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

Enclosure 1 (Safety Case) to

ACP-2016-18 Step 4b Formal Proposal Submission

Document Details

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Author	Cotswold Airport	
Reviewer	Merlin Aerospace Consulting Ltd	

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REFERENCES

All previous work associated with this ACP is referenced and hyperlinked within the table below. These documents (References A to K) are available on CAA's ACP portal.

Reference	Document	Date of Publication
A	Step 1a DAP1916 Statement of Need	27 Sep 2018, Updated from CAP 725 16 Sep 2016
B	Step 1b Design Principles	18 Oct 2018
C	Step 2a Options Development	7 Feb 2019
D	Step 2b Options Appraisal (Initial)	7 Feb 2019
E	Step 3b Consultation Strategy	10 Feb 2020
F	Step 3b Consultation Document	10 Feb 2020
G	Step 3b Options Appraisal (Full)	10 Feb 2020
H	Step 3d Collate and Review Responses	22 May 2020
I	Step 4a Consultation Review Document	2 Jun 2020
J	Step 4a Options Appraisal (Final)	2 Jun 2020
K	Step 4a Updated Designs	2 Jun 2020
L	CAP1122 - Application for Instrument Approach Procedures to Aerodromes without an Instrument Runway and/or Approach Control.	May 2014. Withdrawn. (Reference Only)
M	CAP1616 - Airspace Design.	22 Jan 2020
N	CAP760 – Guidance on the Conduct of Hazard Identification, Risk Assessment and the Production of Safety Cases.	10 Dec 2010
O	ICAO Aircraft Operations (Doc 8168) both Volumes, 5th Ed	2008

Section 1 - Context

1 Introduction

1.0 This document is Enclosure 1 to the Step 4b Formal Proposal Submission and must be read with the main document and all the associated annexes and enclosures for context. It is one of many created as part of the suite required under CAP1616 ACP. It sets out the Safety Case associated with Cotswold Airport (Kemble) proposed implementation of Required Navigation Performance (RNP) Instrument Approach Procedures (IAPs) and results from selection of a satellite-based solution for Instrument Approach Procedures (IAPs) to runways 08 & 26. [Reference I]. Post approval of this ACP, it will remain a live document.

1.2 As Kemble is an aerodrome without an Approach Control Service or an Instrument Runway the Change Sponsor has chosen to rely on the set of High Level Goals and Safety Arguments, originally found in CAP1122, describing how these have been used to show how a number of clearly defined risks can be mitigated by assessment and management of those risks down to as low as reasonably practicable.

2 Background and Need for Change

2.1 Kemble aerodrome sits 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 (AFISOs). 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 logs on average around 30,000 movements a year 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. Due to the 2020 Covid-19 pandemic future growth forecasts have had to be withdrawn and the likelihood at present is for traffic levels to fall slightly this year with growth delayed by an as yet undetermined period.

2.2 The following two paragraphs are taken from the Statement of Need -

> **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 runway 08/26 whilst flying under instrument flight rules (IFR) in poor weather and/or in the dark. Their crews rely on service from RAF Brize Norton whilst positioning themselves 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 descent angles thus bringing a new level of assurance to the approaches. Benefits including reducing the effect of noise on surrounding residents and the reduction in C02 emissions will be published. This proposed

change is not intended to increase traffic, extend opening hours nor provide GPS instrument approach training.

3 Purpose

3.1 The purpose of this document is to present Kemble's Safety Case setting out how and why the introduction of RNP IAPs can be achieved safely. This has been developed by a small team using the Kemble Safety Management System, existing manuals such as Aerodrome and FISO and by reference to CAP760 and parts of CAP1122. It also draws on appropriate lessons identified from other FISO aerodromes, which now have IAPs.

4 Current Operations

4.1 The scope of the ACP is to develop a defined approach for use by approved Performance Based Navigation (PBN) operators that currently use Kemble. The aircraft which are in-scope, in order of movements/anticipated usage, are:

a. Corporate/business turboprop/jets ranging in size from a Pilatus PC12 or Eclipse Jet 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). This includes end-of-life salvage. [KAOP 24]

4.2 In-scope aircraft currently arrive from either the national airways system (mostly international flights) or arrive at lower level under 7000ft; usually national and/or regional flights. They are generally released from Q63 by Swannick Sector 23 through MALBY (Kemble's designated airways join and departure point in the national Standard Routing Document (SRD)) and descend VFR into Class G.

4.3 Most in-scope aircraft currently request a Lower Airspace Radar Service (LARS) from RAF Brize Norton when both appropriate and their controller capacity allows. This is enshrined with the extant Letter of Agreement (LOA) between Kemble and RAF Brize Norton. [See Annex A to formal submission Step 4b for the updated one to support this proposal]. Such aircraft fly under own navigation and once Kemble has been visually identified, the crew then establish the aircraft onto a stable approach to land on either 08 or 26, depending upon the runway in use.

4.4 There is already a tried and tested operational procedure adopted during large airliner arrivals integrating them into the circuit to help ensure risks such as mid-air collisions are minimised. To date, there have been no reportable incidents between in-scope arriving aircraft and other light aircraft in the vicinity or within the circuit, in either VMC or IMC.

5 Objectives/Requirements for Proposed Design

5.1 The objective of the proposed design is to provide an ICAO Doc 8168 PANS OPS compliant and validated IAP design, safely flyable for all in-scope aircraft types. This will replace current undefined approach routing and final approach profiles to land at Kemble.

5.2 This in turn will allow:

a. Increase operational safety by reducing the potential risk of a mid-air collision by placing

all in-scope aircraft onto a defined arrival route, which other pilots will be aware of (through charted markings) and thus take appropriate action to avoid or contact Kemble for information.

b. Increase the Airport's operational capacity by allowing in-scope aircraft to land during periods of reduced visibility/cloud ceiling and/or when their own operational procedures preclude a landing at an airport without a defined instrument approach to an obstacle cleared runway.

c. Reduce the scatter effect, and thereby the distribution on any environmental impacts of in-scope arrivals, due to own navigation routing to establish a visual approach.

6 Proposed Instrument Approach Procedures Description

6.1 As previously stated, this proposal is not a creation nor the amendment of airspace classification. It is the replication of current activity by replacing the pilot defined, visually navigated routing with a defined instrument flight procedure within the current Class G airspace, the designs for which extend for up to 15nm.

6.2 There will be IAP's for both runway 08 and 26. Each procedure is shown below, noting they are not symmetrical. The 08 approach is a straight in approach and 26 is a T-Bar approach. This asymmetry is a product of airspace design to provide the highest degrees of safety through geographical separation from known traffic concentration areas, controlled airspace, and STARS and SIDs resulting from early engagement with stakeholders.

6.3 OCA(H)s for LPV, LNAV/VNAV and LNAV have been calculated though all have to be limited to 500'QFE. Circling minima to VM(c)OCA is also provided.

6.4 No holding patterns are proposed. See Annex A to this Enclosure for the justification which has been accepted.

7 RNP APPROACH RWY08:

7.1 In order to mitigate as much as possible the effect on the Nympsfield gliding site, situated 9nm to the northwest, the approach procedure has been designed using a straight-in structure aligned with the runway centreline and a single initial waypoint (ICAR1) acting as IAF/IF. The schematic is at Fig 1.0. See Annex C in the main document for the draft AIP.

7.2 The intermediate segment has to be intercepted at a minimum altitude of 2500 ft AMSL and joins the final segment at an altitude of 2000 ft AMSL. The length of the segment can accommodate a maximum track change of 110º at the IAF/IF and there's a 4.4 NM straight segment prior to the FAF.

7.3 The final approach segment (FAS) is designed with a descent gradient (GPA) of 3.0º (5.24%) and a standard TCH of 50 ft (15.24 m), which is harmonized with the current APAPI. FAF is set at 2000 ft AMSL, which means a total FAS length of 4.8 NM for the given GPA and TCH. Despite APDO calculations of a computed OCH of 254ft, the OCH is set at 500ft to meet CAP1122 requirements. Kemble's Aerodrome Operating Minima is 900m visibility as per KAOPS 004 Low Visibility Operations procedures. Above this value it is the operator's decision whether to commence an IAP depending on their Flight Ops Manual.

7.4 The MAPt (LNAV) is placed over THR08. The missed approach consists of an initial straight-ahead segment (aligned with final and RWY centreline) in order to gain altitude with the aircraft

stabilised.

7.5 At 4.8 NM from the MAPt two consecutive 90º right turns (accounting for the MSD consumed by each manoeuvre) redirect the aircraft towards the south-west. Another 90º right turn joins the missed approach with the initial approach waypoint (ICAR1).

