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 2b Options Appraisal (Phase 1 Initial)

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. Civil Aviation Authority CAP 1616, 2nd Edition– Airspace Design dated Nov 2018.
E. Department for Transport - Air Navigation Guidance 2017 dated Oct 2017.
F. Department for Transport – TAG Unit A3 – Environmental Impact Appraisal dated Dec 2015.
G. Summary of Stage 2a Engagement Feedback.
H. Cotswold Area of Outstanding Natural Beauty Management Plan 2018-2023.
F. Civil Aviation Authority CAP 1524 - Information on aviation's environmental Impact dated 2017.

Step 2b – Initial Appraisal of Options

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 sufficient evidence to satisfy Stage 2 Develop and Assess Gateway, Step 2b Options Appraisal (Phase 1 Initial), including Safety Assessment.

2. Following engagement with identified stakeholders in Step 2a, Reference A, and subsequent evaluation of the engagement output, Reference B and C, the options were assessed against the Design Principles. All three options analysed have met the design principles criteria with some variation on their conformance, thus remain valid options at this stage. This document articulates the further analysis on the options against a standard set of assessment criteria, as detailed within Appendix E to Reference D, and Department of Transport derived guidance at References E and F.

Strategy

3. Throughout Stage 2 the strategy has been to identify the comprehensive list of suitable options, engage with stakeholders to generate discussion and views on those options and then to evaluate those options against the design principles established in Stage 1. Many stakeholders did not respond, despite follow up phone calls and emails. Most of those who did provided exceptionally useful feedback on our considered options from their perspective. In some cases, notably the local gliding community, local communities and RAF Brize Norton, subsequent follow up discussions and meetings took place to fully understand their concerns or suggestions. A summary of this engagement is at reference G.

4. This level of engagement allowed a fuller design principle evaluation of the three options, this is articulated in a Reference B, and details of engagement outputs summarised at Reference C. This level of evaluation allowed the proposal to be moved onto Step 2b where the initial assessment of options took place; this is articulated in this document. This initial appraisal allowed further analysis of the options against an established set of criteria designed to meet the guidance from the Department of Transport (DfT)and Civil Aviation Authority (CAA) and enshrined within Reference D. This analysis takes account of all the feedback from options engagement. Throughout, guidance has been considered to better understand the impact of this proposal on other airspace users and those affected on the ground, particularly on any environmental effects and on the Cotswold Area of Outstanding Natural Beauty (AONB), as detailed in Reference H.

5. Throughout this initial assessment, proportionality has been used, where appropriate, to aid assessment. It is worth re-articulating the scope of this proposed airspace change (the initial Statement of Need) and the balance of movements and airspace routes currently used by in-scope aircraft against all other airport movements.

Statement of Need

6. The statement of need was articulated and accepted in Stage 1, for clarity and to act as a guide to ensure continued conformance of the options with the original intent, it is set out below:

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 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.

***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.*

***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 decent 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.*

Current Airspace Description – Airspace Change Proposal In-Scope Aircraft

7. In 2018, the airport had 31,564 movements, consisting of all aircraft types from microlights to large airliners. In the previous year, the airport logged 32,698 movements. Over the past 10 years, movements have been consistently between 31,000 and 34,000

movements per annum. The bulk of these annual movements (99%) are out of scope of this airspace change proposal[1].

8. The remaining 1% are in-scope aircraft, which were logged in 2018 as 171 movements. Further analysis of these movements from the airport's air traffic logs show that 22 of these were airliner movements, of which only one departed again and the remainder dismantled and salvaged. Since both a take-off and landing is logged as a movement, this equates to 21 arrivals. Since this change proposal is concerned with defining an approach for arrivals, departures (take-offs) are out of scope. The remaining 149 were private corporate jets and commercial helicopters, this equates to an average of 75 corporate arrivals. Combined with the airliner arrivals, it totals to 96 arrivals throughout 2018. This is a comparatively small annual number, less than some large commercial airports receive in a single day. These 96 arrivals in 2018 is the baseline used and designing a defined approach for those aircraft is the purpose of this airspace change proposal.

9. Each year, the runway in use changes dependent upon the wind direction. In 2018, the Airport's Red Atlas system logged Runway 08 (aircraft approaching Kemble from the West) was used 45% of the year and annually accounted for 43 in-scope aircraft arrivals. Runway 26 (aircraft approaching from the East) was used 55% of the year, accounting for 53 in-scope aircraft arrivals.

