. However, they will remain 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.

10. The Initial Options Appraisal was accepted by the CAA through the Stage 2 Develop and Assess gateway in Feb 2019. The appraisal and analysis concluded that two options remained viable. These options (1 and 2) met the statement of need, conformed to the design principles and addressed the concerns and risks highlighted through engagement with all stakeholders. Option 1 is a PBN approach with an extended centreline projecting out westwards from runway 08 and east from runway 26. Option 2 has the same approach to runway 08 and an extended centreline with a T-Bar (north and south projecting joins onto the extended centreline) onto runway 26. Both options were developed be compliant with international standards[9] and norms for approved PBN approaches and suitable for small corporate jets up to commercial airliner[10] arrivals for maintenance or recycling.

**Engagement and Consultation Strategy Summary**

11. **Further information is contained within the Consultation Strategy** (Reference K). Throughout this change proposal, the change sponsor has maintained a strategy centred on an overriding aim to ensure anyone who may be affected by this change can see, understand and comment on what is being proposed. As the Government's aviation regulatory body, the CAA[11] holds the change sponsor to account to follow CAA guidelines, airspace change methodology[12], process and internationally agreed standards for airspace design and safety. This process is satisfied through CAA gateway meetings, aligned to each stage.

**Scale of This Proposal**

12. As the table at Fig 1.0 shows, the in-scope movement numbers for aircraft that will use the proposed approach is statistically very low from the current baseline of these in-scope aircraft that already fly a visual approach into Kemble. In the spirit of CAP 1616, this ACP has been developed proportionally to match the circumstances. This is further developed in this Full Options Appraisal, although due to the nature of this proposal, in many areas of analysis, there is limited scope for a more detailed appraisal than was conducted for Step 2B, the initial Options Appraisal.

13. Using the latest airport statistics[13], extracted from system-generated reports of the Airport's Red Atlas[14] system, the Airport recorded 28,442 movements in the period 1 Jan to 16 Dec 2019, which is an unusually low year. 2018 recorded 31,562 movements over the same period. In 2017, the airport logged 32,698 movements and over the past 10 years,

[9] ICAO Document 8168

[10] Generally, Airbus A320 series and Boeing 737 series aircraft

[11] On behalf of the Department of Transport

[12] Civil Air Publication (CAP) 1616 – Airspace Design.

[13] Updated from that used in Stage 2 documentation.

[14] A bespoke airport software system that automates much of the accounting and charging from aircraft movement data entered by the Tower, under CAA regulatory audit, which also allows data interrogation for business analysis.

movements have been consistently between 31,000 and 34,000 movements per annum. It is worth noting that these annual movement statistics have, within 20% variance, been consistent since at least 1957[15] in RAF, USAF and now civilian use over the airfield's 82 years of operation[16]. The bulk of these annual movements are GA light aircraft, which in accordance with the Statement of Need[17] are out of scope of this airspace change proposal. The table at Fig 1.0 shows these movements, details the in-scope movements:

| Aircraft Classification | 2018 | | 2019 | |
|---|---|---|---|---|
| | Movements | % | Movements | % |
| Total Movements | 31562 | 100 | 28442 | 100 |
| GA (Rotary and Fixed Wing) **Out of Scope** | 31180 | 98.8 | 28046 | 98.6 |
| **In-Scope** Corporate/Business Jets and Helicopters | 360 | 1.1 | 376 | 1.3 |
| **In-Scope** CAT B-D MRO Aircraft | 22 | 0.1 | 20 | 0.1 |
| **Total In-Scope Movements** | **382** | **1.2** | **396** | **1.4** |

Fig 1.0 – Table Showing In-Scope movements Measured Against Total Annual Movements

14. Since both a take-off, circuit and landing is logged as a movement, this change proposal is concerned with defining an approach for arrivals (landings). Analysis, using an annual average, suggest half of all movements for In-Scope aircraft are arrivals, equating to a **baseline of 191 movements in 2018 and 198 in 2019 (0.6 and 0.7% respectively).**

15. During engagement at Step 2a, four design options were developed that met both the initial Statement of Need and the Design Principles, which were developed during Step 1b through engagement with all stakeholders. During Stage 2, these options were articulated at the macro level; chunks of airspace where we would like to move the aircraft to for an approach into Kemble. These options were then emailed to all stakeholders for comment. The four options are briefly listed below:

a. **Do Nothing Option**. Aircraft will continue to arrive at Kemble on pilot self-defined approaches, either from low level (under 7000ft) route or from the national airways system. 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 define their own route to final approach into Kemble. 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 was not considered a viable option**. It does provide a baseline from which to assess other options against the Design Principles criteria.

b. **Option 1**. Straight in approach to both runway 08 and 26 with Initial, Intermediate and Final approach Fixes. Placing aircraft within an area of extended

[15] Complied data at the Airport can only trace RAF movement data back to 1957, missing the first 20 years of its operational use. In particular, the Second World War where it is expected that movements numbers would have been significantlyhigher.

[16] Opened as RAF Kemble in 1937 as part of the RAF expansion period. A detailed history can be found at www.cotswoldairport.com

[17] CAP 1616 Stage 1 – Kemble ACP

centreline outwards from each end of the runway; the most basic option and one which still required pilots to fly from all directions to start the approach.

c. **Option 2**. For Runway 08, as per Option 1, due to the engagement feedback, primarily from Bristol and the Major Glider Sites to the West of Kemble. For Runway 26, a limited T-bar , both with Initial, Intermediate and Final Approach Fixes.

d. **Option 3**. Full T-bar approach to Runway 08 and 26, comprising Initial, Intermediate and Final Approach Fixes. This is the most standard design layout 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.

16. Following engagement at the end of Stage 2, Step 2a, these options were subsequently modified to take account of engagement feedback and specific working group meetings[22]. Option 3 and the Do Nothing were discounted as they did not align with the design principles and thus invalidated.

17. Despite Option 3 best meeting the Statement of Need, engagement and appraisal suggested this would deliver significant issues and resistance within the local airspace, particularly to the west of Kemble. In this area, two glider sites, with a good glider soaring ridge between them, creates a congested area of airspace, particularly during national gliding competitions. Placing a northern join leg to a 08 approach directly through this area of known traffic density may increase the risk of a mid-air collision between those gliders and any jet aircraft approaching Kemble and potentially disrupt long standing gliding operations. For this reason, this option caused significant concern to the two glider sites, and by transfer the British Gliding Association (BGA). Equally, this option had the potential to have the greatest impact on the Cotswold AONB, with the greatest distance of overflight, affecting their tranquillity mandate in their management plan

18. Options 1 and 2 were then subjected to Initial Appraisal in Step 2b, which was then agreed and accepted at the CAA's Develop and Assess Gateway on the 26 Feb 2019.

**FULL OPTIONS APPRAISAL – STEP 3A**

19. The operational concept for the change to how aircraft in the final approach segment has little variation between options. The magnitude of the proposed change is very small, meaning any statistically viable measurement is hard to gather, particularly when regarding the very small numbers of -In-scope aircraft (0.7%) measured against the total movements at the airport, let alone all local movements within Class G airspace. Variations against the baseline of visually self-positioning may result in some minor concentration of different noise and environmental effect around the initial and intermediate segments. Yet, for the final approach fix there will be an unquantifiable (very small) variance to horizontal and vertical paths from the baseline and thus minimal impact on the local community. For the local communities within the 4Nm final approach, we are not changing anything from the baseline of current operations.

20. Within the spirit and objective of CAP 1616, the sponsor has therefore elected to analyse the common environmental impacts on communities and wider society upfront where, for this very small number of aircraft movements, meaningful analysis using WebTag

[22] This is contained within this CAA portal site under Step 2a, Stage 2a Post Engagement Options Design Principle Evaluation.

A3 to understand $CO^2$ emissions, local air quality and tranquillity cannot be conducted due to the negligible change, if any. The remaining effects on airspace and airspace users will be appraised separately for each option.

21. Prior to conducting a full options appraisal on the remaining two options, the change sponsor contracted PILDO, a CAA Approved Procedure Design Organisation (APDO), to take the two options outputted from Stage 2 and transform them into international standard[23] instrument approach designs, capable of safely accommodating jet aircraft up to and including medium sized airliners[24] This work takes into account international and national regulations, aircraft speed, altitude and glide slope required to safely descend on low power settings[25]. These designs, through this CAP 1616 process have now evolved from the 'big chunks of airspace' on the map into specific flight paths - three dimensional lines on the map. This allows accurate appraisal and consultation on the proposed options.

**Cost Benefit**

22. The cost benefit appraisal is agnostic to proposed option; the benefit of delivering either defined approach articulated in this appraisal will deliver a net financial benefit to the Airport, with some marginal benefit to the local community as an economic ripple felt through increased hotel use, taxi use and potentially an increase in employment opportunities within the airport or MRO. Within the baseline, shown below in the table at Fig 2.0, with significant business development effort, the revenue has plateaued at £0.283M. The source data[26] is taken from our recorded 2018 and 2019 data for in-scope arrivals; the implementation figures account for the additional aircraft arrivals that were cancelled due to bad weather or operational limitations. This proposal will allow those aircraft to land.