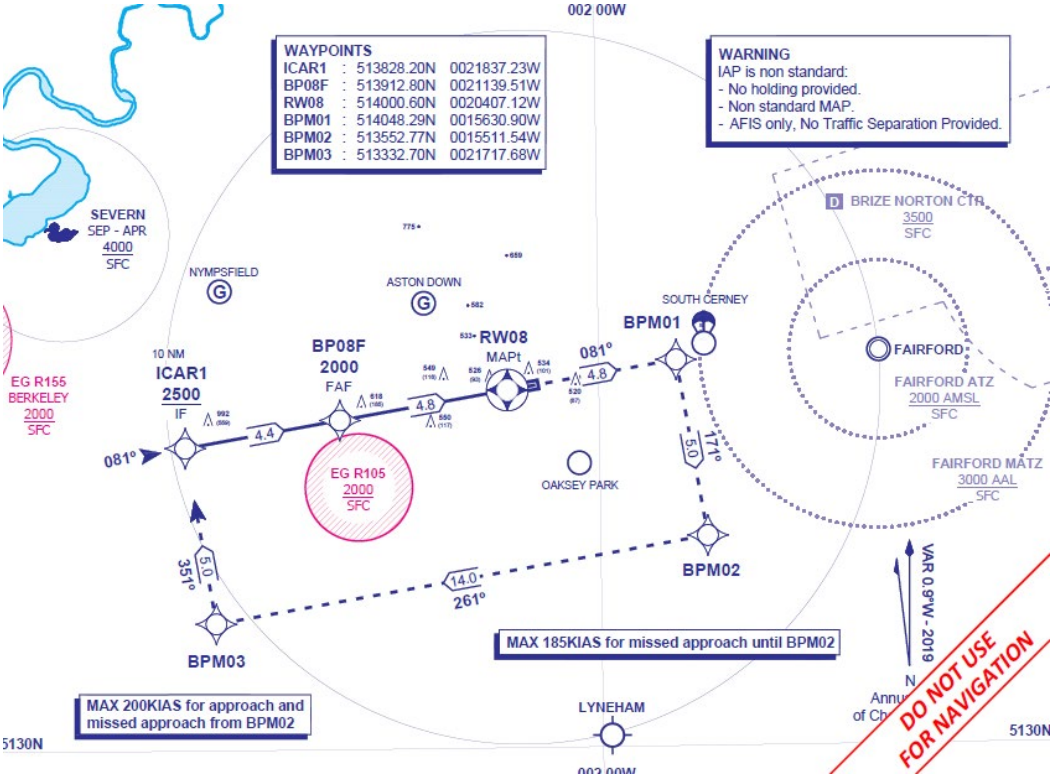


Fig 1.0 Proposed RNP IAP to Runway 08

8 RNP APPROACH RWY26:

8.1 The approach for 26 is designed using a T-bar structure layout, which has been decided based on the outcome of the engagement process. Northern and southern initial approach segments (5nm) can be intercepted at minimum altitude of 2500 ft AMSL. The schematic is at Fig 2.0. See Annex C in the main document for the draft AIP.

8.2 These connect with the intermediate segment (minimum altitude of the intermediate fix is 2400 ft AMSL), which allows intercepting the final segment at an altitude of 1800 ft AMSL. The length of the intermediate segment has taken into account maximum track change of 90º at the IAF/IF and the 3.8 NM straight segment prior to the FAF. It is the shortest distance feasible in order to avoid RAF Fairford and RAF Brize Norton CAS though a clearance to enter from ICAR3 will be required. LoAs are in place to cover the operational requirements of both parties.

8.3 The final approach segment (FAS) is designed with a descent gradient (GPA) of 3.0º (5.24%) and a standard TCH of 50 ft (15.24 m), which is harmonized with the current APAPI. FAF is set at 1800 ft AMSL, which means a total FAS length of 4.2 NM for the given GPA and TCH. Despite APDO calculations of a computed OCH or 254ft, the OCH is set at 500ft to meet CAP1122 requirements.

8.4 Kemble's Aerodrome Operating Minima is 900m visibility as per KAOPS 004 Low Visibility Operations procedures. Above this value it is the operator's decision whether to commence an IAP depending on their Flight Ops Manual.

8.5 The MAPt (LNAV) is placed over THR26. The missed approach consists of an initial straight-in segment (aligned with final and RWY centreline) in order to gain altitude with the aircraft stabilised.

8.6 At 7.5 NM from the MAPt (to avoid overflying the restricted area EG R105 below 2000 ft AMSL) two consecutive 90º right turns redirect the aircraft towards the north-east, joining the missed approach with the initial approach waypoint (ICAR4). No holding patterns are proposed.

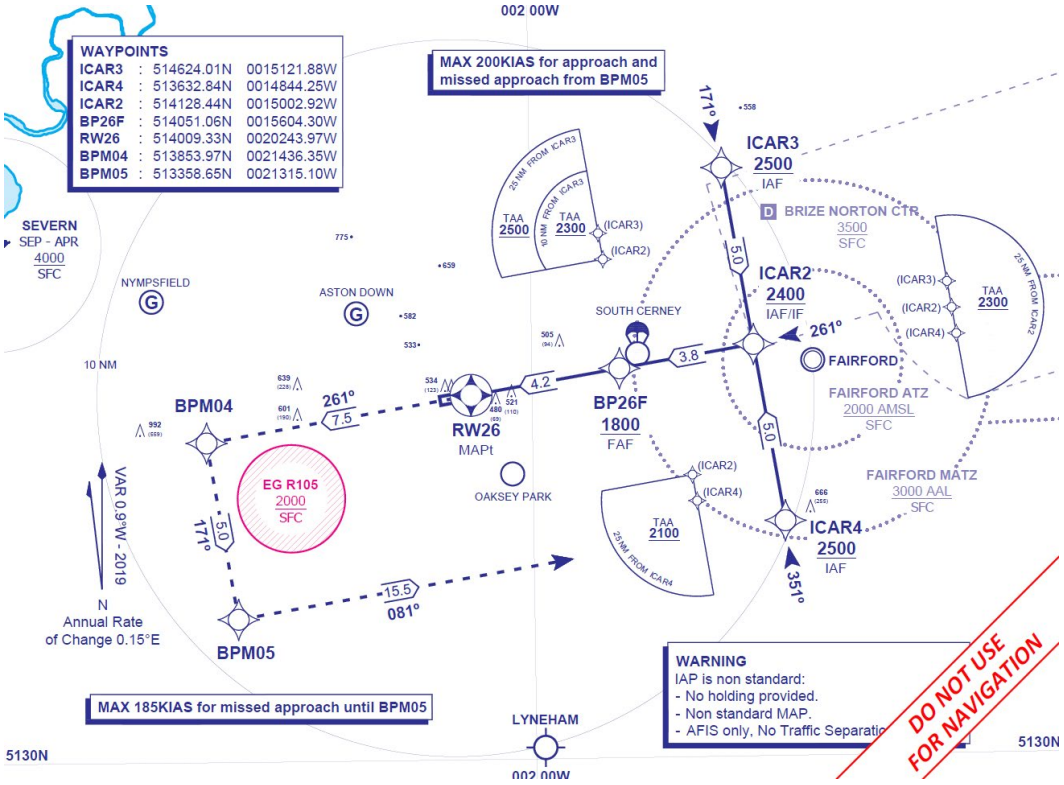


Fig 2.0 Proposed RNP IAP to Runway 26

9 Safety Risks, High Level Goals and Mitigations

9.1 **Safety Risks**. The main current safety issues facing Kemble are the associated risks of collision with other aircraft (MAC/RCOLL) or with the ground (CFIT) due to the absence of an international standardised and safe final approach routes for aircraft within surrounding Class G airspace. In IMC, it is highly likely that all local aircraft will be in receipt of a lower airspace radar service from another ANSP such as RAF Brize Norton. However, when flying under VFR, all in-scope aircraft are required to fly in accordance with SERA and the UK ANO, whereby the crew have sole responsibility for visually ensuring separation, based on give way prioritisation of traffic types. Some additional mitigation may be present in CAT aircraft using TCAS.

9.2 With no published IAP and no instrument approach symbology on air charts (IAP feathered arrows), there is no common publication warning other air users that in-scope aircraft may be on an IAP into Kemble and the route they will take. A significant amount of aerodrome to aerodrome communication is currently required to ensure all local glider sites and other airfields are aware that Kemble is expecting a heavy aircraft to arrive within a time window and this will continue once the RNP approaches are notified. Beyond that, no routing information can be communicated since this is an in cockpit, own navigation decision by each pilot. Despite, a CAA identified CAT aircraft Mid Air Collision (MAC) risk, without the mitigation of a defined approach and chart symbology, this risk

remains unmitigated to As Low As Reasonably Practicable (ALARP).

9.3 Aircraft are required to transition from IFR to VFR at some point on the final approach, depending upon cloud base and visibility. The current approach is conducted in both VMC and during IMC, although this does require visual identification of Kemble, essentially a change to VFR to allow a non-instrument approach landing. With no defined approach profile, there is no set RVR nor is there a set minimum safe terrain altitude for the 'cloud break'. Without defined obstacle limitation data designed into a published approach, using the airports annual survey, a Controlled Flight into Terrain (CFIT) risk remains unmitigated to ALARP. This is the current operational baseline.

9.4 Clearly, the high-level goal is that introduction of RNP IAPs both mitigates these current risks and any risks associated with the introduction of IAPs and is achieved safely and that in operation all risks have been reduced to as low as reasonably practicable. This safety case proposes the ways and means to demonstrate to CAA that has been accomplished.

9.5 **High Level Goal (HLG).** The HLG of the proposed design is to provide an ICAO Doc 8168 PANS OPS compliant and validated IAP design, safely flyable for all in-scope aircraft types. This will replace current undefined approach routing and final approach profiles to land at Kemble.