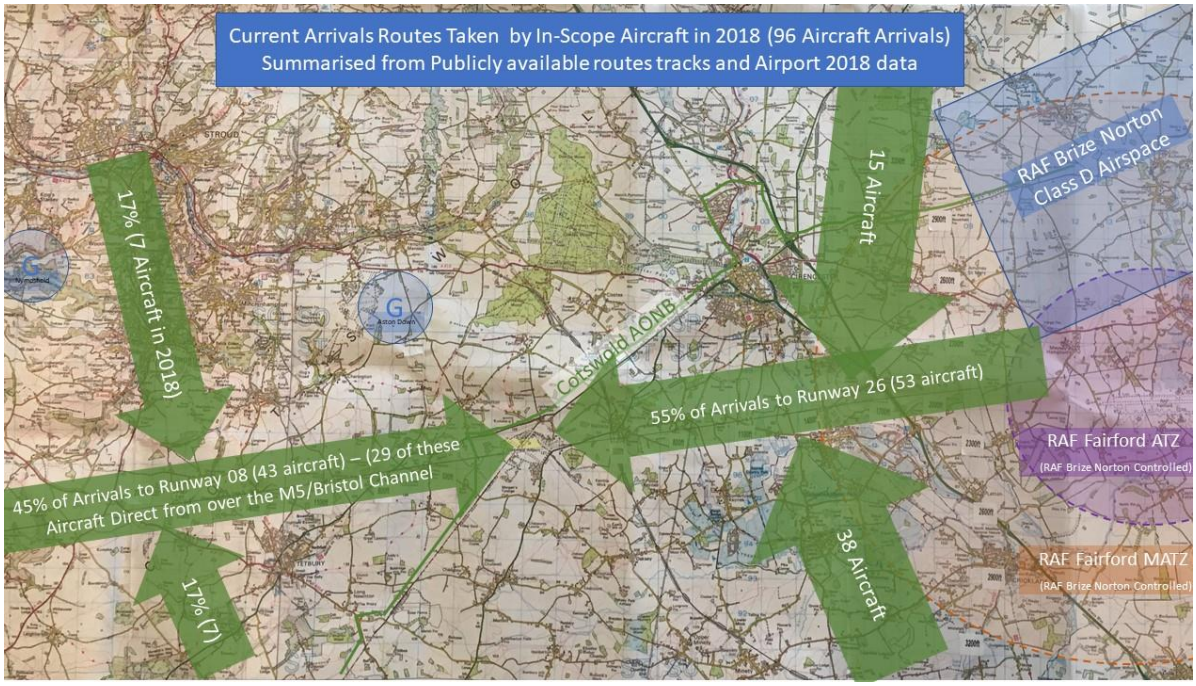


Fig 1.0 - A summary of arrivals routes flown by all in-scope aircraft in 2018.

10. The diagram shown at Fig 2.0 in the Step 2a engagement document shows the flight paths of in-scope aircraft for the months of November and December 2018. It illustrated the vast scatter of pilots defining their own arrival routes into Kemble. Kemble has no radar equipped air traffic unit, so this data has been extracted from publicly available flight tracking software[2] and cross checked against our own air traffic control logs.

11. The diagram at Fig 1.0 (above), shows the annual summary of flight arrival routes, when analysed with runway usage data. This provides an overarching summery of the

[1] 68% of all annual movements are light aircraft, 23% are microlights, and 8% are larger light aircraft.

[2] FlightRadar 24 and ADSB Exchange.

current main areas of overflight and airspace usage for jet aircraft. This is only for the arrivals of in-scope jet aircraft and some commercial helicopters. It does not include any departures, the other 31,000+ movements of smaller aircraft using Kemble, nor the other aircraft flying around this area using other airports, all of which is out of scope of this airspace change proposal.

12. In reference to Fig1.0, it is worth noting the current levels of overflight of the Cotswold AONB, more so when individual aircraft routes are shown. However, it is worth exploring the wider context as almost all the lower airspace, up to 7000ft above the Cotswold AONB is Class G (uncontrolled) airspace. A significantly higher number, by at least a factor of 100, of other aircraft will fly over here, with perhaps as many as 2500 aircraft a month, based on Kemble's light aircraft movements alone. When accounting for the many small private grass strips in the area, the two glider sites within the Cotswold AONB and Gloucestershire Airport, the number is significantly higher. All these movements contribute to noise, visual intrusion, overflight and air quality. Equally, considering the Cotswold AONB dark skies initiative on light pollution, the Statement of Need and thus Design Principles were developed without a requirement to increase the airport's opening hours, thus night operations and any impact on the Dark Skies initiative has been discounted.

13. In terms of airspace congestion, to the east of Kemble, all current arrivals fly through or over a locally known GA and glider choke point[3], between Kemble's ATZ and South Cerney airfield, marked on air charts as a parachute dropping site. It is infrequently used, and airspace users are notified by Notices To Airman (NOTAM), when activated by RAF Brize Norton. Many Kemble routing in-scope aircraft arriving to Runway 26 are assisted by RAF Brize Norton's radar services in some form[4], particularly those descending from the national airways system. Many are routed through RAF Brize Norton's current Class D controlled airspace before been vectored towards Kemble. However, not all GA and gliders contact RAF Brize Norton by radio whilst in this choke point area, nor are they required to. Equally, it is not assessed as a choke point in bad weather, known as Instrument Meteorological Conditions (IMC), when most GA aircraft[5] and gliders cannot fly. This choke point is always perhaps a little artificial and created by pilots completely avoiding South Cerney on the assumption it is always active. This is subject to a separate out of scope activity and has been highlighted to RAF Brize Norton. However, it currently remains an issue and must be considered in options development.

14. To the west of Kemble, analysis has highlighted that in-scope traffic is currently flying through an area of high concentration of glider traffic along the hills of the Stroud valley, particularly during gliding competitions. Of further note, post engagement meeting with the clubs from those two glider sites, highlighted that many ab-initio glider pilots soar along this ridge between the two sites.

15. As a small airport, mostly catering for General Aviation, no noise or air quality data exists to use as an assessment baseline. Government guidance, contained within Civil Aviation Authority publications[6], The Air Navigation Guidance 2017 and the Department for Transport (DfT)'s quantitative analysis and estimate tools, such as WebTAG A3[7], are used

[3] In aviation terms, a choke point is used to describe and 3-dimensional area of airspace, where surrounding areas of controlled airspace or ground hazards channel all aircraft into a certain area, usually restricted on each side and perhaps by controlled airspace above.

[4] Usually a Deconfliction or Traffic Service

[5] Unless the aircraft is suitably equipped for IMC operations and the crew is rated for instrument flying.

[6] CAP 1616 Airspace Design, CAP 1524 Information on aviation's environmental impact and Environmental Research and Consultancy Department publications on Environmental Metrics.

[7] https://www.gov.uk/government/publications/tag-environmental-impacts-worksheets

by larger commercial airports such as Heathrow to generate complex noise contours and detailed analysis of CO^2 emissions and air quality over a 16hr day for the significant volume of daily aircraft movements they receive. This is in stark contrast with the similar in-scope aircraft that Kemble's airspace change proposal seeks to address, where Kemble's current and forecasted in-scope jet arrivals are less annually, than the larger commercial airports receive in a day.