23. Implementation is calculated that an increase in-scope landings from 198 to 251 per year, accounting for the current levels of cancellation and missed approaches due to weather or operational limitations not allowing the aircraft to land. Based on the paucity of similar sized GA aerodromes in the UK SW and the business demand within the Cotswolds area, it is estimated that a shift in growth will not occur until 2023 with 396 planned IAP arrivals, just over one per day. t is difficult to predict the scale of increase beyond 2025, the limiting factor is a current lac o hangar availability at the Airport, which means an in-scope aircraft are transiting rat her than based at the airport, which reduces revenue. Any New hangar build (in initial planning/consideration) requires significant capital investment.

24 . Engagement with Swindon Borough Council and Gloucestershire Council has suggested a strong opportunity link can be made between this proposal and their local council economic development plans (LEIP) to attract and develop national and international business through Kemble developing the capability to support as a business aviation transport hub. This provides synergistic benefits to Gloucestershire, Wiltshire and Swindon Borough Councils.

[23] International Civil Aviation Organisation (ICAO)

[24] Airbus A320 series and Boeing 737 series aircraft and the most likely largest aircraft flying the approach.

[25] Thus, minimising fuel burn and noise

[26] Airport's Red Atlas aircraft movement and accounting electronic system.

| Description | Baseline | | Implementation | | | Initial Growth | | | Growth with Hangar availability | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 |
| Estimated Number of in-scope IAP Landings | 191 | 198 | 251 | 251 | 251 | 396 | 396 | 396 | 487 | 487 | 487 | 487 |
| Discount Factor | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Net Community Benefit (£M) | 0 | 0 | 0 | 0.1 | 0.1 | 0.2 | 0 2 | 0.2 | 0.3 | 0 3 | 0.3 | 0.3 |
| Net Airspace Users Benefit (£M) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Net Sponsor Benefit (£M) | 0.283 | 0.283 | 0.348 | 0.348 | 0 348 | 0.567 | 0.567 | 0 567 | 0.635 | 0.635 | 0.635 | 0.635 |
| Value (£M) | 0.283 | 0.283 | 0.348 | 0.448 | 0.448 | 0.767 | 0.767 | 0.767 | 0.935 | 0.935 | 0 935 | 0.935 |

**Fig 2.0 Economic Analysis of the Impact of a Defined Approach against the Baseline.**

## Operational Design

25 . For all options, the matter of a hold[27] has been considered and the following is provided as the rational as to why a hold is unnecessary. The following safety-based argument has been presented to the CAA in the Bowtie safety questionnaire, which will be developed into a safety case for submission. The inclusion of a hold for the instrument procedures at Kemble had been evaluated at the very early stages of the design process and was assessed to be unnecessary and potentially unhelpful. Early engagement in the CAP 1616 process didn't include a discussion about a hold, particularly with the gliding community for the RW08 approach. To add a hold at this stage, would require re engagement and undermine the ACP process to date.

26 . CAP1122 makes but two passing references to ‘holds’ deliberately. It is guidance material for applicants to help enable them to propose a safe way to introduce new methods of navigation. ICAO PANS OPS Doc 8168 contains the “how-to-design' an approach. Based on the safety arguments to date, we have imposed our own limitations of 5 slots per day. Arrivals to the procedure are sequenced and regulated by slots which will be strictly enforced. The slot length is 30 minutes which allows for an initial approach of 8 minutes, followed by a missed approach of 12 minutes and finally a second approach of 8 minutes. The slot time starts when the inbound aircraft arrives at the initial approach fix. Slots are separated by a safety margin of at 30 minutes before and after to ensure that only one aircraft is using the procedure at any one time.

27 . A hold would serve no purpose for traffic flow management and integration:
The procedure is flown and managed by the pilot operating the aircraft as there is no approach control service sequencing and integrating traffic. Safe operation is achieved by ensuring that there is only one IFR aircraft per slot and all VFR arrivals and departures are stopped whilst the procedure is operation. There is no requirement for an IFR arrival to hold waiting for other traffic before commencing the procedure.

28 . A hold would cause unnecessary environmental impact: In the absence of an approach control service, aircraft would be required to fly the hold after a missed approach as the procedure would have to be flown as published, even if the preference was to return directly to the IAF. This would require the aircraft to fly more track miles, unnecessarily generating both noise and CO2 emissions and reduce fuel reserves further.

29 . A hold would be of limited use in the event of poorer than forecast weather:
The slot length limits the amount of time that the procedure is available to the inbound aircraft, at the expiry of the slot aircraft will be instructed that the aerodrome is no longer available to them. Should an aircraft choose to hold after a missed approach to wait for an improvement in the weather then it is extremely unlikely that it could complete a further

[27] A Hold or Holding procedure. A predetermined manoeuvre which keeps an aircraft within a specified airspace while awaiting further clearance. ICAO Doc 8168 Pans Ops Vol 1.

approach within the allotted time. Pre-application stakeholder engagement revealed that recovery operations from planned tasks required weather be considered, including remaining on the ground at departure aerodromes until an assured end to the flight was likely.

30. In the event of a sudden and unexpected deterioration in the weather towards company operating minima, their CAA approved Flight Operations Manual would dictate actions in the event of a missed approach. A hold would be of limited use in the event of unforeseen circumstances such as a blocked or contaminated runway, which would take time to resolve. In those circumstances it is extremely unlikely that an aircraft could hold and subsequently complete even a single approach within the allotted time slot.

## PROPOSED OPTIONS CONSIDERED

### Overview

31 . The viable options have been developed from those developed through engagement in Stage 1 and refined in Stage 2. Both remaining options, which meet the Statement of Need and Design Principles have been developed with a CAA IPDO, who specialise in PBN approaches. All option designs will be fully complaint with the ICAO standards and norms for both safety and aircraft performance. They will be rigorously flight checked before introduction.

32. Each option is intended for aircraft making an approach to Cotswold Airport from the national airway system or direct at low level (below 7000ft above the ground) from another airport. Both options follow a standard 8-mile approach, apart from Option 2 approaches from the east of Cotswold Airport, which include additional 5-mile legs from north and south to keep joining aircraft away from other airspace. Both options use the standard PBN design shown in the diagram above of an Initial, Intermediate and Final Approach Fix waypoints to allow the pilots to establish the aircraft laterally and vertically on a 3-degree glide slope 4.8 miles from Cotswold Airport at a height of between 1800 and 2000ft above the runway. This 3-degree glide slope is, again, ICAO compliant for the types of in-scope aircraft that would use this approach. This is shown on the included maps as a solid blue line. The dotted line is the route an aircraft would follow in the event that the aircraft cannot land[28] and will fly what is known as a missed approach to restart the approach procedure, back at the Initial Approach Fix.

33. Each option is described in the following pages, noting that both Options have the same design solution for an approach from the west onto Runway 08, which is a result of engagement with stakeholders so far and a limitation due to busy Bristol Airport controlled airspace to the south and an area of intense glider activity to the north. For all options, the matter of a hold[29] has been considered for the instrument procedures at Cotswold Airport and had been evaluated at the very early stages of the design process and was assessed to be unnecessary and potentially unhelpful following safety-based assessment.

[28] If the runway is block by another aircraft or incident or that the pilot's safety criteria cannot be met to safely land.
[29] A Hold or Holding procedure. A predetermined manoeuvre which keeps an aircraft within a specified airspace while awaiting further clearance. ICAO Doc 8168 Pans Ops Vol 1.

### Option 1 – Symmetrical Straight-In PBN Approach to both Runways

34 . **Description**. Following refinement through the initial appraisal and continued engagement with stakeholders, this option proposes a symmetrical straight in approach design, comprising Initial, Intermediate and Final approach fixes. This allows aircraft to follow a defined approach route from 8.6 miles out from the airport onto either runway 08 (Fig 3.0) approaching from the west, or runway 26 (Fig 4.0) approaching from the east, depending upon the runway in use.

35 . The aircraft would follow an ICAO standard 3-degrees glide slope, using minimum power settings to arrive onto final approach and touchdown. By design, this means the aircraft would be flown visually under own navigation, or under a radar service[30] to the Initial Approach Fix, 8.6 miles away from the airport at an altitude of 2300 feet and follow a straight in approach. A Final Approach Fix 4.8 miles away from the airport would confirm the aircraft is on the right track and at 2000ft (Rwy 08) or 1800ft (Rwy 26) . Depending upon the headwind, an in-scope aircraft would take between 3 ½ and 7 minutes to fly the entire approach[31].