9.6 This in turn will allow:

a. Increase operational safety by reducing the potential risk of a mid-air collision by placing all in-scope aircraft onto a defined arrival route, which other pilots will be aware of (through charted markings) and thus take appropriate action to avoid or contact Kemble for information.

b. Increase the Airport's operational capacity by allowing in-scope aircraft to land during periods of reduced visibility/cloud ceiling and/or when their own operational procedures preclude a landing at an airport without a defined instrument approach to an obstacle cleared runway.

c. Reduce the scatter effect, and thereby the distribution on any environmental impacts of in-scope arrivals, due to own navigation routing to establish a visual approach.

10 Initial New Risk Mitigation - Bowtie (ATM) Questionnaire

10.1 In 2018 Kemble was invited to submit answers to a series of questions focussing on risks associated with Air Traffic Management (ATM) using an on-line server. The objective was to build a risk picture using the Bowtie method of modelling.

10.2 Once submitted to CAA, the allocated ATM Inspector reviewed each answer and either accept and closed the question or referred it back for more detailed review and resubmission. Due to transition, this was completed by Kemble prior to the Stage 3 CAA Gateway for CAP1616. In view both this stage of the proposal and time available allowed the opportunity to answer the questions to a far greater level of maturity than intended for an initial bowtie safety questionnaire. These already developed accepted arguments affords the opportunity for informing this safety case.

10.3 The completed signed off questions, exported into an Excel (.xlsx) file can be found in Enclosure 2.

11 Utilisation of the CAP760 Framework

11.1 Although CAP760 Guidance on the Conduct of Hazard Identification, Risk Assessment and the Production of Safety Cases is available, Kemble had already started to use CAP1122 to guide the development of its safety case.

11.2 However, the seven steps set out in CAP760 have been examined to see how they may inform the methodology. They are –

Step 1 - System Description

Step 2 - Hazard and Consequence Identification

Step 3 - Estimation of the Severity of the Hazard Consequences

Step 4 - Estimation/Assessment of the Likelihood of the Hazard Consequences Occurring

Step 5 - Evaluation of the Risk

Step 6 - Risk Mitigation and Safety Requirements

Step 7 - Claims, Arguments and Evidence that the Safety Objectives and Safety Requirements Have Been Met and Documenting this in a Safety Case.

11.3 It was noticed that Steps 2 to 6 in CAP760 are covered by the CAP1122 Goals as per this table and so it is felt that this Safety Case use of CAP1122 guidance presents adequate evidence and argument to demonstrate that the new approaches are tolerably safe.

12 New Risk Mitigation - Using CAP1122 Arguments

12.1 Whilst noting the positive safety benefit of simply having a defined approach, there remains extant risks for an instrument approach to an airport without an approach control service. This was originally enshrined within CAP1122, since withdrawn. However, the risk mitigation outlined in CAP 1122 is a well know benchmark within the CAA and has been used to frame this Safety Case, which uses CAP 670 (reference N), as an appropriate handrail.

12.2 Currently, certain in-scope aircraft arrivals require special operational procedures to be in place to help ensure risks, such as mid-air collision, are effectively managed. The introduction of defined arrival routes reduces the existing risks by employing a number of safety nets as further described below.

12.3 Risks have been mitigated through the proposed design and the supporting outcomes from this safety case to a level considered ALARP by the change sponsor. Primarily, these comprise -

a) Additional slot allocation on top of PPR already in place (Annex F to main document)

b) Sterilisation of the visual circuit in advance of any slot

c) Enhanced markings on air charts (feathered arrows)

d) Provision of meteorological information

e) Trained AFISOs in the VCR (Enclosure 2 to the main document)

f) Increase in Designated Operational Coverage (DOC) (Enclosure 3 to the main document)

g) Aerodrome Safeguarding

h) Updated LoAs with RAF Brize Norton and Cotswold Gliding Club (Annexes A and B to the main document), and

i) Pilot Briefing notes to accompany the IAPs (Annex G to main document).

12.4 The following paragraphs examine these key safety risks and provides evidence of how Kemble will introduce mitigations for them, further detail is within Section 2.

a) **Segregation of aircraft on the IAPs from traffic in the vicinity and in the circuit.** An amendment to KAOPs has been written to cover slot applications for using the IAPs. (see Annex E in the formal submission Step 4b). There will be a limited number of slots available each day due to the constraints of the hours of operations and the length of time each slot is open. 5 slots are available each day starting at 09.30LT open for 1.5 hours until the next slot. The last slot starts at 15.30 [See Appendix B to this document].

Ahead of each slot time is a 15-minute early arrival buffer preceded by 10 minutes in which arriving aircraft could call to announce their updated ETA at the IAF. Each slot is open for 30 minutes which is sufficient time for an approach and landing including a missed approach and subsequent landing. Should any aircraft not land after the second approach the assumption is that it will divert. There is a 15-minute overrun buffer to accommodate slightly late running arrivals too.

Although pre-booked arrival slots trigger changes to normal operations such as ceasing take-offs and sterilising the circuit, emergencies still will take priority.

b) **Sterilisation of the visual circuit in advance of any slot.** There is a risk which cannot be fully eliminated during an IAP arrival slot. This relates to the possibly penetration of the ATZ by a non-participating or non-cooperating aircraft. Although ANO Rule 11 puts the responsibility on pilots to establish two-way communications and obtain relevant information, there is no legal basis on which an AFISO can deny access to the ATZ. However, there have been no reportable incidents such as AIRPROX at Kemble resulting from the unexpected presence of an aircraft in the ATZ.

Over the past few years aerial activity around Kemble has comprised a varied selection of aircraft from sailplanes and gliders to the north, heavy military operations to the east and GA in surrounding Class G. [See Annex C to this document]. In-scope aircraft already fit into this scenario safely and the low percentage of traffic expected to use the IAPs (<1% of total annual movements) means the MAC risk has been assessed as remaining low. Therefore, no detailed traffic survey has been commissioned as the cost benefit does not justify it.

c) **Enhanced markings on air charts (feathered arrows)**. An application will be made to have the appropriate chart symbols (feathered arrows) added to the paper charts published by the CAA in time for the next scheduled reprint. However, many 3rd party suppliers produce electronic navigation applications and they will be asked to add these when the approaches become available in the UK AIP if this is sooner than chart reprint.

d) **Provision of Meteorological Information**. Kemble provides meteorological information which currently satisfies its users' needs and complies with CAP746. Actions to be taken by AFISOs on duty at the start of each watch are detailed in the AFISO Manual and make use of a variety of data sources. There is already equipment installed in the VCR to help gather and display data and this is regularly checked for accuracy, calibration and availability of back up equipment in case of failure. The proximity of RAF Brize Norton (METAR and TAFs) and RAF/USAF Fairford (ATIS), allows very good local MET accuracy.

However, it is recognised that the changes brought about by the introduction of IAPs which may be flown during periods of adverse weather, requires a reassessment of the quality of such information and the integrity of data gathering equipment. The next issue of CAP746 and recent guidance notes and checklist on Meteorological Provision have been studied and used to internally audit the VCR.

Kemble has no trained Met Observers, so any information passed to pilots is prefixed "unofficial". Training and Competence is covered in the FISO Manual. Three of the 5 AFISOs are current licensed pilots which includes basic meteorological training so affording a higher level of observing competence. Going forward, the newly available training course developed by CAA and Industry will be considered as part of the INTRO phase for staff with an identified training need.

e) **Trained AFISOs in the VCR**. During normal operations, the minimum staffing level in the VCR is two AFISO's. Under certain circumstances this can be amended to one AFISO and one assistant. They are licensed and their training and competency is overseen by the Senior AFISO [KAOPS 064 AFISO Induction Procedure]

As Kemble is a former RAF Station the VCR is of typical design. Since civilianisation, a programme of continuous maintenance and improvement has been followed resulting in a fully functioning unit regularly audited by CAA. In view of RAF Brize Norton's proximity direct telephone landlines to all their ATC desks are provided. The site wide flight information display system powered by Red Atlas is part of the information available on the desk.

The recent revisions to CAP413 including the latest SI on RNP nomenclature have been noted and will be adopted forthwith.

f) **Increase in Designated Operational Coverage (DOC).** OFCOM currently grant Kemble a DOC of 10nm and 3000'. This has now been assessed as insufficient to allow r/t between inbound aircraft and AFISOs with sufficient time to pass all relevant information before the aircraft arrives at the IAF.

By looking at the leg lengths of each approach plus the fact that some aircraft will be leaving airways by descent (for instance from MALBY) and the potential speed at which they could be travelling, an application has been made to extend this to 25nm and 4000'. It is understood no change of allocated frequency is needed and that the process will be

complete before the approaches enter the AIRAC cycle. See Enclosure 3 to the main document.

g) **Aerodrome Safeguarding**. Although Kemble is not on the DfT list of officially safeguarded aerodromes, a safeguarding map has been produced as per CAP 738 Safeguarding of Aerodromes [See Appendix D]. Copies have been lodged with appropriate Local Authority Planning Departments and it is well understood by Cotswold District Council.