16. Whilst considering scalability and proportionality, as articulated in Appendix E to CAP 1616, analysis of these publications offers little guidance to quantitively appraise very low numbers of movements, in this case between 0 and 3 per day maximum, spread over multiple arrival routes, dependent upon option. Furthermore, manipulation of the data web tools available on the government websites has not delivered a tangible output. Contextually, against the unquantified baseline of the significantly larger number of aircraft movement across the same area, and minimal forecasted changes to traffic patterns for the in-scope aircraft, it is suggested that the cost benefit of contracting a specialist consultancy organisation to measure any changes created by this airspace change proposal would be disproportionate. Therefore, quantitative[8] measurements and monetising and impact it not considered suitable for this level of change; it is suggested only qualitative assessment will provide any useful metric for appraisal.

Comprehensive List of Options

17. All options developed in Step 2a remain viable options, at this stage and have been tested against the Statement of Need and Design Principles. These options articulated in Reference B, are then subjected to further analysis and appraisal throughout the remainder of this document to allow shortlisting of options for a Full Appraisal in Stage 3.

Options Appraisal (Phase 1 Initial)

18. The baseline (do nothing) option was discounted in Step 2a; it does not deliver any kind of improvement, nor deliver against the Statement of Need; thereby not meeting the Design Principles.

19. The three option concepts are briefly described below, and indicative operational diagrams are shown at the start of each option appraisal, depicting areas where each option places arriving aircraft for the approach. These options only include aircraft in the concept approach area, generally from 3-4000ft height above the airport's runway; aircraft routing to this approach area in Class G airspace between 4000ft and the base of the airways is not appraised but considered where appropriate.

a. **Option 1**. Placing aircraft within an area of extended centreline outwards approx.6 nautical miles (Nm) from the end of each runway; the most basic option.

b. **Option 2**. Placing aircraft within an area of extended centreline from the end of Runway 08 approx. 6 Nm, as per option 1. On Runway 26, extending an area out to the east approx. 6Nm, with northern and southern projecting joins in the form or a T shape of between 4 and 6 Nm on each extension.

c. **Option 3**. Placing aircraft within a T shape, off an extended centreline for both Runways 08 and 26. Both T's have a North and South join leg bringing aircraft onto a 6Nm extended centreline.

[8] Quantitative research generates numerical data of information that can be converted into numbers, qualitative research generates non-numerical data such as analysis, observation and documentary analysis.

20. As articulated in paragraph 16, it is neither proportionate nor feasible to include monetised values for cost appraisal of the effect of establishing a defined approach on communities or airspace users. Current lost revenue is the only quantifiable cost that can be forecasted against. Lost revenue can only be realised by a defined approach, the only deciding factor is the current baseline or a defined approach, independent of selected option. Therefore, the cost benefit appraisal is simply a bipolar analysis between a defined approach and the baseline.

21. Within the baseline of 96 in-scope arrivals during 2018, 19 planned arrivals from one operator were either cancelled or diverted due to bad weather, most of which could have landed safely with such a defined approach in place. Based on percentages of known operator movements, this has been forecasted in Table 1 (below) as net sponsor benefit. Of note, the area shaded in blue in the table, requires an additional capital investment in more hangars to exploit the full dividend of this proposal.

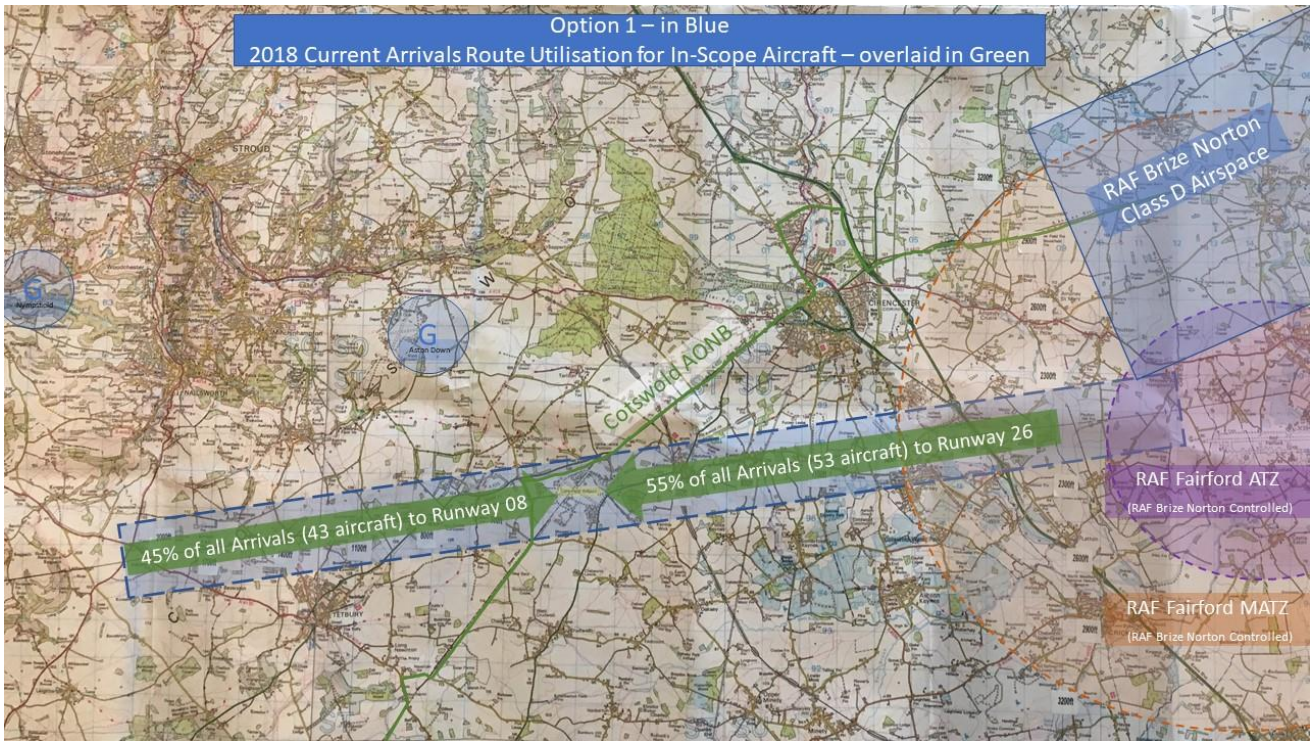
22. Change to estimated in-scope traffic are included within Table 1. These estimates deliver marginal growth in annual in-scope arrivals from 2021, which accounts for lost revenue only. It is estimated that it will be 2023 before significant increases occur, noting that this only equates to 133 aircraft arrivals per year. Forecasts to double the current number of in-scope arrivals from year 5 onwards require sequencing with releasing current hangars or building new hangars to allow in-scope private corporate jet aircraft to be based at Kemble.