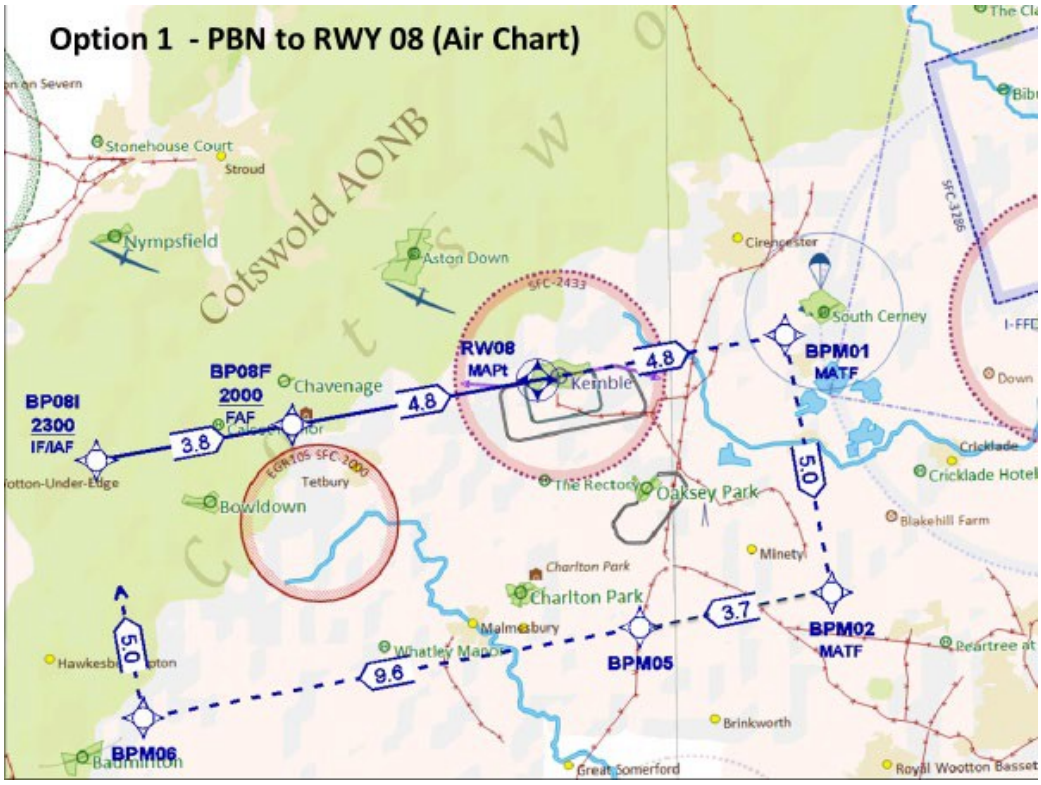


Fig 3.0 – Option 1 PBN approach (from the west) to Runway 08 (Common to Option 1 and 2)

[30] Currently an LOA agreement exists with RAF Brize Norton to provide this for the airports current in-scope arrivals.
[31] Assuming a ground speed of between 100 and 160 knots, depending upon the speed of the headwind and adding a 2-minute margin.

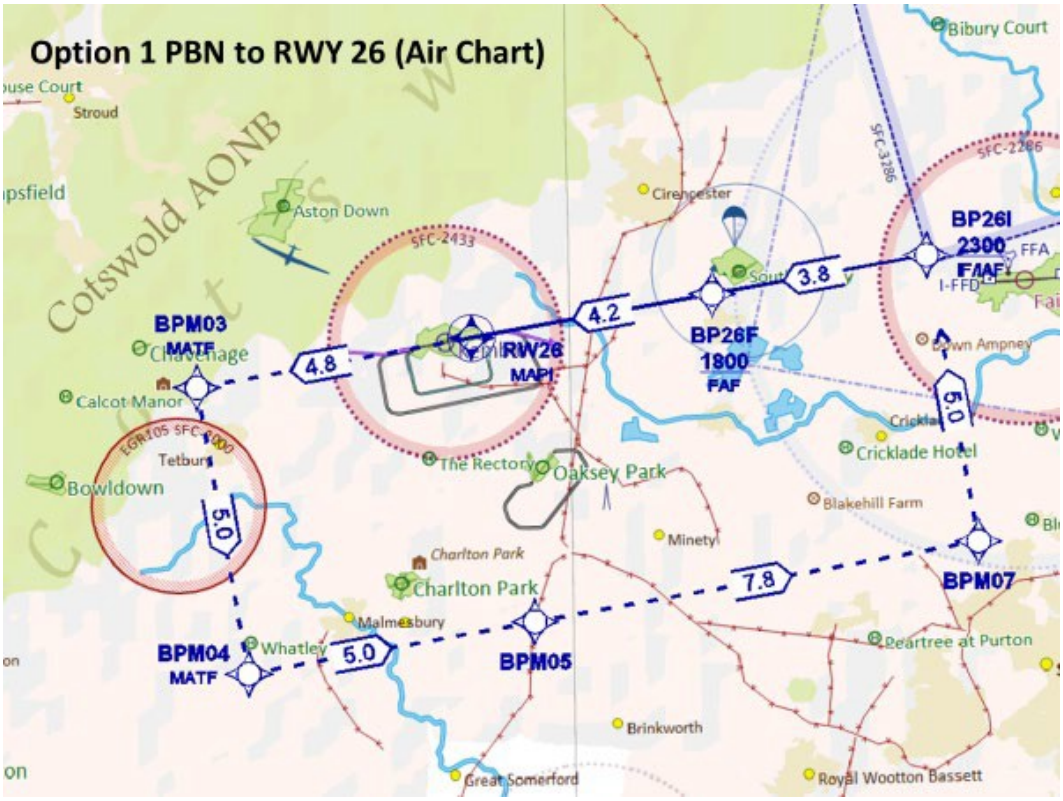


Fig 4.0 - Option 1 PBN Approach (from the east) to Runway

**Option 2 – Non-Symmetrical PBN Straight-in approach to Runway 08 and a T-Bar approach to Runway 26**

36 . **Description**. Following refinement through the initial appraisal and continued engagement with stakeholders, this option proposes a non-symmetrical approach design, which is a result of engagement and design development in Stage 2. Local airspace usage has driven this design development into a non-symmetrical approach; a product of successfully following the clear guidance in CAP 1616. This allows aircraft to follow a defined approach route from 8.6 miles out from the west of airport onto runway 08 (the same as Option 1 for an approach to runway 08, Fig 3.0). Aircraft arriving from the east onto runway 26 will join the approach from a northern or southern link to them line them up on the runway 26 centreline (Fig 5.0).

37 . The aircraft would follow an ICAO standard 3-degrees glide slope, using minimum power settings to arrive onto final approach and touchdown. By design, this means the aircraft would be flown visually, or under a service[32] to start the approach at an initial GPS fix, 8.6 miles away from the airport at an altitude of 2300 feet on the north or south leg to fly from the Initial Approach Fix (IAF) to the Intermediate Fix (IF) and then stabilise to the Final Approach Fix (FAF) to fly a straight in approach. A final approach fix 4.8 miles away from the airport would confirm the aircraft is on the right track and at 2000ft (Rwy 08) or 1800ft (Rwy 26). Depending upon the headwind, an in-scope aircraft would take between 3 ½ and 7 minutes to fly the entire approach[33].

[32] Most likely a LARS service, subject to capacity. Currently, an LOA agreement exists with RAF Brize Norton to provide this for the airports current in-scope arrivals.
[33] Assuming a ground speed of between 100 and 160 kts, depending upon the speed of the headwind and adding a 2-minute margin.