The rural nature of Kemble's location means there are few if any threats to the local airspace from developments which may penetrate obstacle limitation surfaces; for at least the past 10 years, there has been little change recorded annually in the CAP 232 surveys, less changes to tree heights.

h) **Updated LoAs with RAF Brize Norton and Cotswold Gliding Club**. The existing LoA with RAF Brize Norton's ATS has been in place for a number of years and operates successfully. This includes special situations brought about by increased traffic at RAF Fairford during RIAT.

At present, large CAT aircraft destined for Kemble can avail themselves of LARS often on a handover from Swannick. Engagement with, and agreement to a revised LoA has been reach though due to their own ACP a second alternative LoA is also ready for when their revisions to airspace take place. [See Annex A to formal submission Step 4b].

Aston Down aerodrome 4nm northwest of Kemble is home to the Cotswold Gliding Club. A longstanding LoA underpins regular contact and a revised document was signed in 2019. It came out of early engagement by the wider gliding community including BGA which resulted in the removal of the 08 northern IAF join. Furthermore, part of the northwest sector of the Kemble ATZ is delegated to the gliding club on certain days to accommodate their operations during events such as competitions. [See Annex B to formal submission Step 4b].

i) **Pilot Briefing notes to accompany the IAPs**. Recognising the non-standard nature of IAPs conducted in Class G, Kemble has developed a Pilot Briefing document, agreed with RAF Brize Norton. It will be mandatory that pilots applying for a PPR slot will have to confirm they have read and understood the contents. It will also be published on the Cotswold Aerodrome website and cascaded as widely as possibly to air stakeholders for awareness. [See Annex G to formal submission Step 4b].

12.5 There are common themes in the Bowtie questions and the CAP1122 Candidate Safety Arguments and this next section (Section 2) draws on those answers to support statements in the Candidate Safety Arguments above.

Section 2 – Safety Arguments Using CAP1122

13. Guidance Framework For Safety Assessment

13.1 Although withdrawn, CAP1122 reflects the safety goals which are satisfied within the extant standards-based approach to the approval of IAPs at UK aerodromes. These and the underpinning safety statements are based on the required guidance for an approach for aerodromes without approach control and/or a runway meeting CAP 168 'non-instrument runway' standards.

13.2 The Change Sponsor believes this provides sufficient levels of assurance to allow the CAA to grant an exemption from related instrument approach control Articles (183) within the Air Navigation Order, as originally defined in CAP1122, noting that Article 183 is based on aerodrome navigational infrastructure using radar or radio approach equipment, rather than SiS (GPS).

13.3 Goal 1 is subdivided into seven sections as follows:

Goal 1.1 The risk of a controlled flight into terrain accident is acceptably low (CFIT).

Goal 1.2 The risk of a runway excursion accident is acceptably low (REXC).

Goal 1.3 The risk of a runway collision accident is acceptably low (RCOLL).

Goal 1.4 The risk of a mid-air collision accident is acceptably low (MAC).

Goal 1.5 The risk of a loss of control accident is acceptably low (LOC).

Goal 1.6 The risk of an accident during the introduction to service of a new IAP at this aerodrome is acceptably low (INTRO).

Goal 1.7 The risk of an accident during the through-life operation of an IAP at this aerodrome is acceptably low (THRULIFE).

13.4 In each section, Kemble believes it has correctly assessed which hazards have to be addressed and applied risk-based judgements on appropriate alternative safety arguments to mitigate against likelihood and severity.

13.5 The work associated with writing this safety case has shown that the risks identified and mitigations employed in it help ensure the RNP IAPs proposed for Kemble are tolerable and acceptably safe and that risks have been mitigated to be as low as reasonably practicable (ALARP).

13.6 In both paragraph 12 and Concluding Remarks in paragraph 14, safety statements referencing each goal are made to substantiate the claim that the introduction of RNP approaches will be tolerably safe.

13.7 The aerodrome is certified as an Air Navigation Service Provider providing higher levels of CAA regulatory oversight than is usual at aerodromes without Air Traffic Services.

13.8 Kemble's runways 08 and 26 are currently designated non-instrument runways although have precision instrument runway markings. The area around the runway strip is free from obstruction and will afford protection against runway excursion fully meeting the strip requirements stated in CAP168 Chapter 3 Physical Characteristics.

Goal 1.1 (CFIT)

Goal 1.1 The risk of a CFIT accident is acceptably low. (CFIT)

CFIT 1 CAP168 Instrument Runway Standards are met.

CFIT 1.1 CAP168 compliant instrument runway strip reduces the risk of a CFIT accident by an inaccurately positioned aircraft in the immediate aerodrome environment through provision of an area free from infrangible obstacles. CAP 168 Chapter 6, para 3.43 (1) refers.

CFIT 1.2 Details of the compliant AGL and runway markings can be found in the Kemble UK AIP entry. EGBP AD 2.14 Approach and Runway Lighting.

At present the service provided by Kemble is an Aerodrome Flight Information Service (AFIS). The duty AFISO can report and confirm accurate readback of the QNH obtained from approved barometric equipment. The argument is therefore made that the pressure settings provided at Kemble are accurate, the systems in place are tried and tested and therefore mitigation is achieved for an IAP with a higher minima type of approach.

Kemble AFISOs pass unofficial meteorological information. Kemble is in the vicinity of RAF Brize Norton with full ATC which publish meteorological information in the form of TAFs and METARS. AFISOs are able to interrogate this information to help establish the unofficial cloud base at Kemble. Any inbound aircraft to Kemble is passed these weather reports via R/T in accordance with normal aviation practice. The risk of an incorrect weather report being passed at Kemble is equivalent to that provided at aerodromes where the duties of approach and aerodrome controller are periodically discharged by a single individual.

This is at Kemble an equal risk to the provision of a non-surveillance assisted approach procedure and therefore is an acceptable mitigation.

CFIT 2 ANO 183 Requirement for Approach Control is mitigated by provision of AFIS.

CFIT 2.1 Approach controller reduces the risk of CFIT by providing accurate Altimeter setting (QNH), instructions and providing a confirmatory check of pilot readback.

CFIT 2.1.3 ALTERNATIVE ARGUMENT: Altimeter Setting - Aerodrome with AFIS

The service provided by Kemble is an AFIS. The duty AFISO can report and confirm accurate readback of the QNH obtained from calibrated and correctly maintained barometric equipment.

The argument is therefore made that the pressure settings provided at Kemble are accurate, the systems in place are tried and tested and therefore mitigation is achieved for an IAP with a higher minima type of approach.

CFIT 2.2 Approach controller reduces the risk of CFIT by providing meteorological information in the form of cloud base and visibility information.

CFIT 2.2.2 ALTERNATIVE ARGUMENT: Weather Reporting – Aerodrome ATS or AFIS.

Kemble's AFISOs pass unofficial meteorological information. Kemble is in the

vicinity of RAF Brize Norton with full ATC which publish meteorological information in the form of TAFs and METARS.

AFISOs are able to interrogate this information to help establish the unofficial cloud base at Kemble. Any inbound aircraft is passed this meteorological information via R/T in accordance with CAP413 phraseology. The risk of an incorrect weather report being passed at Kemble is equivalent to that provided at aerodromes where the duties of approach and aerodrome controller are periodically discharged by a single individual.

CFIT 2.3 Provision of Approach Control with surveillance reduces the risk of CFIT as the Approach Controller assumes some responsibility for terrain safety.

CFIT 2.3.1 ALTERNATIVE ARGUMENT: Requirement for Monitoring of Lateral and Vertical Flight Path – Type of Operation.

Due to the lack of high ground and low traffic levels expected to fly the Kemble IAP, an effective mitigation is that the IAP design is ICAO Doc 8168 PANS OPS compliant and its requirements place TAAs at or above MSA. See Appendix 2 & 3.

Furthermore, when using LPV accurate vertical guidance is provided.

CFIT 3 The Aerodrome is licensed.

CFIT 3.1 As the aerodrome is licensed, CAP 232 Aerodrome Survey Standards are met and 'safeguarding' applies, both of which reduce the risk of CFIT by providing a 'known' terrain and obstacle environment.

CFIT 4 The IAP design has been conducted in accordance with PANS OPS and the procedure notified in the UKAIP.

CFIT 4.1 Use of PANS-OPS IAP Design criteria reduces the risk of CFIT by permitting the aircraft to fly to an altitude and position from which either a landing or missed-approach may be flown whilst remaining terrain-safe.

CFIT 4.2 The established procedures for designing and approving IAP designs (including flight validation procedures) provide participating aircraft with a flightpath which will keep aircraft clear of terrain and obstacles.

CFIT 5 The integrity and accuracy of the navigation aids used for the instrument approach meet the required standards.

CFIT 5.1 The integrity and accuracy of the navigation aids used for instrument approaches are such that they will provide the crew of participating aircraft with sufficiently reliable and accurate guidance to enable them to follow the published IAP within the tolerable limits required to avoid flight into terrain or obstacles. In the case of GPS receiver equipment designed to accept an EGNOS-augmented signal in space, fault detection and exclusion (FDE) increases system integrity to help permit navigation by sole reference. An EGNOS Working Agreement has been logged.

CFIT 6 The crew members of participating aircraft are suitably qualified and proficient to safely execute an IAP with sufficient accuracy to remain clear of terrain and obstacles.

CFIT 6.1 Aircrew are licensed/rated in accordance with ICAO Annex 1 Personnel Licensing.

CFIT 7 Aerodrome ATS is not provided but mitigated by provision of AFIS.