	Current Growth Forecast based on lost Revenue										Additional forecasted growth delivered by new hangar availability											
	2019		2020		2021		2022		2023		2024		2025		2026		2027		2028		2029	
Annual Estimated No of In-Scope Arrivals	Runway 08	Runway 26	Runway 08	Runway 26	Runway 08	Runway 26	Runway 08	Runway 26	Runway 08	Runway 26	Runway 08	Runway 26	Runway 08	Runway 26	Runway 08	Runway 26	Runway 08	Runway 26	Runway 08	Runway 26	Runway 08	Runway 26
	43	53	43	53	57	70	57	70	60	73	86	106	86	106	86	106	86	106	86	106	86	106
Discount Factor	1		1		0.965		0.965		0.931		0.931		0.899		0.899		0.867		0.867		0.837	
Net Community Benefit £m	0		0		0		0		0		0		0		0		0		0		0	
Net Airspace Users Benefit £m	0		0		0.1		0.1		0.2		0.2		0.3		0.3		0.4		0.4		0.5	
Net Sponsor Benefit £m	0		0		0.055		0.055		0.066		0.171		0.171		0.17		0.171		0.171		0.171	
Present Value £m	0.171		0.171		0.226		0.226		0.237		0.342		0.342		0.342		0.342		0.342		0.342	

Note: figures are in £m . The table shows estimated overall revenue increases for a defined approach, including additionally fuel uplift and parking associated with increasing arrivals on in-scope aircraft.

Table 1 – Cost Benefit Appraisal – Option Independent

Option 1 - Initial Appraisal



Group	Impact	Level of Analysis	Evidence
Communities	Noise impact on health and quality of life	Qualitative	Changes to in scope air traffic patterns below 7,000ft account for 1% of the airport's annual movements. The potential noise impacts caused by a very small number (no more than 3 per day maximum) of non-commercial jet flights, descending from above 7000ft at certain times under certain conditions, is neither measurable nor describable, particularly against the wider baseline of the remaining 99% of movements. It is assessed that noise metrics are not possible to measure given this scenario and there would be no discernible change in impact. In comparison to the baseline, observation and ADBS tracking of aircraft have shown many approaching aircraft fly a stepped down approach and, in many instances, have flown lower visual approach than they would if an ICAO compliant GPS approach was adopted. The environmental benefits of a defined approach using a Constant Descent Approach and low power settings have been identified as early as 1978 (CAA Paper 78006). We assess that using this low power CDA approach would reduce the overall noise impact within the area defined for a GPS approach. However, in comparison to the Options 2 and 3, this option delivers the shortest defined approach, in terms of Nm and area overflown) and therefore it is suggested would deliver the lowest reduction in noise impact against the current baseline.
Communities	Air quality	N/A	No changes below 1,000ft. At 1000ft (2-3Nm) those in-scope aircraft would follow the same routing as the current baseline.

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 2018's movement data, 53 aircraft approached from the East to land on Kemble's runway 26 and 43 approaches from the West onto runway 08. It is assessed that greenhouse gas metrics are not possible to measure given this scenario and there would be no discernible change in impact. However, although unquantifiable, this concept would Likely yield a positive Net Present Value which reflects a benefit i.e. a CO_2 emissions reduction against the current baseline. Observation and ADS-B 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 and low power settings have been identified as early as 1978 (CAA Paper 78006) In comparison to Options 2 and 3, this option delivers the least reduction against the current baseline, since it provides for the smallest area/shortest defined approach length where a CDA would be applied.
Wider society	Capacity/ resilience	Qualitative	Increased flight planning options can allow aircraft operators to avoid capacity-constrained areas.
General Aviation	Access	Qualitative	This proposal is within Class G airspace and 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, when the approach is active and would require careful Air Navigation Service Provider (ANSP) management between Kemble and RAF Brize Norton to militate against this risk. 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 officially termed Instrument Meteorological Conditions (IMC). This proposal is expected to cause a relatively low impact on GA users and on the 99% of Kemble's annual GA movements. Analysis of engagement feedback has suggested a positive response from the GA and glider communities in placing these larger aircraft into a defined or known areas, whilst they are arriving into Kemble. They noted that this is not permanent and that the approach is likely to only be active up to 3 times a day (worst case) and only on one runway. We contend that, although in Class G, this reduces the potential Mid Air Collision (MAC) risk from the current baseline. When assessed against Options 2 and 3, this option delivers the least certainty to GA users when jet and airliners are approaching Kemble. 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. All four options could account for the establishment of a notifiable segregation mechanism to identify when the approach is active, either through ANSP or direct communications with other ANSPs, further mitigating potential effects on GA access.
General Aviation/ commercial airlines	Economic impact from increased effective capacity	N/A	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.