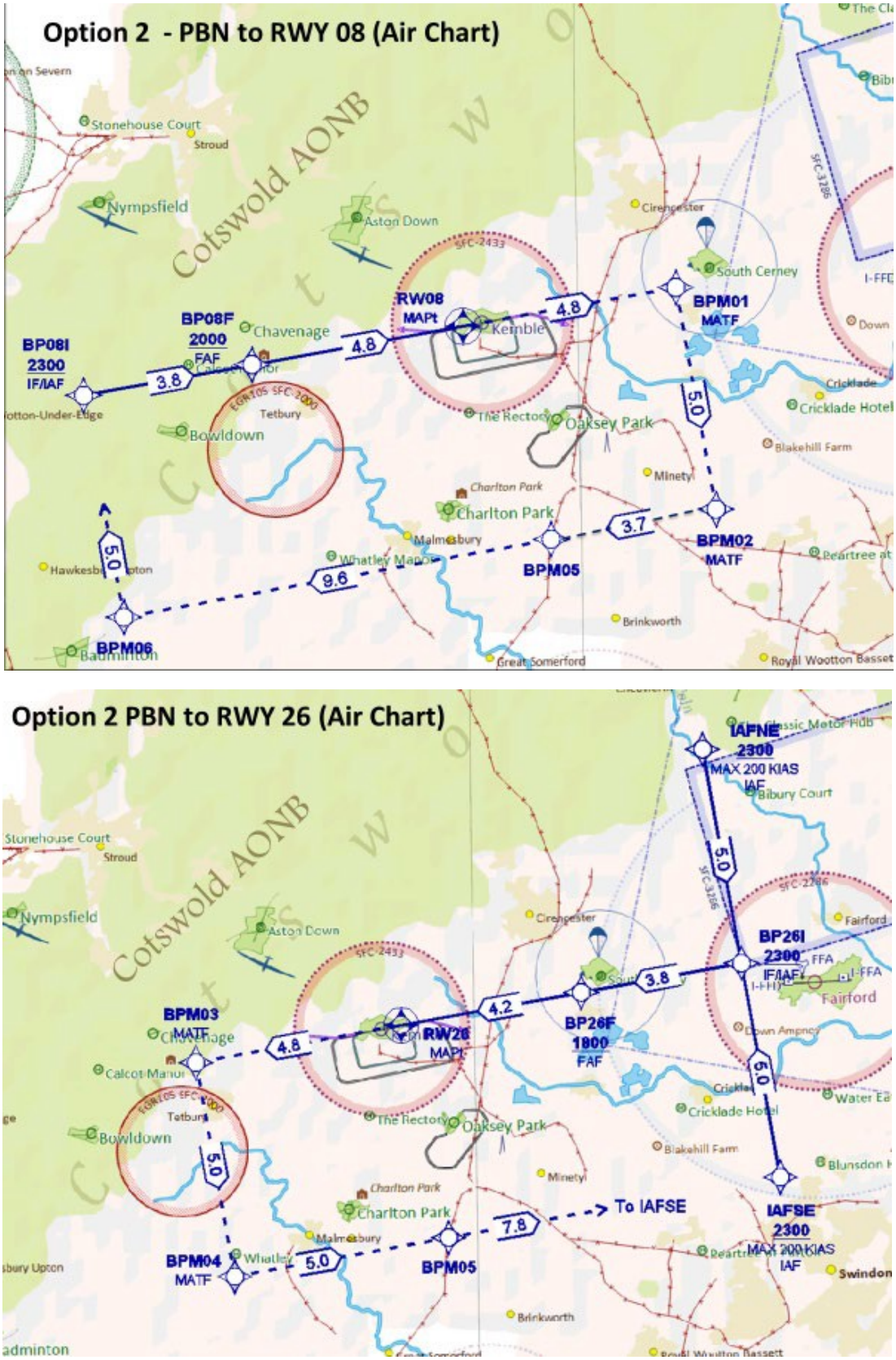


Fig 5.0 – Option 2 PBN T-Bar approach (from the east) to runway 26

38. Whilst considering the scalability and proportionality, as articulated in Appendix E to CAP 1616, analysis of these publications offers little guidance on quantitative analysis of this magnitude of change from the baseline, in this case 0.7% of current in-scope movements,

spread across two approach directions. Furthermore, manipulation of the data tools recommended for governmental related change has not provided any tangible metrics, detailed in paragraph 17.

39. Based on this, it is the change sponsors view that there is negligible effect on ground stakeholders; the predominate effect, however small, will be to other airspace users. The following community (noise and air quality impacts) and wider society (greenhouse gasses) factors for appraisal are therefore considered for both options; an qualitative assessment is between the baseline and a defined PBN approach and thus will be assessed up front once rather than stated twice for each option. This will then be followed by appraisal of Options 1 and 2.

## Analysis Common to Option 1 and Option 2

| Common Analysis for Both Options | | | |
|---|---|---|---|
| **Group** | **Impact** | **Level of Analysis** | **Description** |
| Communities | Noise Impact on health and quality of life | Qualitative | Government guidance, contained within CAA publications, the Air Navigation Order 2017 and the Department for Transport's quantitative analysis tools and estimate tools, such as WebTag A3. These tools generate as assess complex noise contours and detailed analysis of CO2 emissions and air quality over a 16hr day, for the significant volume of daily aircraft movements they receive. This impact has been the most demanding to analyse quantitively. Kemble is not an airport required to conduct noise assessment and profiles; central government mandates this for Heathrow, Gatwick and Stansted and other major commercial airports, operating continuous commercial aircraft within their own controlled airspace to do the same.<br><br>As a General Aviation airport, no noise data exists to provide a numerical baseline for in-scope aircraft arrivals. It is suggested that to attempt to measure the noise baseline of the 0.7% annually of current in scope aircraft arrivals, against the significant levels of background noise of light aircraft, both Kemble's other 99.3% of its movements and other local GA and military aircraft, operating continually in uncontrolled airspace on any self-defined routing would present significant challenges and it would be neither proportionate or provide any statistically meaningful data. Equally, the variance of in-scope arrivals is between 1 and 3 per day from a monthly average of 21 in-scope arrivals, on implementation of this proposal.<br><br>Within this context, particularly below 4000ft, it is suggested (with a high degree of confidence) that any noise readings, measuring dBA over a duration of 16hrs when the airport is closed for half of that period, will not change and any measurement would not deliver any statistically viable data that can then be used in WebTag analysis. Furthermore, the cost benefit of contracting an external company to do this would far outweigh any benefit of doing so. The latter has far reaching consequences; for small GA, non-commercial airports, most of which are just economically sustainable, would set a dangerous precedence that could push may out of business, contrary to the CAA and the APPG's strategy to build a resilient GA strategic network of airfields.<br><br>Without any viable quantitive data, a qualitive assessment of noise has been used to aid analysis; two factors have been considered: using local annoyance as an indicator of impact and the published noise benefits of a low power continuous descents. No complaints for aircraft noise related to in-scope aircraft in this proposal have ever been received.<br><br>Noise Benefits of Lower Power Continuous Descents. Back in 1976, when the impact of noise at Heathrow Airport was being investigated by the CAA. The result of this study was the key driver for the development of all today's approaches features continuous descent at low power settings. Whilst this has become the norm for all GPS approach designs today, without a defined approach, all visual self-determined approaches at Kemble are like the traditional approaches referred to in this paper. The suggestion was that a defined approach would deliver a 3dB noise reduction by implementing low power continuous descents, noting that this was based on 1970s aircraft engine noise, which has been significantly reduced by todays modern engines. Despite not having measured noise data, the benefits of a low power continuous descent, as proposed in this option, would deliver a reduction in noise against the current baseline. |

| Common Analysis for Both Options | | | |
|---|---|---|---|
| **Group** | **Impact** | **Level of Analysis** | **Description** |
| Communities | Overflight | Qualitative | There is no assessed effect on the local communities. The local area of the Cotswold area which is -scope for potential change in this ACP is sparsely populated. Narrowing the focus from the local Class G airspace and onto the defined approach, the bulk of the overflight between 4000 ft and down to 1000ft is over open countryside or sparsely populated hamlets/single dwellings. Under the aircraft tracks this proposal's IAP routing would create, there are no significant populations larger than a hamlet until after the final approach fix. The local villages (Kemble and Ewen to the east of Runway 26 and Ashley and Culkerton to the west of Runway 08) are within the final approach segment and within 2Nm from the end runway threshold. In both instances, there is assessed to be negligible changes to the vertical and horizontal final approach segment from the Final Approach Fix 4.8Nm from the Airport. This is further supported by the low numbers of in-scope aircraft on final approach (0.7%) in comparison to the remainder of the Airport's movement and wider transiting traffic within the surrounding Class G airspace. |

| Common Analysis for Both Options | | | |
|---|---|---|---|
| **Group** | **Impact** | **Level of Analysis** | **Description** |
| Communities | Tranquillity | Qualitative | The Cotswold Area of Outstanding Natural Beauty (AONB) is to the west of Kemble. The AONB authority were engaged during Step 1b and Stage 2, which highlighted 2 concerns within their Management Plan, namely Tranquillity and Dark Skies.<br><br>Both options took this into consideration during Stage 2. Kemble is not planning to operate at night, thus mitigating the Dark Skies consideration. Both options, following a straight in approach to runway 08, take the shortest route across the AONB at between 2000 and 2500ft. In contrast to the current baseline, with pilots on in-scope aircraft flying their self-determined visual approach, this is an improvement, see diagram 1.<br><br>Furthermore, the lower airspace (below 7000ft) above the Cotswold AONB is Class G airspace. A significantly higher number, by at least a factor of 100, of other aircraft will fly over the AONB, with perhaps as many as 2500 per month, based on Kemble's light aircraft movement. When accounting for all the smaller airfield and grass strips in the area and the two glider sites within the AONB, the number is significantly higher. All these movements contribute to overall aviation noise, overflight (visual intrusion) and air quality.<br><br>It is estimated that there will be no change in the levels of tranquillity and no quantitative assessment is made. |

| Common Analysis for Both Options | | | |
|---|---|---|---|
| **Group** | **Impact** | **Level of Analysis** | **Description** |
| Communities | Air Quality | Qualitative | Below 1800ft and at 4.8Nm from touchdown, there is no discernible difference concerning air quality in terms of the traffic distribution of in-scope aircraft between the baseline and this option. This is driven by required aircraft performance to fly a safe approach during the final approach segment. And whilst a defined approach with a low power continuous descent will reduce noise and emissions, the low utilisation of the small percentage of Kemble's movements will not deliver any measurable benefit at this altitude and distance; some benefit maybe realised above 1800ft in provide more efficient routing from the initial approach fix and from any transitional routing, although this is outside this ACP. |

| Common Analysis for Both Options | | | |
|---|---|---|---|
| **Group** | **Impact** | **Level of Analysis** | **Description** |
| Wider Society | Greenhouse gas impact | Qualitative | WebTag A3 could not provide any useful data for so few aircraft that this proposal aims to address. Using 2019's movement data, It is assessed that greenhouse gas metrics are not possible to measure given this scenario and there would be no discernible change in impact.<br>However, although unquantifiable, this concept would likely yield a positive Net Present Value which reflects a benefit i.e. a CO2 emissions reduction against the current baseline. Observation and ADS-8 tracking of aircraft have shown many approaching aircraft fly a stepped down visual approach at varying airspeeds and, in many instances, have flown lower than they would if an ICAO compliant GPS approach was followed. The environmental benefits of a defined approach using a Constant Descent Approach (CDA) and low power settings have been identified as early as 1978 (CAA Paper 78006). |