CFIT 7.1 Aerodrome ATS reduces the risk of CFIT by providing local meteorological information in the form of cloud base and visibility information.

CFIT 7.1.2 ALTERNATIVE ARGUMENT: Weather Reporting – Aerodrome with AFIS.

Kemble's FISOs pass unofficial meteorological information. Kemble is in the vicinity of RAF Brize Norton with full ATC which publish meteorological information in the form of TAFs and METARS. AFISOs are able to interrogate this information to help establish the unofficial cloud base at Kemble. Any inbound aircraft to Kemble is passed meteorological information via R/T in accordance with normal aviation practice All significant features such as buildings, church spires or woodland have been identified and their distances from the VCR measured. These are noted in FISO Manual. The risk of an incorrect weather report being passed at Kemble is therefore no greater than that at an airport with full ATC.

Goal 1.2 (REXC)

Goal 1.2 The risk of a runway excursion event is acceptably low. (RExC)

REXC 1 CAP 168 Instrument Runway Standards are met.

REXC 1.1 Kemble 's runway dimensions, markings and lighting are CAP168 compliant and therefore assist pilots in reducing the risk of runway excursion by enhancing visual determination of runway boundaries and touchdown area, thereby aiding early visual detection and stable approach to safe touchdown in the correct position. Details of compliance can be found in the Kemble AIP entry.

REXC 1.2 Kemble has a CAP 168 compliant 105m instrument runway strip and Runway End Safety Area (RESA) in order to assist in mitigating the impacts should a runway excursion occur. Details of the declared distances and RESA can be found in the Kemble AIP entry. EGBP AD 2.12 Runway Physical Characteristics.

Although a recent change to international standards means that the width of a code 3/4 runway instrument strip is now 280m, Kemble is maintaining the previous 300m.

REXC 2 ANO 183 Requirement for Approach Control is mitigated by provision of AFIS.

REXC 2.1 Approach control provides crew with information on runway condition and surface wind info which will assist in reducing the risk of a runway excursion accident.

REXC 2.1.2 ALTERNATIVE ARGUMENT: Runway Condition and Surface Wind Reporting – Aerodrome with AFIS.

Kemble's AFISOs pass unofficial meteorological information. The Airfield Ops Team/RFFS inspect the runway each day and record the conditions in accordance with CAP 168, more often following a significant change. An accurate assessment of moisture/precipitation will be passed to the AFISO, including any other issues affecting the runway surface condition.

In addition to this regime, a further inspection will be carried out prior to any slot allocated RNP approach and then at no greater than hourly intervals during successive approaches. These details will then be relayed to the Aircraft Commander using standard phraseology as laid down in CAP413.

There is a calibrated anemometer mounted on the roof of the VCR with a readout incorporated into the weather station display visible to the AFISO. Furthermore, three wind direction indicators are provided; one south of the runway abeam Holding Point C1, one illuminated to the east of Holding Point C2 and one north of the runway west of D1. [Ref UK AIP AD 2. EGBP-2-1]

Kemble intend introducing an IAP with Higher Minima type of approach, so the use of an unofficial meteorological information provided by AFISOs will be acceptable on the basis that, with this type of approach used with appropriately conservative aerodrome operating minima, an aircraft commander will have more time to establish a stable, visual, final approach with an adequate safety margin.

REXC 3 The IAP design has been conducted in association with PANS OPS and the procedure notified in the UKAIP which, where appropriate, is used as the

source data for coding the approaches in navigation databases and brings the required degree of data integrity.

REXC 3.1 Use of PANS-OPS IAP Design criteria reduces the risk of runway excursion by permitting the aircraft to fly to an altitude and position from which the pilot can decide whether it is either safe to land or may execute a missed approach.

REXC 4 The integrity and accuracy of the navigation aids used for the instrument approach meet the required standards.

REXC 4.1 The integrity and accuracy of the navigation aids used for instrument approaches are such that they will provide the crew of participating aircraft with sufficiently reliable and accurate guidance to enable them to follow the published IAP within the tolerable limits required to allow a safe landing to be made on the runway or a safe missed approach to be executed.

REXC 5 The crew members of participating aircraft are suitably qualified and proficient to safely execute an IAP with sufficient accuracy to allow a safe landing to be made on the runway or to execute a safe missed approach.

REXC 5.1 Aircrew are licensed/rated in accordance with ICAO Annex 1 Personnel Licensing.

Goal 1.3 (RCOLL)

Goal 1.3 The risk of a runway collision accident is acceptably low. (RCOLL)

RCOLL 1 ANO 183 Requirement for Approach Control is mitigated by provision of AFIS.

RCOLL 1.1 Approach control provides sequencing of Instrument Approach traffic to reduce the risk of runway collision between participating instrument traffic.

RCOLL 1.1.1 ALTERNATIVE ARGUMENT: Management of IAP Use:

Kemble will, through an extension of the existing PPR arrangements, adopt a strict allocated arrivals slot system to help ensure separation of participating aircraft. (see Appendix B)

Furthermore, circuit and aerodrome operations will be suspended on the aerodrome's authority whilst any permitted aircraft makes its approach. Suspension will be for a period of time equal to the start of a slot period. This extends from 15 minutes before the aircraft plans to be at one of the IAFs until it has landed or diverted.

RCOLL 2 CAP 168 Instrument Runway Standards are met.

RCOLL 2.1 CAP 168 compliant signage, markings and lighting assist pilots, aerodrome vehicle drivers and pedestrians in reducing the risk of runway collision by enhancing visual determination of holding points and runway boundaries. Details of the compliance of AGL and runway markings and can be found in the Kemble entry of the UK AIP. EGBP AD 2.9 SMGCS and Markings.

RCOLL 3 Aerodrome ATS is mitigated by provision of AFIS.

RCOLL 3.1 Provision of an aerodrome ATS reduces risk of runway collision between instrument and visual traffic.

RCOLL 3.1.2 ALTERNATIVE ARGUMENT: Without Aerodrome ATS:

AFIS is provided at Kemble. It is recognised that at AFIS aerodromes the aircraft commander is solely responsible for avoiding runway collisions between their aircraft and other aircraft, either IFR or VFR. Mitigation is available in that at Kemble the AFIS position is constantly manned when the aerodrome is open and staff are rostered to this position. The AFIS Operator has a clear view of the runways and manoeuvring area and would be able to warn pilots of another aircraft on the runway. All hold positions are marked and signed in accordance with CAP 168.
Further strength to the mitigation can be added by the use of a mandatory PPR slot booking system as described in RCOLL 1.1.1 above.

RCOLL 3.2 Provision of an aerodrome ATS reduces risk of runway collision between instrument traffic and vehicles/towed aircraft, etc.

RCOLL 3.2.2 ALTERNATIVE ARGUMENT: Without Aerodrome ATS.

As per RCOLL 3.1.2. Additionally, at Kemble, the AFISO is in 2-way communications with, and controls all vehicles/towed aircraft on the manoeuvring area.

RCOLL 3.3 Provision of an aerodrome ATS and associated runway inspection regime reduces the risk of runway collision between aircraft and foreign objects, including wildlife.

RCOLL 3.3.1 ALTERNATIVE ARGUMENT: Runway Inspections by AFISO

Kemble already has a tried and tested runway inspection regime as described in the Aerodrome Manual. This involves at least two inspections per day plus in advance of any current CAT arrivals. In addition to this regime, a further inspection will be carried out prior to an RNP approach, and then at no greater than hourly intervals during successive approaches. These inspections will be made by personnel such as the RFFS/Airfield Ops team or the Airport Manager. Results of these inspections will be recorded in the VCR Watch Log. [Ref KAOP 001Runway Inspections]

RCOLL 3.3.2 ALTERNATIVE ARGUMENT: Aerodrome Security, Types of Operations and Risk Exposure.

Kemble has 24-hour gated security in place at the main entrance and all other entrances are secured. Boundary security is enforced with a combination of fencing and hedging and has proven effective for its former military task and since the airfield became a civil aerodrome.

The RNP Approach is expected to be used mainly by non-public transport operations by CAT A, B, C & D aircraft equipped with effective landing lights. In addition, for both day and night operations, the runway has an approved AGL system with stadium type lighting illuminating other parts of the apron and manoeuvring area. Two AFISOs are on duty in the Visual Control Room throughout the notified hours of operation and is able to visually monitor the runways and manoeuvring areas for any collision risks.

Kemble has an active wildlife management policy and has demonstrated an effective reduction in the presence of hares, rabbits and concentrations of birds.

RCOLL 3.3.3 ALTERNATIVE ARGUMENT: Use of Higher Minima.

The use of a 500’ DH for the IAP, particularly if used in the context of an IAP with Higher Minima’ approach, will allow participating crews completing such an approach more time in the VMC environment in which to detect visually and to avoid obstacles or wildlife on the runway.

RCOLL 4 The crew members of aircraft participating in the IAP and others using the aerodrome are suitably qualified and proficient to operate safely in the vicinity of the runway.

RCOLL 4.1 Aircrew are licensed/rated in accordance with ICAO Annex 1 Personnel Licensing.

Goal 1.4 (MAC)

Goal 1.4 The risk of a mid-air collision accident is acceptably low. (MAC)

MAC 1 ANO 183 Requirement for Approach Control is mitigated by provision of AFIS.