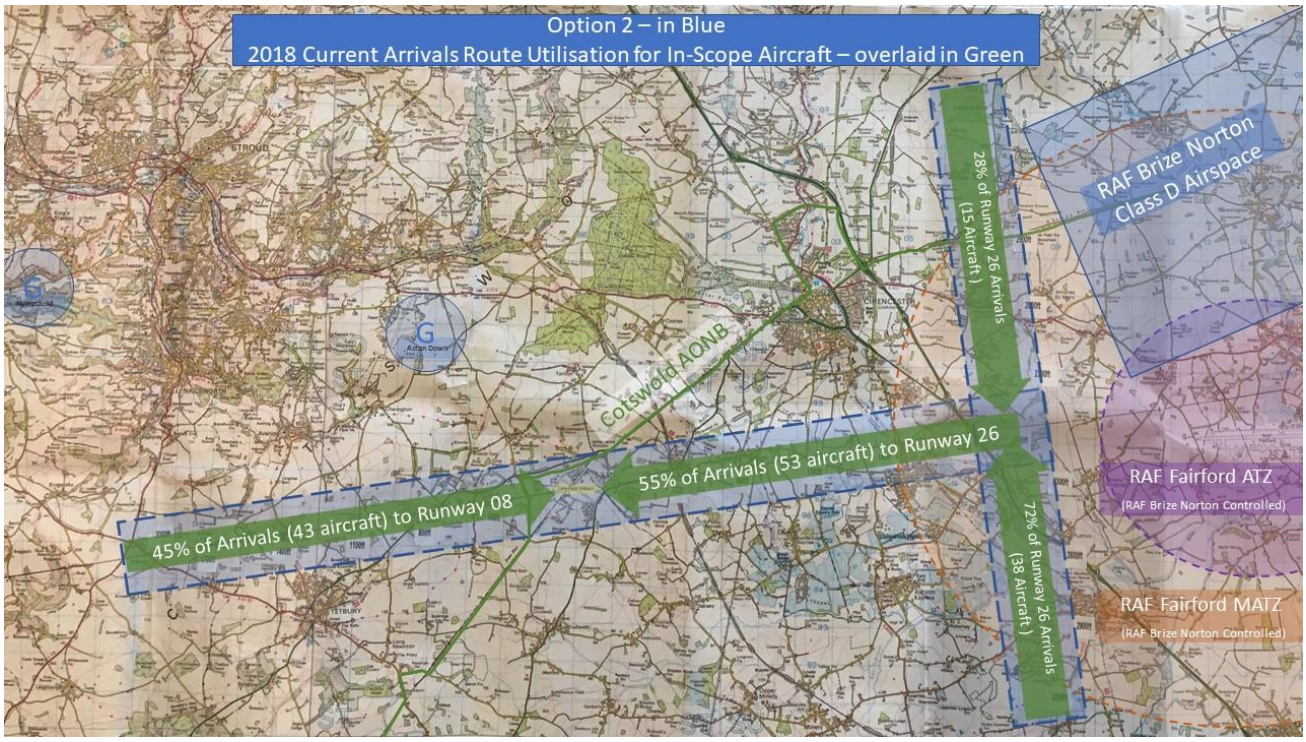
General Aviation/ commercial airlines	Fuel burn	N/A	It is not proportionate to attempt to monetise any fuel burn reductions created by this proposal. Equally, it is not proportionate, nor realistically possible to quantify or monetise any changes to GA fuel burn.
Commercial airlines	Training cost	N/A	It is not proportionate to attempt to quantify airline training costs.
Commercial airlines	Other costs	N/A	There are no other known costs which would be imposed on commercial aviation.
Airport/ Air navigation service provider	Infrastructure costs	N/A	There would be no costs attributable to infrastructure.
Airport/ Air navigation service provider	Operational costs	N/A	This proposal would not lead to changes in operational costs.
Airport/ Air navigation service provider	Deployment costs	Qualitative and quantitative	The current baseline utilises an LOA and strong relationship between Kemble and RAF Brize Norton to provide a radar service for the larger jet aircraft leaving the national airways system and descending on an approach into Kemble. This option does overly RAF Fairfield's Aerodrome Traffic Zone (ATZ) and requires permission to transit through the Fairford MATZ, when activated. Fairford's traffic is controlled by RAF Brize Norton's ATC, so although achievable through a revised LOA it may require resourcing, which is not supported by the MoD (from engagement with them this option was not supported). It also does not account for RAF Brize Norton's own planned airspace change, nor any already announced planned operational/capacity increases at RAF Fairford. NB Cotswold Airport cannot quantify training costs for other ANSPs such as RAF Brize Norton; however, their acceptance of this proposal is a high-priority design principle. This proposal cannot be introduced without their agreement through an updated LOA, but this proposal does not require a guaranteed level of ANSP support from the MoD. We contend there is negligible training costs, and these are acceptable to these agencies.

Summary of Option 1 Initial Appraisal.

23. On balance, appraisal of Option 1 indicates that although it meets the design principles, it would deliver minimal reductions in the environmental impact of in-scope aircraft arriving at Kemble. Additionally, it does not fully address the GA expressed concern that would allow these aircraft to be placed into known areas throughout their approach; it still requires self-defined north and south routing to intercept the start of the extended centreline approach. Equally, it does create friction and potentially exacerbate a known GA and glider choke point, particularly when RAF Brize Norton's airspace change proposal is accounted for, which may place an altitude cap over this choke point, further squeezing dissimilar aircraft into a smaller space. However, to the west of Kemble, it does conform to the engagement feedback received from the local glider community.

24. This remains a viable option but needs significant refinement in this area between Kemble and RAF Fairford/Brize Norton during Stage 3.