## Option 1 - Full Appraisal

| Option 1 - Symmetrical Straight-in approach to RWY08 and RWY26 | | | |
|---|---|---|---|
| **Group** | **Impact** | **Level of Analysis** | **Description** |
| General Aviation | Access | Qualitative | The Change Sponsor identified several activities at the start of this process and engaged with key stakeholders. In terms of GA, these have included the Gliding Communities, in particular BGGC at Nympsfield advised as c10k movements per annum and Cotswold Gliding Club at Aston Down, who advised c20k movements per annum, resulting in a new Letter of Agreement with Aston Down which is c3.5Nm NW of Kemble. This includes a Sailplane Accessible Area (SAA) in the underused NW quadrant of Kemble's ATZ to both assist in National Gliding Competitions and more importantly place all associated glider traffic away into a known area and from our extended centreline to RW08. Oaksey Park (GA grass unlicensed airfield) is to the SE of Kemble, who advised c15K movements per year. Due to the proximity of both Aston Down and Oaksey Park, we have open lines of communication. There are small grass strips within a 10Nm radius from Kemble, most with less than a handful of based aircraft. Additionally, most based GA aircraft route south from Kemble to a training area south of Lyneham. GA use of this airspace is dependent on weather conditions and seasonality but can be assumed to exist generally throughout the year, although less so in poor weather (IMC). This proposal is expected to cause a relatively low effect on GA users and on the 99.3% of Kemble's annual GA movements.<br><br>This option is within Class G airspace; none of the options change access to this airspace, nor seek to establish new areas of controlled airspace. It is acknowledged that a defined approach, even in Class G airspace, will create areas of avoidance, such as approach fans on an air chart and in the Kemble approach AIP plate entry would require careful Air Navigation Service Provider (ANSP) management and signed agreements between Kemble, RAF Brize Norton[34] and RAF Fairford to militate against any effect and associated risk.<br><br>We are proactively trying to eradicate an unhelpful chart symbology associated with South Cerney and its former use for parachuting which creates the false impression of a 1.2 Nm wide choke point, funnelling GA traffic between Kemble's ATZ and South Cerney. Both Kemble and Brize have raised this to DATM. This is of concern, since following approval, the AIRAC publication of the IAP will deliver feathered arrows on the chart. This is 7Nm aligned from each runway; for RW26 this is through the inactive marked paradropping site. |

[34] An LOA already exists with RAF Brize Norton, which support s this ACP Proposal.

| Option 1 – Symmetrical Straight-in approach to RWY08 and RWY26 | | | |
|---|---|---|---|
| **Group** | **Impact** | **Level of Analysis** | **Description** |
| General Aviation (Local Gliding) | Access | Qualitative | As a result of engagement for this proposal, a Letter of Agreement (LOA) has been signed to allow gliders to operate within a north quadrant of Kemble's ATZ, which both assists the gliders and places gliders operating in and out of Aston Down into a known area away from the extended centreline of Kemble's runways. Equally, a new LOA with RAF Brize Norton has been signed, detailing the provision of a radar service for in-scope aircraft, when capacity allows. To date, there has not been a period of arriving in-scope aircraft that is beyond RAF Brize Norton's capacity.<br><br>It is noted that this option is one favoured by the local glider community as it creates minimal impact to the west of Kemble and routes Kemble's in-scope approaching aircraft through an area of low utilisation by gliders. However, in the east of Kemble, it may exacerbate a known choke point between Kemble's ATZ and South Cerney aerodrome's parachute dropping zone |

| Option 1 – Symmetrical Straight-in approach to RWY08 and RWY26 | | | |
|---|---|---|---|
| **Group** | **Impact** | **Level of Analysis** | **Description** |
| General Aviation/ Commercial Air Transport | Economic impact from increased effective capacity | Qualitative | There are no air transport movements, passenger numbers or cargo carried as an outcome of this proposal. The Flight Plan options this proposal would introduce could allow Commercial Air Transport (CAT) to avoid capacity constrained areas and avoid consequential delay and cost. However, this is not quantifiable, and no specific capacity increase is assumed by this proposal.<br><br>The STARS and SIDS for both RAF Brize Norton and the STAR 7.3 (2D) and SID BADMIN 1X and WOTAN 1Z for Bristol. Analysis of the latter and discussion (as part of the ACP engagement, with minutes on the ACP site) with Bristol suggest STAR 7.3 is south of any Kemble SRD route and both relevant SIDs are above FL60 to join the airways at BADMIN and WOTAN above Kemble's extended centreline. The current proposed IAP has a IAF altitude of 2500ft QNH, underneath the WOTAN airways join. Subject to IAP design option (Pans Ops Doc 8168), both Bristol SIDS therefore have at least 2500ft vertical separation above any Kemble RW08 IAF traffic.<br><br>For RAF Brize Norton's STARS and SIDs, Their SRD has STARS from MALBY, SIREN (Along with MIMBI, HON, DTY and BCN). The current SRD for Kemble's traffic to and from airways is MALBY. The remaining STARS routes to Brize Norton are clear of Kemble IMC airways traffic. the only potentially conflicting SID is to MALBY for both RW09 and RW27. However, iaw our current LOA with RAF Brize Norton, Brize Radar provides a LARS service from Kemble's SRD route to de-conflict with their own traffic and to position for an approach to Kemble; Sector 23 will deconflict any traffic departing the airways at MALBY, iaw with SRD. We anticipate amending the LOA with RAF Brize Norton, with finalised proposed IAP designs during Stage 4 of the ACP to be more specific in the transition from SRD to IAF on the approach, for both RW08 and RW26. This may necessitate an SRD change of SRD to better provide the transition, iaw DOC 8168. Any non-airways traffic IFR traffic inbound to Kemble has a LARS service from RAF Brize Norton (within capacity) and may include an approach radar service through Brize Zone, if requested by the PIC. Current low-level Cat A and B, such as a PC12, arrives into Kemble VFR. The current proposed IAF for RW26 is set at 2300ft QNH. |

| Option 1 –Symmetrical Straight-in approach to RWY08 and RWY26 | | | |
|---|---|---|---|
| **Group** | **Impact** | **Level of Analysis** | **Description** |
| General Aviation/ Commercial Air Transport | Fuel Burn | Qualitative | It is not proportionate to attempt to monetise any fuel burn reductions created by this proposal, although it should be noted that the benefits of a defined approach with a constant low power descent decrease fuel burn whilst on the GPS approach, as reported by a CAA Paper. Equally, it is not proportionate, nor realistically possible to quantify or monetise any changes to GA fuel burn. |

| Option 1 –Symmetrical Straight-in approach to RWY08 and RWY26 | | | |
|---|---|---|---|
| **Group** | **Impact** | **Level of Analysis** | **Description** |
| General Aviation/ Commercial Air Transport | Fuel Burn | Qualitative | There are no training costs required for commercial operators to participate in the RNP approach as regulation No.539/2016 Performance Based Navigation (PBN) requires al pilots who fly PBN routes or procedures to have PBN endorsement on their licences from 25 August 2018 and instrument approach training for commercial pilots (both helicopter and fixed wing) is a mandated requirement.<br><br>It is therefore expected that all commercial operators using the RNP will have training aircrew/ Equally, the recent publication of Regulation (EU) No 1048/2018 it is expected that commercial operators will introduce LPV capabilities into their fleets; there may be small number so legacy aircraft arriving for the MRO, but this is likely to be single figures as most aircraft come straight from service. Given these assumptions, no quantitive assessment is made. |

| Option 1 – Sy metrical Straight-in approach to RWY08 and RWY26 | | | |
|---|---|---|---|
| **Group** | **Impact** | **Level of Analysis** | **Description** |
| Airport/Air Navigation Service Provider | Infrastructure Costs | Qualitative | There are no infrastructure (equipment) costs associated with the RNP approach. The only costs associated with the RNP approach are design and implementation costs:<br>• IAP Design<br>• IAP Validation<br>• Safety Assessment (Bow Tie)<br>• Airspace Change and Consultation<br>• Certification<br>• Own ANSP Training<br>• AIP publication<br><br>No quantitive estimate is provided for each component, as these are commercially sensitive. Overall, it is expected to be in the region of £1 00k, some of which will be reclaimed following DfT directives. |

| Option 1 - Symmetrical Straight-in approach to RWY08 and RWY26 | | | |
|---|---|---|---|
| **Group** | **Impact** | **Level of Analysis** | **Description** |
| Airport/Air Navigation Service Provider | Operational Costs | Qualitative | There cost of ownership of the RNP approach, supported by GPS is very low due to no physical infrastructure, in comparison to other conventional approaches, which require ground navigation infrastructure. It will require maintenance of the approach proceeded on a five-yearly basis, with a shorter periodicity in the implementation and validation phases. This is yet to be estimated, using data from similar aerodromes with an RNP approach, once they have been approved. The associated costs are expected to be relatively small. |