MAC 1.1 Approach control reduces the risk of mid-air collision between participating instrument traffic by providing separation.

MAC 1.1.1 ALTERNATIVE ARGUMENT: Separation of Participants without ATS –Management of IAP use by Participating Aircraft Commanders.

MAC 1.1.1.1 Kemble will, through an extension of the existing PPR arrangements, adopt a strict allocated arrivals slot system to help ensure separation of participating aircraft. (See Appendix B)

Furthermore, circuit and aerodrome operations will be suspended on the aerodrome's authority whilst any permitted aircraft makes its approach. Suspension will be for a period of time equal to the start of a slot period. This extends from 15 minutes before the aircraft plans to be at one of the IAFs until it has landed or diverted.

MAC 1.1.1.2 The AIP entry and the Aerodrome Manual will have procedures in place to help mitigate the risk of mid-air collision whilst maintaining the authorisation of the AFISO Certificate of Competence in the event of two aircraft wishing to use the approach at the same time (see accompanying submission). This will also be promulgated in the Pilots Brief which the AFISO/Operations will confirm the crew are familiar with before issuing an arrival slot.

MAC 1.1.1.3 AFISOs are allowed to provide Traffic Information based on pilot reports within the authorisation of their Licence.

MAC 1.2 Where the nature and level of traffic requires it, provision of surveillance data allows approach controllers to further reduce the risk of mid-air collision, both between participating traffic and against non-participating traffic.

MAC 1.2.1 ALTERNATIVE ARGUMENT: Lack of surveillance data.

The risk of a mid-air collision caused in part by the lack of surveillance data is mitigated by the following courses of action:

a) Infrequent instrument approaches, slot allocation system in place. See Section 1 Paragraph 2 Introduction 2.6 to 2.11

b) AFIS provided from the VCR throughout the notified hours of operation as detailed in RCOLL 3.1.1 above.

c) An ATZ is established as detailed in MAC 3.1 below

d) The aerodrome location and presence of an IAP are depicted in the UK AIP and, where appropriate, on aeronautical charts as detailed in MAC 4.1 below.

e) Letters of Agreement in place with neighbouring Aviation Stakeholders i.e. RAF Brize Norton, RAF Fairford and Aston Down Gliders.

MAC 3 Airspace design measures are in place in the vicinity of the aerodrome.

MAC 3.1 An ATZ can, to an extent, provide a 'known' environment close to the aerodrome itself which reduces the risk of collision between instrument traffic and non-participating visual traffic.

MAC 3.1.1 Kemble is licensed according to CAP168 and has established an Aerodrome Traffic Zone (ATZ) of 2 miles radius centred on the Aerodrome Reference Point. Pilots are to conform with CAP 393 Section 2 schedule 1 Section 3 para 11(2)

MAC 3.2 Provision of Controlled Airspace:

Where the nature and level of traffic requires it, CAS further reduces the risk of collision between instrument traffic and non-participating visual traffic by providing a known and controlled local air traffic environment which extends further beyond the boundaries of the ATZ.

MAC 3.2.1 This application does not include an application for Controlled Airspace.

MAC 4 The aerodrome location and presence of an IAP are depicted in the UK AIP and, where appropriate, on aeronautical charts.

MAC 4.1 Marking the Aerodrome and instrument approach paths (feathered arrows) on aviation charts assists pilots of non- participating aircraft in avoiding these areas, thereby reducing the risk of mid-air collisions with non-participating traffic. Kemble will ensure that a request is made to include the necessary chart changes to coincide with the introduction of the IAP.

MAC 5 Visual lookout by aircraft crews and the 'see and avoid principle' provides some protection against mid-air collision during relevant portions of flying an IAP.

MAC 5.1 ALTERNATIVE ARGUMENT: VMC flight whilst flying the IAP.

If any portion of the procedure where an aircraft flying the IAP is in VMC the 'see and avoid' principle provides a degree of mitigation against the likelihood of collision with other aircraft.

MAC 5.1.1 ALTERNATIVE ARGUMENT: Use of Higher Minima.

Whilst flying an IAP with a Higher Minima Approach, the more conservative aerodrome operating minima of 500' DH, provides more opportunity (where VMC exist) for 'see and avoid' principles to be utilised. This provides additional mitigation against the risk of a mid-air collision.

Goal 1.5 (LOC)

Goal 1.5 The risk of a loss of control accident is acceptably low. (LOC)

LOC 1 ANO 183 Requirement for Approach Control is mitigated by provision of AFIS.

LOC 1.1 Approach control reduces the risk of a loss of control accident arising from Wake Turbulence by sequencing participating instrument approach traffic.

LOC 1.1.1. ALTERNATIVE ARGUMENT: Managed use of IAP:

Kemble will, through an extension of the existing PPR arrangements, adopt an allocated arrivals slot system to help ensure separation of participating aircraft. Allocation of arrival slots will be strictly controlled by Kemble Ops (See Appendix B)

Furthermore, circuit and aerodrome operations will be suspended on the aerodrome's authority whilst any permitted aircraft makes its approach. Suspension will be for a period of time equal to the start of a slot period. This extends from 15 minutes before the aircraft plans to be at one of the IAFs until it has landed or diverted.

The time differential between approaches means that Wake Turbulence issues should never occur.

LOC 3 The crew members of aircraft participating in the IAP are suitably qualified and proficient to fly the IAP safely and under control.

LOC 3.1 Aircrew are licensed/rated in accordance with ICAO Annex 1 Personnel Licensing.

Goal 1.6 (INTRO)

Goal 1.6 The risk of an accident during the introduction to service of a new IAP at this aerodrome is acceptably low. (INTRO)

INTRO 1 A formal approval process is followed for the introduction into service of an IAP which ensures that all associated activities needed for safe introduction, such as the publication of aeronautical information etc. have been satisfactorily completed before the IAP can be used operationally. (CAP 785 refers.)

Kemble will apply all of the procedures and mitigations listed in CAP1122 Annex B "INTRO 1" and will also undertake the following:

1) The IAPs and new phraseology will be inserted into the Kemble AFIS Manual and the AFISO Instructions. A general guide relating to RNP procedures at Kemble will be made available to all based aircraft operators at Kemble and also published in the Pilot Brief on the Cotswold Airport website.

2) Suitable entries to the UK AIP have already been prepared which will be checked and amended as required prior to submission. Once the details have been incorporated into the UK AIP, the aviation industry alternative information providers will also be notified of the IAPs in accordance with our usual periodic information amendment process.

3) Staff involved operationally will be trained in a structured and carefully managed way and where deemed appropriate tested and validated to help ensure the safe introduction of the IAPs.

4) Prior to the introduction of the IAP, all immediate aviation stakeholders will be notified including BGA/LAA/BMAA etc. Aircraft operators based at Kemble will be sent information packs concerning proper use of the IAP facilities (Pilot Briefing Notes). Post introduction, at least one information/awareness evening is being considered at Kemble to further inform local airspace users and based flying training schools. Further briefings will be cascaded via the quarterly KAOG meetings as detailed in the Aerodrome Manual.

5) A period of trial operation in which monitoring will be more detailed with additional safety mitigations in place to provide further risk reduction and provide safety evidence in support of key safety arguments presented.

6) No ground-based equipment is required for the operation of the IAP other than suitable radios and Met equipment that is already in place. Kemble's 8.33 kHz radios are approved by the CAA for use and have all the relevant licences and OFCOM approvals. Kemble 's Met equipment is ICAO compliant and front-end units are replaced yearly instead of servicing/calibration. The CAA ANSP audit includes MET and Met Office inspected. All such equipment is monitored, inspected and maintained in accordance with manufacturers specifications. If any doubt exists as to the serviceability of any of this equipment, the IAPs will be withdrawn from service until serviceability is restored. All equipment therefore will be present prior to the introduction of the IAP and fit for service.

Goal 1.7 (THRULIFE)

Goal 1.7 The risk of an accident during the through-life operation of an IAP at this aerodrome is acceptably low. (THRULIFE)

THRULIFE 1 A formal process is followed for the ongoing maintenance, review and safeguarding of an IAP which requires that changes to airspace structure, survey data and magnetic variation etc. are taken into account, that records are kept by the aerodrome owner and a full review is undertaken at 5 yearly intervals (CAP 785 refers).

THRULIFE 1.1Kemble will apply the procedures outlined in "THRULIFE 1" (Annex B, CAP1122).

A safety monitoring and feedback process will be put in place which will provide feedback on safety information regarding the operation of the IAPs which will be used to monitor the continued validity of the alternative safety arguments used and provide a trigger for additional safety management activity if new hazards are discovered or the level of risk is deemed to have changed.

Additionally, the following actions will also be undertaken:

a) Maintenance of the IAP in accordance with the standard review procedures described in CAP785 Chapter 2, including changes to the obstacle environment and changing magnetic variation

b) Monitoring of the safeguarding surfaces relevant to the approach procedure to ensure that any new obstacles are identified and short-term adjustments are promulgated to approach minima if required

c) Reviewing the operation after 1 month, 6 months and a year.

d) Monitoring utilisation, feedback from pilots, instructors, aerodrome personnel and other local ATC units

e) Follow Single European Sky requirements by signing an EGNOS Working Agreement with ESSP for receiving NOTAM including monitoring the SiS integrity and any reports of failures

f) Ensuring that any effects on other local airspace stakeholders are considered and managed

g) Recording of any relevant incidents, and

h) Documenting the review procedures with nominated persons as required.