Option 2 - Initial Appraisal



Group	Impact	Level of Analysis	Evidence
Communities	Noise impact on health and quality of life	Qualitative	Changes to in-scope air traffic patterns below 7,000ft account for 1% of the airport's annual movements. The potential noise impacts caused by a very small number (no more than 3 per day maximum) of non-commercial jet flights, descending from above 7000ft at certain times under certain conditions, is neither measurable nor describable, particularly against the wider baseline of the remaining 99% of movements. It is assessed that noise metrics are not measurable given this scenario and there would be no discernible change in impact. In comparison to the baseline, observation and ADS-B tracking of aircraft have shown many approaching aircraft fly a stepped down approach and, in many instances, have flown lower visual approach 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). We assess that using this low power CDA approach would reduce the overall noise impact within the area defined for a GPS approach. Utilising a T shape for runway 26, in addition to the straight line for 08, as per option 1, would reduce the overall number of people overflown to the east of Kemble, where the current baseline tracks shown the most scatter. However, this may increase overflight and visual intrusion for some as the tracks are concentrated onto a defined approach. Beyond option 1, there is no further change to the effect on AONB tranquillity, as approaches to runway 26 are mostly outside the AONB boundary and approaches to 08, would fly directly across one of the shortest points between the AONB boundaries. It is suggested, the low number of current and forecasted movements will mitigate this.
Communities	Air quality	N/A	No changes below 1,000ft. At 1000ft (2-3Nm) those in-scope aircraft would follow the same routing as the current baseline.

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 2018's movement data, 53 aircraft approached from the East to land on Kemble's runway 26 and 43 approaches from the West onto runway 08. It is assessed that greenhouse gas metrics are not possible to measure given this scenario and there would be no discernible change in impact. However, although unquantifiable, this concept would likely yield a positive Net Present Value which reflects a benefit i.e. a CO_2 emissions reduction against the current baseline. Observation and ADS-B 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 and low power settings have been identified as early as 1978 (CAA Paper 78006) In comparison to Options 1 and 3, this option delivers the same unquantified reduction to the West of Kemble but additionally, would deliver a significant reduction to the East, where the T shape provides an opportunity for Constant Descent Approach from around 3500-4000ft, thus reducing power settings and decreasing the number of throttle changes.
Wider society	Capacity/ resilience	Qualitative	Increased flight planning options can allow aircraft operators to avoid capacity-constrained areas.
General Aviation	Access	Qualitative	The first two paragraphs from option 1 also apply to this option. This option provides the best compromise between the benefits of options 1 and 3. By concentrating all arrivals onto runway 26 into the T shape, it provides the most certainty (the same as option 3) to the GA and glider operating between Kemble and Brize Norton, and importantly in the choke point between South Cerney and Kemble. Equally, in the west for arrivals to Kemble's runway 08, it does not intersect known areas of glider concentration (north of the option's airspace concept area and importantly between the two glider sites of Nympsfield and Aston Down, as highlighted in the Step 2a engagement feedback table).
General Aviation/ commercial airlines	Economic impact from increased effective capacity	N/A	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.
General Aviation/ commercial airlines	Fuel burn	N/A	It is not proportionate to attempt to monetise any fuel burn reductions created by this proposal. Equally, it is not proportionate, nor realistically possible to quantify or monetise any changes to GA fuel burn.
Commercial airlines	Training cost	N/A	It is not proportionate to attempt to quantify airline training costs.
Commercial airlines	Other costs	N/A	There are no other known costs which would be imposed on commercial aviation.
Airport/ Air navigation service provider	Infrastructure costs	N/A	There would be no costs attributable to infrastructure.
Airport/ Air navigation service provider	Operational costs	N/A	This proposal would not lead to changes in operational costs.

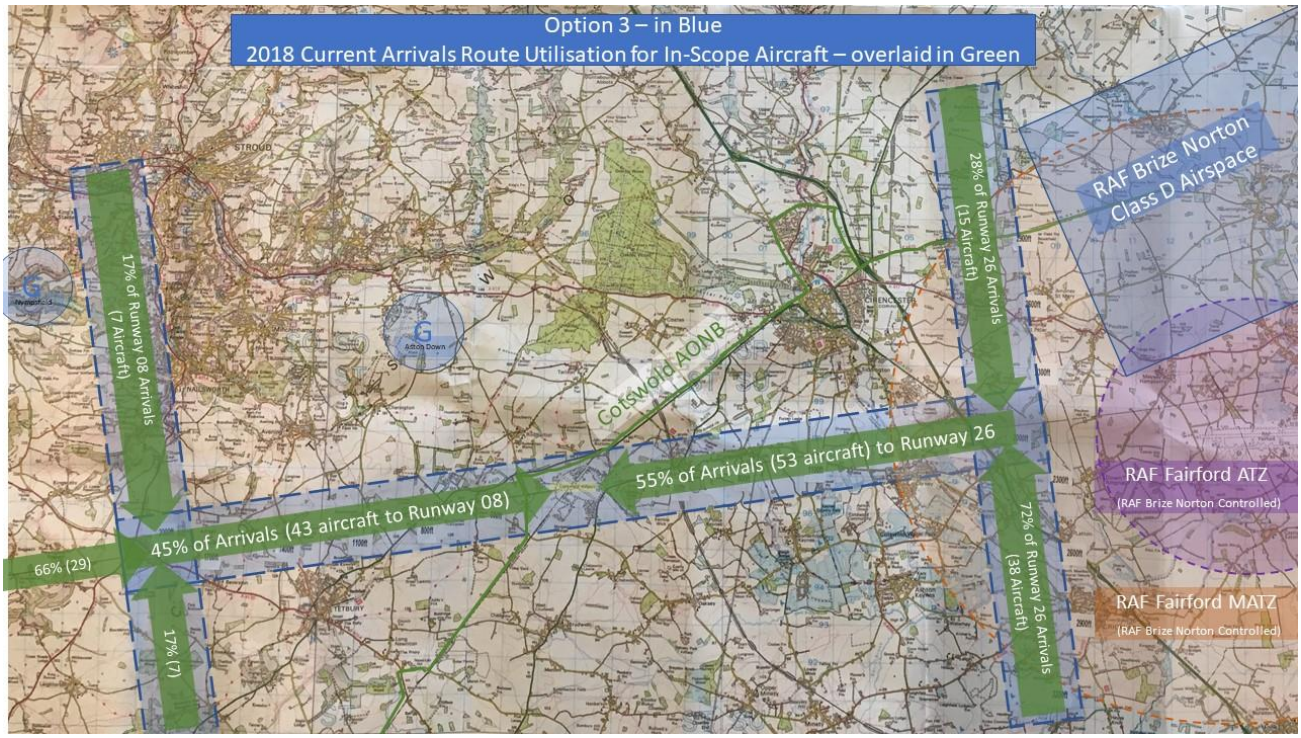
Airport/ Air navigation service provider	Deployment costs	Qualitative	The current baseline utilises an LOA and strong relationship between Kemble and RAF Brize Norton to provide a radar service for the larger jet aircraft leaving the national airways system and descending on an approach into Kemble. This option does overly RAF Fairfield's Aerodrome Traffic Zone (ATZ) and requires permission to transit through the Fairford MATZ, when activated. Fairford's traffic is controlled by RAF Brize Norton's ATC, so although achievable through a revised LOA it may require resourcing, which is not supported by the MoD (from engagement with them this option was not supported). It also does not account for RAF Brize Norton's own planned airspace change, nor any already announced planned operational/capacity increases at RAF Fairford. NB Cotswold Airport cannot quantify training costs for other ANSPs such as RAF Brize Norton; however, their acceptance of this proposal is a high-priority design principle. This proposal cannot be introduced without their agreement through an updated LOA, but this proposal does not require a guaranteed level of ANSP support from the MoD. We contend there is negligible training costs, and these are acceptable to these agencies.