| Option 1 - Symmetrical Straight-in approach to RWY08 and RWY26 | | | |
|---|---|---|---|
| **Group** | **Impact** | **Level of Analysis** | **Description** |
| Airport/Air Navigation Service Provider | Deployment Costs | Qualitative | There are no deployment costs associated with the RNP approach. The only costs associated with the RNP approach are design and implementation costs:<br>• IAP Design<br>• IAP Validation<br>• Safety Assessment (Bow Tie)<br>• Airspace Change and Consultation<br>• Certification<br>• Own ANSP Training<br>• AIP publication<br>No quantitive estimate is provided for each component, as these are commercially sensitive. Overall, it is expected to be in the region of £1OOk, some of which will be reclaimed following DfT directives. |

| Option 1 - Symmetrical Straight-in approach to RWY08 and RWY26 | | | |
|---|---|---|---|
| **Group** | **Impact** | **Level of Analysis** | **Description** |
| Airport/Air Navigation Service Provider | Effect on other ANSPs/Airports | Qualitative | The only major commercial airport in this area is Bristol airport. Initial discussions with Bristol Airport during Stage 2 suggested there is no airspace impact of this proposal on Bristol Airport's operations; both options are the same for a 08 approach from the west and remain separated from Bristol's airspace and their arrival and departure routes.<br><br>Both RAF Fairford and RAF Brize Norton operate in the same airspace. The proposed approach to Runway 26 for Option 1 starts overhead of RAF Fairford's ATZ; this conversely applies to their aircraft approaching Fairford's runway 09 overhead Kemble's ATZ. Aircraft arriving at the Initial Approach Fix (IAF) for Kemble's runway 26 may require a zone transit through RAF Brize Norton's Class D airspace and RAF Fairford's MATZ, when activated by RAF Brize Norton. This is entirely dependent upon the route flown by the aircraft en-route to the IAF. Tactically, this is no different from the current baseline, except that it will focus aircraft onto a defined area/point. It will require a revised LOA with RAF Brize Norton (which is in course of preparation) and a new LOA with RAF Fairford, as they increase their operations; previously, this was included in the RAF Brize Norton LOA.<br><br>Option 1 has no interference with Gloucestershire Airport's ATZ or approaches. Assessing local unlicensed grass strips/airfields, Oaskey Park, just to the south of our ATZ, Chavenage, underneath and offset to the north of the approach track onto runway 08 will not be effected by this chance, for both, there is no change from the baseline for in-scope aircraft arriving into Kemble now and no difference for the remaining 99.3% of our movements for GA aircraft. This is all within Class G airspace.<br><br>For both options, analysis of glider movements, through discussions with both glider sites to the west of Kemble, deleted option 3 during Stage 2. This gives consideration for known areas of glider operations, does not constraint their movements and keep Kemble's inbound aircraft from the west onto a defined approach, an improvement, which has been developed jointly between the two glider sites and Kemble. Equally, a new LOA has just been signed between Aston Down (3.5 Nm NW of Kemble) and Kemble to allow gliders access to a Sailplane Accessible Area on the NW quadrant of Kemble's ATZ. This supports their operations, particularly for gliding competitions and keep gliders clear of the 08 approach. |

40. This proposal is interwoven with its supporting CAP 1122 Bow Tie safety arguments, which will be developed into the safety case for CAA approval. Noting this is agnostic to options and simply the safety argument for an PBN approach against the current baseline, below is a synopsis for Option 1.

41. There remains an inherent risk of a near miss (known as an Air Proximity Report (Airprox) or worse a mid-air collision (MAC) between high performance corporate jets or airliners arriving into Kemble flying self-defined approaches and a light aircraft flying in the vicinity of Kemble. Without creating a new area of controlled airspace around Kemble, an internationally compliant defined approach will create certainty for other airspace users and concentrate all in-scope arriving aircraft into established areas. ICAO publish Procedures for Air Navigation Services – Operations (PANSOPS). Currently Doc 8168 is the international guidance used by Instrument Approach Procedure designers to create pathways in the sky for aircraft to follow which bring the highest level of safety and regularity to all flights worldwide requiring an approach procedure; in this case for landing at Kemble.

42. For both runway approaches, this option proposes a conventional, symmetrical ICAO compliant, well understood straight in approach in the least used area of class G airspace, with very few reported Airprox incidents. This enables in-scope aircraft that currently arrive onto Kemble's runway 08 and 26 on a safer, compliant and defined approach, reducing the scatter and unpredictability, whilst in Class G airspace. In the west, this proposed option for a defined approach avoids any conflict to Bristol and Gloucestershire airport's operation and airspace and maintains separation between the two glider clubs and Kemble's approaching aircraft to runway 08. Although the Runway 08 approach is entirely within Class G airspace, annotated air chart symbology known as 'feathered arrows' or 'fan lines' would mitigate this risk, as is currently used for all other airports without an encompassing area of controlled airspace.

43. In the east, arrivals to runway 26 following the proposed design would need to transition either from airways or own navigation onto the IAF. This transition is no different from the baseline, until onto the IAF, aircraft would arrive either direct or by utilising a LARS service, if available, from RAF Brize Norton. The IAF is overhead RAF Fairford's airspace, within Class G; a modified LOA with RAF Brize Norton[55], would need to be supplemented with a LOA with RAF Fairford[56] to allow tactical level procedural agreements and communications to ensure separation between traffic in Fairford's ATZ and Kemble's RNP approach traffic. To mitigate, Kemble, Brize Norton and Fairford all have runways aligned east/west, so there should be no counter direction aircraft flying approaches to runways at Kemble, Fairford and Brize Norton. Although this sounds problematic, it has worked without incident for 10+ years for aircraft arriving to Brize Norton and Fairford's ILS and aircraft self-defining approaches to Kemble. This proposed, agnostic of option, will improve this by placing all aircraft onto known, published descent and approach routes.

**Summary of Option 1 Full Appraisal.**

44. On balance, appraisal of Option 1 indicates this as the most appropriate option, which meets the design principles. It is assessed to have negligible effect of ground stakeholders, and a positive safeguarding effect on Kemble's approach traffic, without causing interference with other ANSPs; it essentially replicated the current approach tracks but replaces visual own navigation with a defined approach. The addition of fan line annotations on cartography and alternative electronic devices[57] will create an area of avoidance for GA to safeguard Kemble's traffic, but this is not new and provides a degree of MAC risk mitigation where there currently is none and thus not assessed as having a net effect on GA access and routing.

45. Given the appraisal above, **Option 1 has been retained.**

[55] Signed prior to the Stage 3 Gateway.

[56] Now being developed, following a meeting with RAF Fairford ATM Manger 12 Jun 19.

[57] Sky Demon, Runway HD, Garmin Navigational Systems etc.

| Option 2 - Non-Symmetrical Straight-in approach to RWY08 and T-Bar to RWY26 | | | |
|---|---|---|---|
| **Group** | **Impact** | **Level of Analysis** | **Description** |
| General Aviation | Access | Qualitative | The Change Sponsor identified several activities at the start of this process and engaged with key stakeholders. In terms of GA, these have included the Gliding Communities, in particular BGGC at Nympsfield advised as c10k movements per annum and Cotswold Gliding Club at Aston Down, who advised c20k movements per annum, resulting in a new Letter of Agreement with Aston Down which is c3.5Nm NW of Kemble. This includes a Sailplane Accessible Area (SAA) in the underused NW quadrant of Kemble's ATZ to both assist in National Gliding Competitions and more importantly place all associated glider traffic away into a known area and from our extended centreline to RW0S. Oaksey Park (GA grass unlicensed airfield) is to the SE of Kemble, who advised c15K movements per year. Due to the proximity of both Aston Down and Oaksey Park, we have open lines of communication. There are small grass strips within a 10N m radius from Kemble, most with less than a handful of based aircraft. Additionally, most based GA aircraft route south from Kemble to a training area south of Lyneham. GA use of this airspace is dependent on weather conditions and seasonality but can be assumed to exist generally throughout the year, although less so in poor weather (IMC). This proposal is expected to cause a relatively low effect on GA users and on the 99.3% of Kemble's annual GA movements.<br><br>This option is within Class G airspace; none of the options change access to this airspace, nor seek to establish new areas of controlled airspace. It is acknowledged that a defined approach, even in Class G airspace, will create areas of avoidance, such as approach fans on an air chart and in the Kemble approach AIP plate entry would require careful Air Navigation Service Provider (ANSP) management and signed agreements between Kemble, RAF Brize Norton[59] and RAF Fairford to militate against any effect and associated risk. However, although within Class G, this option may have a small, but negative effect on GA access, when accounting for the current airspace and the local parachute dropping sites.<br><br>We are proactively trying to eradicate an unhelpful chart symbology associated with South Cerney and its former use for parachuting which creates the false impression of a 1.2 Nm wide choke point, funnelling GA traffic between Kemble's ATZ and South Cerney. Both Kemble and Brize have raised this to DATM. This is of concern, since following approval, the AIRAC publication of the IAP will deliver feathered arrows on the chart. This is 7Nm aligned from each runway; for RW26 this is through the inactive vet marked paradropping site. |

| Option 2 - Non-Symmetrical Straight-in approach to RWY08 and T Bar to RWY26 | | | |
|---|---|---|---|
| **Group** | **Impact** | **Level of Analysis** | **Description** |
| General Aviation (Local Gliding) | Access | Qualitative | As a result of engagement for this proposal, a Letter of Agreement (LOA) has been signed to allow gliders to operate within a north quadrant of Kemble's ATZ, which both assists the gliders and places gliders operating in and out of Aston Down into a known area away from the extended centreline of Kemble's runways. Equally, a new LOA with RAF Brize Norton has been signed, detailing the provision of a radar service for in-scope aircraft, when capacity allows. To date, there has not been a period of arriving in-scope aircraft that is beyond RAF Brize Norton's capacity.<br><br>It is noted that this option is one favoured by the local glider community as it creates minimal impact to the west of Kemble and routes Kemble's in-scope approaching aircraft through an area of low utilisation by gliders. However, in the east of Kemble, it may exacerbate a known choke point between Kemble's ATZ and South Cerney aerodrome's parachute dropping zone |