14 Concluding Remarks

14.1 Set out below, against each safety goal, are statements to reflect the results of the risk assessments conducted. These argue that overall the process followed has given Kemble confidence that the introduction of RNP IAPs will be safe and that risks have been reduced by the application of mitigating operating procedures to an acceptable level.

14.2 Goal 1.1 CFIT

- The IAPs are ICAO Doc 8168 PANS OPS compliant
- Arriving at an IAF the TAAs are set above MSA
- In Class G terrain avoidance is the pilot's responsibility
- AFISOs have the ability to pass the aerodrome QNH/QFE
- Runway 08/26 is fully compliant with CAP168 for a non-Instrument Code 4 runway.
- A 500'DH will give aircrew sufficient time to see the runway, its visual reference and make a safe landing.

14.3 The risk of CFIT is assessed as low as reasonably practicable and therefore acceptable.

14.4 Goal 1.2 REXC

- Runway 08/26 is fully compliant with CAP168 for a non-Instrument Code 4 runway. It is lighted & marked for a precision approach. A 500'DH will give aircrew sufficient time to see the runway, its visual reference and make a safe landing
- Kemble staff inspect the runway regularly, before a slot and more frequently during poor weather
- The surface wind can be passed to inbound aircraft
- Runway conditions can be passed in accordance with CAP797
- A defined approach using PBN aids a stabilised approach.

14.5 The risk of a Runway Excursion is assessed as low as reasonably practicable and therefore acceptable.

14.6 Goal 1.3 RCOLL

- Time separation is achieved by PPR and allocated arrival slots
- IAPs are only permitted during notified hours of operation
- AFISOs can see the runway and manoeuvring area from the VCR and communicate with aircraft and vehicles on the ground
- The runway and instrument strip are safeguarded by CAP168 runway taxiway holding positions including signs, markings and runway guard lights
- Kemble staff inspect the runway regularly, before a slot and more frequently during poor weather.

14.7 The risk of a Runway Collision is assessed as low as reasonably practicable and therefore acceptable.

14.8 Goal 1.4 MAC

- During an IAP the ATZ is unavailable to traffic.
- Aircraft in the circuit either land or vacate the ATZ
- Traffic information will be passed regarding known aircraft in the vicinity

- Non-participating transiting traffic which do not establish two-way communication may present a risk. However, the risk is equal to an ATSU providing a procedural service without the benefit of surveillance equipment
- Whilst impossible to completely eradicate the risk of MAC outside of the ATZ in Class G over which Kemble has no jurisdiction, recent studies across the UK show a very small number over the past 30 or so years.

14.9 The risk of MAC is assessed as low as reasonably practicable and therefore acceptable.

14.10 Goal 1.5 LOC

- Time separation is achieved by PPR and allocated arrival slots
- Only appropriately licensed/rated aircrew in suitably equipped aircraft will be allowed to fly the approaches
- Upset recovery training is part of AOC operators' SOPs and wake turbulence forms a major part of the syllabus.

14.11 The risk of LOC is assessed as low as reasonably practicable and therefore acceptable

14.12 Goal 1.6 INTRO

- Introduction will commence under trial conditions
- Training will be given to staff involved or affected by the introduction of IAPs
- Procedures to be followed by aerodrome personnel and aircrew and associated organisations will be tested
- Equipment associated with the IAPs will be available, suitable and fit for purpose and or approved where necessary.
- Reviews will be conducted after 1, 6 and 12 months from start.

14.13 The risk of an accident during INTRO is assessed as low as reasonably practicable and therefore acceptable.

14.15 Goal 1.7 THRULIFE

- Monitoring a range of data will afford early warning of increasing risks.
- Procedures to collect and review IAP operations using feedback forms will build up a picture of developing issues
- Regular reviews by an accountable manager will help ensure oversight of the procedures is maintained

14.16 The risk of an accident during THRULIFE is assessed as low as reasonably practicable and therefore acceptable.

[ENDS]

ANNEXES

The following Annexes are supplied as attached documents and used to complement to remaining ACP work, as details in References in Section 1.

Annex	Document	Notes
A	No Holding justification	
B	PPR IAP Slot timings chart	Annex F to Main Document
C	Local Airspace	
D	Safeguarding Map	
Encs		
1	Bowtie (ATM) Questionnaire completed	Excel File
2	Amended FISO Training Manual (See Enclosure 2 to Main Document)	See Main Document

Annex A - No Holding justification

Rational for not including a hold in the IAP design

1. The matter of a hold has been considered and the following is provided as the rational as to why a hold is unnecessary. 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.

2. Staff tasked by the Chair of the CAA's CNS/ATM Steering Group with the development of CAP1122 carefully considered all issues concerning holding patterns, both for arrivals and managing missed approaches. The document produced makes but two passing references to 'holds' deliberately. It is guidance material for applicants to help enable them to propose a safe way of introducing new methods of navigation. ICAO PANS OPS Doc 8168 contains the "how-to-design' an approach; CAP1122 the way new risks created by such designs could be made acceptable to the Regulator.

3. Arrivals to the procedure are sequenced and regulated by slots which are strictly enforced. Ahead of each slot time are a 15-minute early arrival buffer preceded by 10 minutes in which arriving aircraft could call to announce their updated ETA at the IAF. Each slot is open for 30 minutes which is sufficient time for an approach and landing including a missed approach and landing. Such any aircraft not land after the second approach the assumption is that it will divert. There is a 15-minute overrun buffer to accommodate slightly late running arrivals too. [See Annex B]

4. The time the aerodrome is operationally available vs number of slots possible, when criteria applied, limits maximum number of arrivals per day. Pre-application stakeholder engagement showed demand likely to be in the order of 1 per day initially. The decision not to incorporate a hold in the designs was fully supported by the chief pilots of the based commercial operators at that time.

5. No Hold Rational:

a) **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 aircraft per slot and all arrivals and departures are suspended whilst the procedure is operation. There is no requirement for an arrival to hold waiting for other traffic before commencing the procedure.

b) **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.

c) **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 approach 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 approach within the allotted time.

Pre-application stakeholder engagement revealed that operations for planned tasks

required meteorological information be taken into account, including remaining on the ground at the departure aerodromes until an assured end to the flight was likely. In the event of a sudden and unexpected deterioration in the weather towards operating minima, their SOPs would dictate actions in the event of a missed approach.

d) **A hold would be of limited use in the event of unforeseen circumstances:** Unforeseen circumstances such as a blocked or contaminated runway take time for the ground staff 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.

e) **A hold can introduce increased pilot workload:** The use of a hold by an aircraft equipped with a fully coupled autopilot which provides the ability to fly holding patterns automatically can clearly reduce pilot workload. This level of equipage is not reflected across all aircraft and is particularly absent in the average category A aircraft. Using raw data to hand fly a hold significantly increases rather reduces pilot workload.

6. Risk Mitigations:

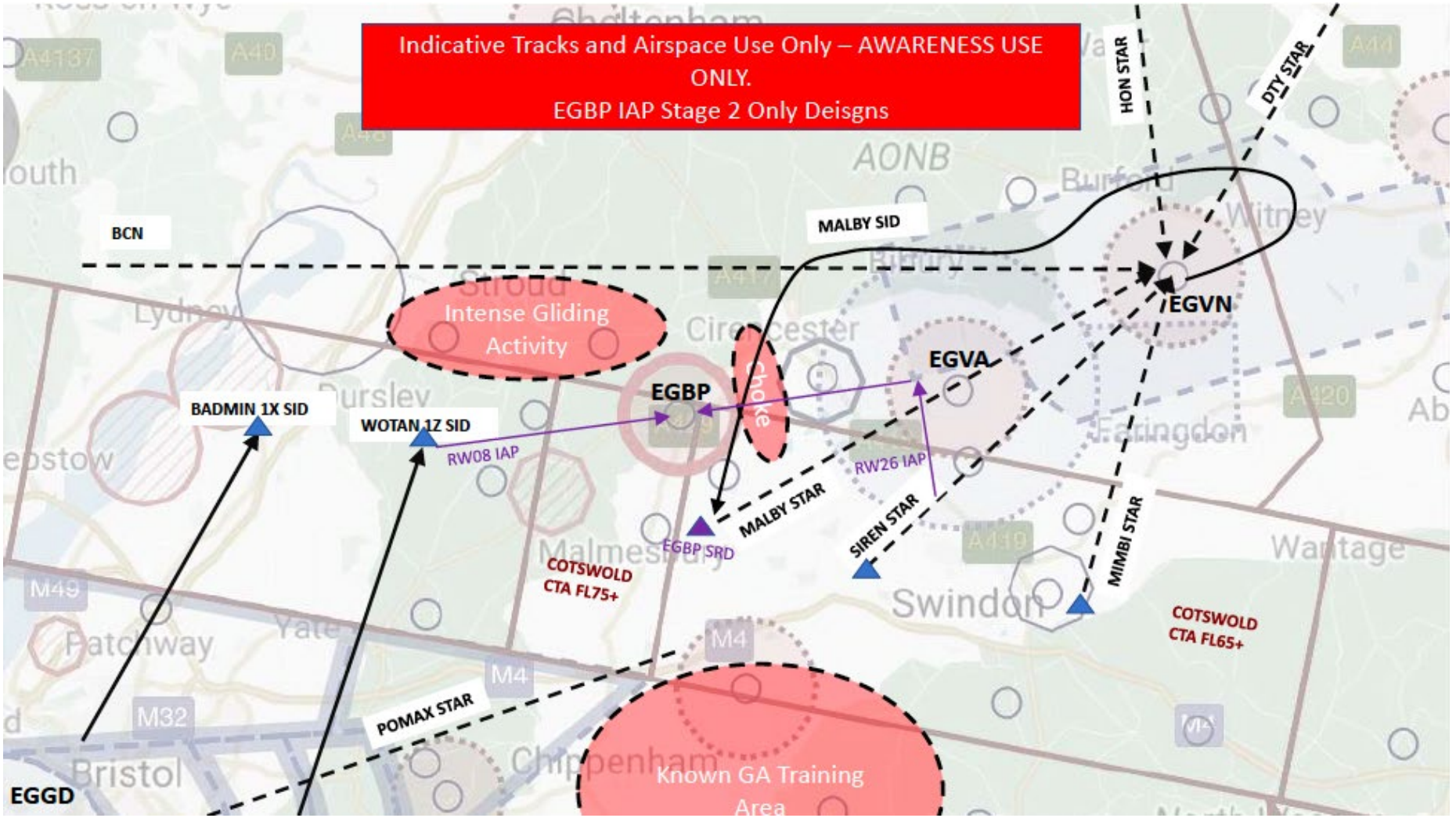
a) Traffic management is safely achieved through the slot system and suspending operations in the ATZ.