Summary of Option 2 Initial Appraisal.

25. On balance, appraisal of Option 2 indicates that this offers the best compromise between airspace and environmental (ground) concerns highlighted through engagement and subsequent analysis. It does not constrain GA and glider operations to the West of Kemble and to the East creates a known picture for other airspace users, requiring less interaction from RAF Brize Norton. This routes aircraft north and south around both RAF Fairford and Brize Norton's ATZ and controlled airspace and takes account of known future airspace proposals of both. It is acknowledged that in conformance to standard designs for GPS approaches (ICAO Doc 8618), the overall defined approach is not balanced, with dissimilar approaches for both runways.

26. At this stage, this option continues to meet the Statement of Need, Design Principles and the concerns raised during Stage 2 engagement. This option will be subject to further development in Stage 3 and is the change sponsor's preferred option.

Option 3 - Initial Appraisal



Group	Impact	Level of Analysis	Evidence
Communities	Noise impact on health and quality of life	Qualitative	Changes to in-scope air traffic patterns below 7,000ft account for 1% of the airport's annual movements. The potential noise impacts caused by a very small number (no more than 3 per day maximum) of non-commercial jet flights, descending from above 7000ft at certain times under certain conditions, is neither measurable nor describable, particularly against the wider baseline of the remaining 99% of movements. It is assessed that noise metrics are not measurable given this scenario and there would be no discernible change in impact. In comparison to the baseline, observation and ADS-B tracking of aircraft have shown many approaching aircraft fly a stepped down approach and, in many instances, have flown lower visual approach 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). We assess that using this low power CDA approach would reduce the overall noise impact within the area defined for a GPS approach. Utilising a T shape for both runway arrivals will deliver the largest reduction in the overall number of people overflown in comparison the baseline, thus reducing almost all scatter below 7000ft and all scatter below 4000ft. However, this may increase overflight and visual intrusion for some as the tracks are concentrated onto defined approaches. Whilst delivering the greatest reduction in visual intrusion and overflight, it does concentrate aircraft within the AONB and thus may (on the defined approach tracks) have a detrimental effect on AONB tranquillity, where scatter of these infrequent arrivals may be deemed better. Equally, concentrating traffic on a northern T leg would place aircraft along the Stroud valley and centrally along both the AONB and the Dark Skies and Tranquillity boundary. This option has the greatest effect on the AONB. It is suggested, the low number of current and forecasted movements will mitigate this.

Communities	Air quality	N/A	No changes below 1,000ft. At 1000ft (2-3Nm) those in-scope aircraft would follow the same routing as the current baseline.
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 2018's movement data, 53 aircraft approached from the East to land on Kemble's runway 26 and 43 approaches from the West onto runway 08. It is assessed that greenhouse gas metrics are not possible to measure given this scenario and there would be no discernible change in impact. 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-B 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 and low power settings have been identified as early as 1978 (CAA Paper 78006) In comparison the baseline and options 1 and 2, It is suggested, this option delivers a significant reduction in both the East and West of Kemble, where the T shape provides an opportunity for Constant Descent Approach (CDA) from around 3500-4000ft, thus reducing power settings and decreasing the number of throttle changes. In short, although unquantified, it is suggested this option delivers the most benefit in reducing greenhouse gas emissions.
Wider society	Capacity/ resilience	Qualitative	Increased flight planning options can allow aircraft operators to avoid capacity-constrained areas.
General Aviation	Access	Qualitative	The first two paragraphs from option 1 also apply to this option. This option delivers the most certainty to GA and glider airspace users around Kemble by placing all in-scope Kemble inbound traffic into a known area. However, this does place Kemble's inbound traffic arriving from the North onto Runway 08 into a known area of high glider concentration and intersects a known area of ab-initio glider pilot training between Aston Down and Nympsfield. This may create a higher MAC risk and would have a disproportionate effect on gliders in the Cotswold area, especially if it was always assumed to be active (for all the right safety reasons) by glider pilots, in the same way GA pilots avoid glider sites and parachute drop sites.
General Aviation/ commercial airlines	Economic impact from increased effective capacity	N/A	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.
General Aviation/ commercial airlines	Fuel burn	N/A	It is not proportionate to attempt to monetise any fuel burn reductions created by this proposal. Equally, it is not proportionate, nor realistically possible to quantify or monetise any changes to GA fuel burn.
Commercial airlines	Training cost	N/A	It is not proportionate to attempt to quantify airline training costs.
Commercial airlines	Other costs	N/A	There are no other known costs which would be imposed on commercial aviation.