[59] An LOA already exist s with RAF Brize Norton, which support s this ACP Proposal.

| Option 2 – No -Symmetrical Straight-in approach to RWY08 and T-Bar to RWY26 | | | |
|---|---|---|---|
| **Group** | **Impact** | **Level of Analysis** | **Description** |
| General Aviation/ Commercial Air Transport | Economic impact from increased effective capacity | Qualitative | There are no air transport movements, passenger numbers or cargo carried as an outcome of this proposal. The Flight Plan options this proposal would introduce could allow Commercial Air Transport (CAT) to avoid capacity constrained areas and avoid consequential delay and cost. However, this is not quantifiable, and no specific capacity increase is assumed by this proposal.<br><br>The STARS and SIDS for both RAF Brize Norton and the STAR 7.3 (2D) and SID BADMIN 1X and WOTAN 1Z for Bristol. Analysis of the latter and discussion (as part of the ACP engagement, with minutes on the ACP site) with Bristol suggest STAR 7.3 is south of any Kemble SRD route and both relevant SIDs are above FL60 to join the airways at BADMIN and WOTAN above Kemble's extended centreline. The current proposed IAP has an IAF altitude of 2500ft QNH, underneath the WOTAN airways join. Subject to IAP design option (Pans Ops Doc 8168), both Bristol SIDS therefore have at least 2500ft vertical separation above any Kemble RW08 IAF traffic.<br><br>For this option, the northerly leg of the RWY 26 RNP approach does interfere with RAF Brize Norton's Class D airspace and will need an amended LOA agreeing to a zone transit to fly the initial to intermediate approach fix. This is subject to RAF Brize Norton's agreement, although with tactical coordination (that is already in place to service Kemble's current own navigation arrivals of in-scope aircraft) this would mitigate any effect on RAF Brize Norton's capacity, noting their relatively low levels of movements in comparison to other Class D airspace ANSP's, such as Bristol.<br><br>For RAF Brize Norton's STARS and SIDs, Their SRD has STARS from MALBY, SIREN (Along with MIMBI, HON, DTY and BCN). The current SRD for Kemble's traffic to and from airways is MALBY. The remaining STARS routes to Brize Norton are clear of Kemble IMC airways traffic. the only potentially conflicting SID is to MALBY for both RW09 and RW27. However, iaw our current LOA with RAF Brize Norton, Brize Radar provides a LARS service from Kemble's SRD route to de-conflict with their own traffic and to position for an approach to Kemble; Sector 23 will deconflict any traffic departing the airways at MALBY, iaw with SRD. We anticipate amending the LOA with RAF Brize Norton, with finalised proposed IAP designs during Stage 4 of the ACP to be more specific in the transition from SRD to IAF on the approach, for both RW08 and RW26. This may necessitate an SRD change of SRD to better provide the transition, iaw DOC 8168. Any non-airways traffic IFR traffic inbound to Kemble has a LARS service from RAF Brize Norton (within capacity) and may include an approach radar service through Brize Zone, if requested by the PIC. Current low-level Cat A and B, such as a PC12, arrives into Kemble VFR. The current proposed IAF for RW26 is set at 2300ft QNH. |

| Option 2 – Non-Symmetrical Straight-in approach to RWY08 and T-Bar to RWY26 | | | |
|---|---|---|---|
| **Group** | **Impact** | **Level of Analysis** | **Description** |
| General Aviation/ Commercial Air Transport | Fuel Burn | Qualitative | It is not proportionate to attempt to monetise any fuel burn reductions created by this proposal, although it should be noted that the benefits of a defined approach with a constant low power descent decrease fuel burn whilst on the GPS approach, as reported by a CAA Paper. Equally, it is not proportionate, nor realistically possible to quantify or monetise any changes to GA fuel burn. |

| Option 2 – Non-Symmetrical Straight-in approach to RWY08 and T-Bar to RWY26 | | | |
|---|---|---|---|
| **Group** | **Impact** | **Level of Analysis** | **Description** |
| General Aviation/ Commercial Air Transport | Fuel Burn | Qualitative | There are no training costs required for commercial operators to participate in the RNP approach as regulation No.539/2016 Performance Based Navigation (PBN) requires al pilots who fly PBN routes or procedures to have PBN endorsement on their licences from 25 August 2018 and instrument approach training for commercial pilots (both helicopter and fixed wing) is a mandated requirement.<br><br>It is therefore expected that all commercial operators using the RNP will have training aircrew/ Equally, the recent publication of Regulation (EU) No 1048/2018 it is expected that commercial operators will introduce LPV capabilities into their fleets; there may be small number so legacy aircraft arriving for the MRO, but this is likely to be single figures as most aircraft come straight from service. Given these assumptions, no quantitive assessment is made. |

| Option 2 – Non-Symmetrical Straight-in approach to RWY08 and T-Bar to RWY26 | | | |
|---|---|---|---|
| **Group** | **Impact** | **Level of Analysis** | **Description** |
| Airport/Air Navigation Service Provider | Infrastructure Costs | Qualitative | There are no infrastructure (equipment) costs associated with the RNP approach. The only costs associated with the RNP approach are design and implementation costs:<br>• IAP Design<br>• IAP Validation<br>• Safety Assessment (Bow Tie)<br>• Airspace Change and Consultation<br>• Certification<br>• Own ANSP Training<br>• AIP publication<br><br>No quantitive estimate is provided for each component, as these are commercially sensitive. Overall, it is expected to be in the region of £1 00k, some of which will be reclaimed following DfT directives. |

| Option 2 - Non-Symmetrical Straight-in approach to RWY08 and T-Bar to RWY26 | | | |
|---|---|---|---|
| **Group** | **Impact** | **Level of Analysis** | **Description** |
| Airport/Air Navigation Service Provider | Operational Costs | Qualitative | There cost of ownership of the RNP approach, supported by GPS is very low due to no physical infrastructure, in comparison to other conventional approaches, which require ground navigation infrastructure. It will require maintenance of the approach proceeded on a five-yearly basis, with a shorter periodicity in the implementation and validation phases. This is yet to be estimated, using data from similar aerodromes with an RNP approach, once they have been approved. The associated costs are expected to be relatively small. |

| Option 2 - Non-Symmetrical Straight-in approach to RWY08 and T-Bar to RWY26 | | | |
|---|---|---|---|
| **Group** | **Impact** | **Level of Analysis** | **Description** |
| Airport/Air Navigation Service Provider | Deployment Costs | Qualitative | There are no deployment costs associated with the RNP approach. The only costs associated with the RNP approach are design and implementation costs:<br>• IAP Design<br>• IAP Validation<br>• Safety Assessment (Bow Tie)<br>• Airspace Change and Consultation<br>• Certification<br>• Own ANSP Training<br>• AIP publication<br>No quantitive estimate is provided for each component, as these are commercially sensitive. Overall, it is expected to be in the region of £1OOk, some of which will be reclaimed following DfT directives. |