b) Risks associated with aircraft flying in Class G in IMC have already been dealt with by the Government.

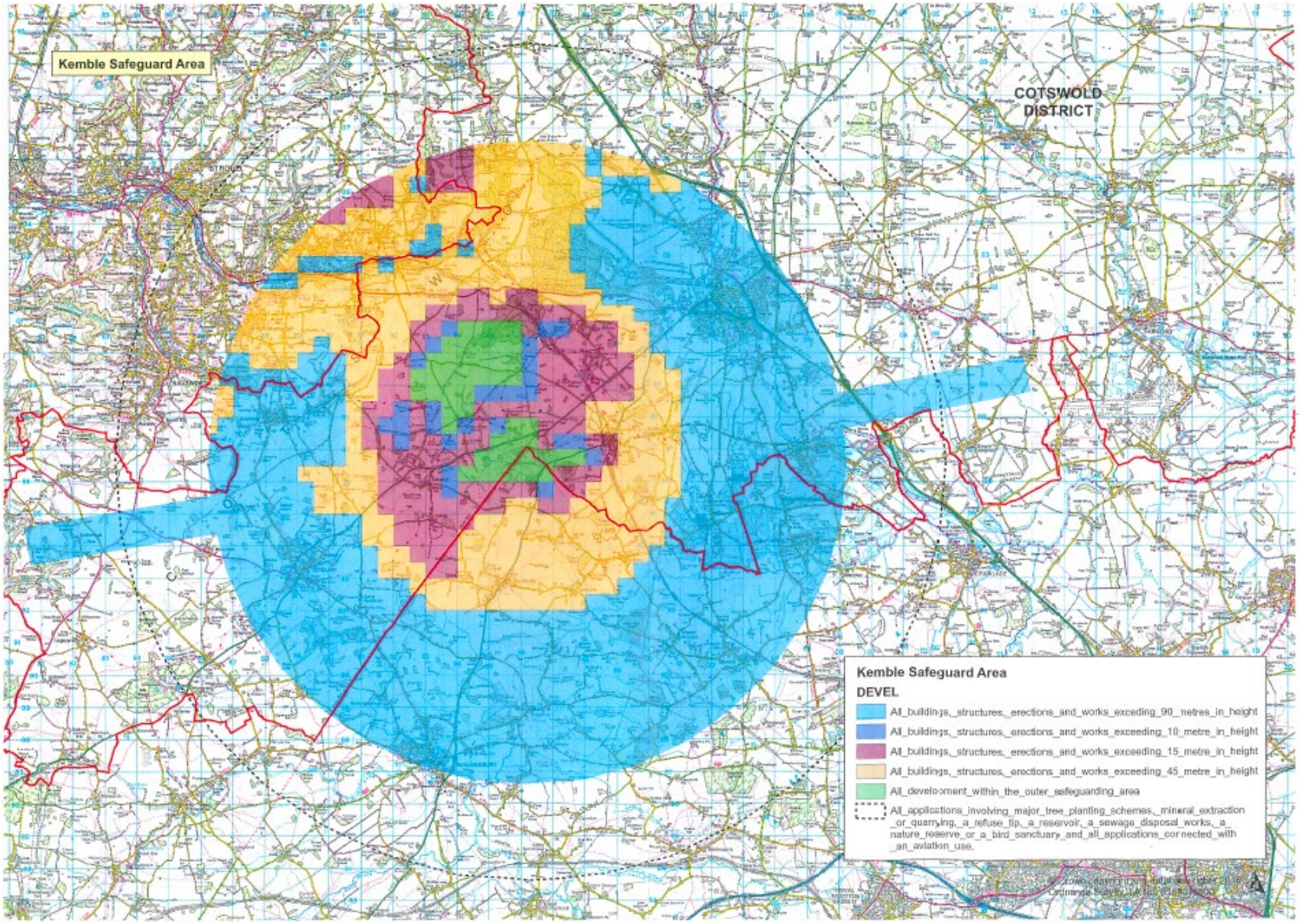
Annex B - Slot System (Also Published as Annex F to Main Document)

Proposed IAP PPR Slot Times - EGBP Kemble		
FISO Watch Open	0900	ATM Description
		IFR Seperation Time 15 Mins - No Previous Traffic
IFR Approach Slot 1 - 0930		
Early Arrival Buffer	0915	
Allocated Slot Start	0930	
Slot Complete	1000	
Overrun Buffer	1015	IFR Seperation Time - 30 Mins
IFR Approach Slot 2 - 1100		
Early Arrival Buffer	1045	
Allocated Slot Start	1100	
Slot Complete	1130	
Overrun Buffer	1145	IFR Seperation Time - 30 Mins
IFR Approach Slot 3 - 1230		
Early Arrival Buffer	1215	
Allocated Slot Start	1230	
Slot Complete	1300	
Overrun Buffer	1315	IFR Seperation Time - 30 Mins
IFR Approach Slot 4 -1400		
Early Arrival Buffer	1345	
Allocated Slot Start	1400	
Slot Complete	1430	
Overrun Buffer	1445	IFR Seperation Time - 30 Mins
IFR Approach Slot 5 - 1500		
Early Arrival Buffer	1515	
Allocated Slot Start	1530	
Slot Complete	1600	
Overrun Buffer	1645	IFR Seperation Time - 15 Mins
Aerodrome Closes	1700	

Annex C - Local Airspace



Annex D - Safeguarding map



Acronyms and Abbreviations

AFIS	Aerodrome Flight Information Service
AIP	Aeronautical Information Publication
ANO	Air Navigation Order
AOC	Air Operator Certificate
APAPI	Abbreviated Precision Approach Path Indicator
ATC	Air Traffic Control
ATS	Air Traffic Services
ATSU	Air Traffic Service Unit
ATZ	Aerodrome Traffic Zone
CAA	Civil Aviation Authority
CAP	Civil Aviation Publication
CAT	Commercial Air Transport
CFIT	Controlled Flight into Terrain
CNS	Communication, Navigation and Surveillance
DOC	Designated Operational Coverage
EGNOS	European Geostationary Navigation Overlay Service
FAF	Final Approach Fix
FL	Flight Level
GA	General Aviation
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
IAF	Initial Approach Fix
IAP	Instrument Approach Procedure
ICAO	International Civil Aviation Organization
IF	Initial Approach Fix
IAF	Intermediate Fix
IFR	Instrument Flight Rules
IMC	Instrument Meteorological Conditions
KIAS	Knots-Indicated Air Speed
LNAV	Lateral Navigation
LOC	Loss of control
LPV	Localizer Performance with Vertical guidance
MAC	Mid-air collision
MAP	Missed Approach Procedure
MAPt	Missed Approach Point
MET	Meteorological
MHz	Mega Hertz
MSA	Minimum Sector Altitude
NM	Nautical Mile
OCA	Obstacle Clearance Altitude
OCH	Obstacle Clearance Height
PANS - OPS	Procedures for Air Navigation Services – aircraft operations
RNP	Required Navigation Performance
PPR	Prior Permission Required
QFE	Q-code for atmospheric pressure at Field Elevation
QNH	Q-code for atmospheric pressure at Sea Level
RCF	Radio Communications Failure
RCOLL	Runway COLLision
RESA	Runway End Safety Area
REXC	Runway EXCursion accident
RWY	Runway
SMS	Safety Management System
SSR	Secondary-Surveillance Radar
UKAIP	United Kingdom Aeronautical Information Publication
VFR	Visual Flight Rules
VMC	Visual Meteorological Conditions
VM(c)	Visual Manoeuvring (Circling)