Airport/ Air navigation service provider	Infrastructure costs	N/A	There would be no costs attributable to infrastructure.
Airport/ Air navigation service provider	Operational costs	N/A	This proposal would not lead to changes in operational costs.
Airport/ Air navigation service provider	Deployment costs	Qualitative	The current baseline utilises an LOA and strong relationship between Kemble and RAF Brize Norton to provide a radar service for the larger jet aircraft leaving the national airways system and descending on an approach into Kemble. This option does overly RAF Fairfield's Aerodrome Traffic Zone (ATZ) and requires permission to transit through the Fairford MATZ, when activated. Fairford's traffic is controlled by RAF Brize Norton's ATC, so although achievable through a revised LOA it may require resourcing, which is not supported by the MoD (from engagement with them this option was not supported). It also does not account for RAF Brize Norton's own planned airspace change, nor any already announced planned operational/capacity increases at RAF Fairford. NB Cotswold Airport cannot quantify training costs for other ANSPs such as RAF Brize Norton; however, their acceptance of this proposal is a high-priority design principle. This proposal cannot be introduced without their agreement through an updated LOA, but this proposal does not require a guaranteed level of ANSP support from the MoD. We contend there is negligible training costs, and these are acceptable to these agencies.

Summary of Option 3 Initial Appraisal.

27. In terms of conformance with the Statement of Need and Design Principles, this option evaluated as optimum during Step 2a. However, engagement highlighted key concerns to the West of Kemble for both airspace users and ground entities. In particular, the local glider community expressed well founded concerns and further analysis identified this option's potentially most significant impact on the AONB of all the options.

28. To progress to Stage 3 for further development, it is suggested this option would need significant redesign for the 08 approach. To address the risk and concerns highlight in this appraisal, that redesign work would need to remove at least the northern join to the 08 approach and thus, superfluous would result in a transformation into Option 2. Despite, originally developing into a favoured option during Step 2a. This option is not considered suitable and thus will not progress to Stage 3.

Safety Summary – All Options

29. 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 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 8618 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. This proposal is interwoven with its supporting CAP 1122 safety case, latterly known as the bow tie safety questionnaire. Further detailed safety analysis and risk mitigation is contained within that document, the output of which is expected to be approved by and included in, the output from Stage 3.

Conclusion and Next Steps

30. This proposal has been developed following the submission of a Statement of Need shown in paragraph 5. The appraisal output from this stage delivered the following:

a. The 'do-nothing' baseline option is not a suitable option.

b. Options 1 and 2 have proven to be viable options and met the evaluation against the Design Principles and the rigour of appraisal; both will be progressed into Stage 3 for further development and refinement prior to public consultation.

c. Despite evaluating highly against the Design Principles, Option 3 highlight fundamental issues and concerns during engagement, appraisal demonstrated its unsuitability as a viable option and thus, will not be progressed.

31. **Specific challenges**. Going forward a number of key actions rest with Kemble to progress in concert with this ACP. In no particular order these are: -

a. **RAF Brize Norton Letter of Agreement (LoA)**. An agreement dated 15th May 2017 has served both parties well and stood the test of increased activity at both airfields. Furthermore, it has been a key foundation for operations during the Royal International Air Tattoo (RIAT) when held at RAF Fairford. Regular liaison meetings held independently of the ACP had already identified a need revisit, refresh and reissue a new LoA fit for the next phase of operations. Issues to be discussed and agreed include the possibility RNAV(GNSS) Instrument Approaches, RAF Brize Norton Class D airspace post their ACP, revisions to NATS Enroute airspace management flowing from LAMP 2 and other airspace modernisation initiatives and USAFE re-establishment of continuous flying operations at RAF Fairford as RAF Mildenhall closes.

b. **Glider sites LoA**. Although the level of engagement and cooperation with Cotswold Gliding Cub at Aston Down and the Bristol and Gloucestershire Gliding Club at Nympsfield for this ACP has been most welcome the need to further improve daily contact remains regardless of the current work. Kemble's GA traffic shares the same Class G airspace as gliders operating from these two airfields and it's manifestly clear that good levels of communications day-to-day between all parties is very important, especially when large-scale competitions are in progress. Whatever the outcome of this ACP, Kemble will remain committed to reaching agreements with the two clubs to help enable safe operations continue.

c. **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 Public Consultation.

d. **South Cerney Aerodrome choke point**. It's the responsibility of an aircraft commander to satisfy themselves any 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 covering the Cotswolds denotes parachute dropping at South Cerney aerodrome as flying through a drop zone whilst parachutists are in freefall or under canopy is not safe. Changes to the MOD expenditure and training needs has seen a steady decrease in activity at this site and yet with the symbol remaining on the chart the effect on all GA traffic in the Kemble vicinity remains. Kemble, the local gliding communities and BGA and bodies representing GA will continue to press for this to be changed.

e. **Further engagement through Stage 3**. Although Stage 3 could be regarded as gearing up for Public Consultation, Step 3a still requires close engagement with stakeholders. Decisions which have come from Stage 2, Step 2b Options appraisal have to be communicated back to everyone who contributed to the process up to that point. Not everyone may like the way options they felt held merit might have changed or discarded and so the challenge will be to retain those stakeholders 'on side' through the consultation. Fortunately, very good lines of communication have been established, making this easier to do.

32 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 staff and invaluable assistance and support from our local community airport liaison committee. Cotswold Airport thanks all these stakeholders and looks forward to continuing the development of this proposal through to a successful outcome.

33. The next step is the Stage 2 Gateway Assessment planned for 22nd February 2019. Subject to CAA approval, this proposal would move on to Stage 3 Consult.