| Option 2 - Non-Symmetrical Straight-in approach to RWY08 and T-Bar to RWY26 | | | |
|---|---|---|---|
| **Group** | **Impact** | **Level of Analysis** | **Description** |
| Airport/Air Navigation Service Provider | Effect on other ANSPs/Airports | Qualitative | The only major commercial airport in this area is Bristol airport. Initial discussions with Bristol Airport during Stage 2 suggested there is no airspace impact of this proposal on Bristol Airport's operations; both options are the same for a 08 approach from the west and remain separated from Bristol's airspace and their arrival and departure routes.<br><br>Both RAF Fairford and RAF Brize Norton operate in the same airspace. The proposed approach to Runway 26 for Option 1 starts overhead of RAF Fairford's ATZ; this conversely applies to their aircraft approaching Fairford's runway 09 overhead Kemble's ATZ. Aircraft arriving at the Initial Approach Fix (IAF) for Kemble's runway 26 may require a zone transit through RAF Brize Norton's Class D airspace and RAF Fairford's MATZ, when activated by RAF Brize Norton. This is entirely dependent upon the route flown by the aircraft en-route to the IAF. Tactically, this is no different from the current baseline, except that it will focus aircraft onto a defined area/point. It will require a revised LOA with RAF Brize Norton (which is in course of preparation) and a new LOA with RAF Fairford, as they increase their operations; previously, this was included in the RAF Brize Norton LOA.<br><br>For this option, the northerly leg of the RWY 26 RNP approach does interfere with RAF Brize Norton's Class D airspace and will need an amended LOA agreeing to a zone transit to fly the initial to intermediate approach fix. This is subject to RAF Brize Norton's agreement, although with tactical coordination (that is already in place to service Kemble's current own navigation arrivals of in-scope aircraft) this would mitigate any effect on RAF Brize Norton's capacity, noting their relatively low levels of movements in comparison to other Class D airspace ANSP's, such as Bristol.<br><br>Option 2 has no interference with Gloucestershire Airport's ATZ or approaches. Assessing local unlicensed grass strips/airfields, Oaskey Park, just to the south of our ATZ, Chavenage, underneath and offset to the north of the approach track onto runway 08 will not be effected by this chance, for both, there is no change from the baseline for in-scope aircraft arriving into Kemble now and no difference for the remaining 99.3% of our movements for GA aircraft. This is all within Class G airspace.<br><br>For both options, analysis of glider movements, through discussions with both glider sites to the west of Kemble, deleted option 3 during Stage 2. This gives consideration for known areas of glider operations, does not constraint their movements and keep Kemble's inbound aircraft from the west onto a defined approach, an improvement, which has been developed jointly between the two glider sites and Kemble. Equally, a new LOA has just been signed between Aston Down (3.5 Nm NW of Kemble) and Kemble to allow gliders access to a Sailplane Accessible Area on the NW quadrant of Kemble's ATZ. This supports their operations, particularly for gliding competitions and keep gliders clear of the 08 approach. |

46. This proposal is interwoven with its supporting CAP 1122 Bow Tie safety argument, which will be developed into the safety case and presented to the CAA for approval. Noting this is agnostic to options and simply the safety argument for an PBN approach against the current baseline, below is a synopsis for Option 2. There remains an inherent risk of a near miss (known as an Air Proximity Report (Airprox) or worse a mid-air collision (MAC) between high performance corporate jets or airliners arriving into Kemble flying self-defined approaches and any light aircraft flying in the vicinity of Kemble. Without creating a new area of controlled airspace around Kemble, an internationally compliant defined approach will create certainty for other airspace users and concentrate all in-scope arriving aircraft into established areas. ICAO publish Procedures for Air Navigation Services – Operations (PANSOPS). Currently Doc 8168 is the international guidance used by Instrument Approach Procedure designers to create pathways in the sky for aircraft to follow which bring the highest level of safety and regularity to all flights worldwide requiring an approach procedure; in this case for landing at Kemble.

47. For both runway approaches, this option proposes a conventional, but non-symmetrical ICAO compliant, using commonly used PBN approaches designs of a straight in approach to runway 08 and a T shaped approach to runway 26. The track of both approaches has very few reported Airprox incidents. This enables in-scope aircraft that currently arrive onto Kemble's runway 08 and 26 on a safer, compliant and defined approach, reducing the scatter and unpredictability, whilst in Class G airspace. In the west, this proposed option for a defined approach avoids any conflict to Bristol and Gloucestershire airport's operation and airspace and maintains separation between the two glider clubs and Kemble's approaching aircraft to runway 08. Although in the 08 approach is entirely within Class G airspace, annotated air chart symbology (feathered arrows) would mitigate this risk, as is currently used for all other airports without an encompassing area of controlled airspace.

48. In the east, arrivals to runway 26 following the proposed design has standard T shaped joins north and south, allowing aircraft to transition on the IAF with minimal disruption and scatter in the area of RAF Brize Norton and Fairford, compared with the baseline. This transition is no different from the baseline, except further away from Kemble and at a higher altitude, until onto the IAF, aircraft would arrive VFR or IFR either direct or by utilising a LARS service, if available, from RAF Brize Norton.

49. The IF is overhead RAF Fairford's airspace; a modified LOA with RAF Brize Norton[74], would need to be supplemented with a LOA with RAF Fairford[75] to allow tactical level procedural agreements and communications. To mitigate, Kemble, Brize Norton and Fairford all have runways aligned east/west, so there should be no counter direction aircraft flying approaches to runways at Kemble, Fairford and Brize Norton. Although this sounds problematic, it has worked without incident for 10+ years for aircraft arriving to Brize Norton and Fairford's ILS and aircraft self-defining approaches to Kemble. This proposed, agnostic of option, will improve this by placing all aircraft onto known, published descent and approach routes.

**Summary of Option 2 Full Appraisal.**

50. On balance, appraisal of Option 2 indicates it meets the design principles, but it has the greatest (in relative terms against the baseline and option 1), potential impact on other GA air users and the most complex (from the two options) to implement and coordinate with other ANSPs. However, it does ensure transitions for in-scope Kemble traffic to the RWY 26 RNP approach are directed away from RAF Brize Norton, with the northerly leg close to the RAF Brize Norton NAXAT termination from their STARS routing from MALBY and aligning the Southern leg towards MALBY, noting MALBY is the national airways release point in the Standard Routing Document for Kemble arrivals.

51. Given the appraisal above, **Option 2 has been retained at this stage.**

[74] Signed prior to the Stage 3 Gateway.

[75] Now being developed, following a meeting with RAF Fairford ATM Manger 12 Jun 19.

**Conclusion and Next Steps**

52. Both options in this proposal has been developed following the submission of a Statement of Need, development of design principles and open development of the design through engagement during Stages 1 and 2. The specific challenges highlighted in the conclusion at Stage 2 have mostly been addressed; specifically, an updated LOA with RAF Brize Norton (taking into account this proposal), a new LOA with the gliding club at Aston Down and continued and expanded engagement opportunities with the local councils and RAF Fairford. These will continue to be developed throughout the consultation, as defined in the consultation strategy, with a view to providing the groundwork to fully develop the most suitable option in Stage 4, to a submittal proposed solution. The appraisal has highlighted that, there is little to separate the two options in terms of economic benefit or impact on safety or ground stakeholders. However, in terms of the impact of other airspace users and Airfields/ANSPs (RAF Brize Norton in particular), Option 2 has the greatest impact to the east of Kemble (arrivals to Rwy 26), without a proportionate comparative benefit over Option 1. **Therefore, whilst both meet the requirements in the Statement of Need, Design Principles and the outputs of engagement thus far, Option 1 is assessed as the most suitable and recommended option at this stage.**

53. In respect of safety, this proposal (agnostic of individual option) should satisfy the CAA of the safety in provision of air traffic services maintained the highest standards of safety for the following reasons:

a. The proposed PBN procedures for both options provide a safe method of landing an aircraft at Cotswold Airport in poor weather conditions, in terms of low cloud ceiling and visibility.

b. The proposed procedures will be designed in accordance with ICAO and CAA standards, customs and practices.

c. The procedure would be operated without a hold, due to a lack of air traffic service capability to safely manage traffic in a hold or in the vicinity of a hold.

d. it will be used very infrequently compared with the general level of traffic.

e. It will be used by aircraft types which already operate at the Airport.

54. The consultation strategy outlines the next steps for the consultation. The output of the consultation will indicate the level of support for this proposal as a whole and from the different stakeholder groups, their preferred option. Continual engagement has been at the heart of the evolution of these options, the CS does not anticipate this will change through consultation.

55. **Specific challenges**. For refinement, during and after consultation a few key actions rest with Kemble to progress in concert with this ACP. In no particular order these are: -

a. **RAF Brize Norton ACP**. Studying the Brize ACP, even as it was originally published, shows a number of positives around the proposed extension of Class D airspace towards and over Kemble. It was always understood that larger jet aircraft joining from the national airways system handled by NATS Swannick Centre, Sector 23 would be released to Brize radar at an airways waypoint coded MALBY. Radar control and hence separation from another participating a/c could only be given provided the inbound remained in CAS. This means, at present, there is a period before the landing a/c enters the Kemble ATZ when Brize radar cannot provide full radar control including collision avoidance. Should the CAA decide in favour of their ACP, even in its proposed modified size and shape, the situation for Kemble's traffic is still ameliorated. As a result, Kemble has already signalled its support via RAF Brize Norton's SATCO and will continue to do so through the Consultation.

b. **South Cerney Aerodrome choke point**. It's the responsibility of any aircraft commander to satisfy themselves the flight they intend to operate can be done so safely. Part of flight planning involves identifying areas to avoid marked on aeronautical charts as areas to be circumnavigated. A symbol on the chart denotes parachute dropping at South Cerney aerodrome that should be avoided and thus a false gap is created between Kemble's ATZ and South Cerney. Since handover to the Army there has been a steady decrease in activity at this site and no active paradrop or parachute units based there.

56. These options have been developed thus far with assistance, input, feedback and effort from senior representatives of the GA and local gliding communities, RAF Brize Norton and RAF Fairford staff and invaluable assistance and support from our local community airport liaison committee. Cotswold Airport thanks all these stakeholders and looks forward the opportunity for fuller engagement delivered by a formal consultation period to further the development of this proposal through to a successful outcome.

57. The next step is the Stage 3 Gateway Assessment planned for 31st January 2020. Subject to CAA approval, the Change Sponsor will initiate an 8-week public consultation on the proposal, commencing the 10th February 2020 and closing 6 April 2020.