Safety and Airspace Regulation Group

Applications for instrument approach procedures to aerodromes without Approach Control and/or with a non-instrument runway – additional policy, guidance, and Acceptable Means of Compliance

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Contents

Contents 3

Revision history and effective pages 5

Preface 6

Aim 6

Context 6

Approval fees 6

Chapter 1 7

General 7

Introduction 7

Chapter 2 8

Policy 8

Introduction 8

Historic policy 8

The case for change 9

Legal considerations 9

Required regulatory approach 10

Legacy issues 11

Chapter 3 12

Implementation 12

The assessment and management of safety risk 12

Safety assurance process and documentation 12

Post implementation continuing safety assurance 13

Chapter 4 14

Baseline Safety Arguments 14

Chapter 5 23

Candidate alternative safety arguments 23

Abbreviations and Glossary 47

Abbreviations 47

Glossary of terms 48

IAP to a non-instrument runway and/or an aerodrome which does not provide an Approach Control service 52

General 52

Absence of an approach control service 53

Runway environment 54

Survey requirements 54

Airspace/ATS environment 54

Instrument approach procedure 55

Design criteria and methodology for the calculation of OCA(H) for aircraft to non-instrument runways in the UK 55

General concepts 55

Design assumptions 55

Design criteria 56

Minimum obstacle data required 56

Methodology for the calculation of OCH for straight in approaches to non instrument runways 57

Methodology for the calculation of OCA(H) for visual manoeuvring 58

Helicopter PinS approaches 59

General 59

Revision history and effective pages

Preface

Aim

The purpose of this document is to set out additional Civil Aviation Authority (CAA) policy, guidance and Acceptable Means of Compliance (AMC) to support the safety arguments and mitigations required for applications in accordance with CAP1616 Part 1c[1] to be considered for approval by the CAA for the establishment of Instrument Approach Procedures (IAPs) to aerodromes without an Approach Control service and/or with a non-instrument runways.

Context

In addition to any safety case and specific mitigations associated with an application under this policy, the introduction of a new IAP does not negate the need to follow existing CAA requirements regarding the design of an Instrument Flight Procedure (IFP). CAP 785[2] and the “Validation of Instrument Flight Procedures” Policy Statement[3] provides CAA guidance on approval requirements for Instrument Flight Procedures (IFPs).

Approval fees

Fees associated with obtaining CAA approval to design IFPs for use in United Kingdom (UK) airspace are available from the CAA website at: www.caa.co.uk/ors5.

1 CAP 1616 – Airspace Change

2 CAP 785 - Approval Requirements for Instrument Flight Procedures for Use in UK Airspace

3 DAP Policy - Validation of Instrument Flight Procedures

Chapter 1

General

Introduction

Current CAA policy requires that the operator of a UK licensed aerodrome wishing to offer an instrument approach[4] must provide a runway which meets the criteria laid down in CAP 168[5] (i.e. a precision or non-precision instrument runway). A further requirement is that, in accordance with Air Navigation Order (ANO) 2016 Article 183, an Approach Control service must be provided to aircraft making an instrument approach to a UK aerodrome. Compliance with these regulatory requirements guarantee an acceptable level of safety management of the main risks associated with making approaches under Instrument Flight Rules (IFR).

The use of conventional IAPs at aerodromes has traditionally been limited by the associated need for relatively costly ground-based navigation system infrastructure; however, the availability of satellite-based navigation systems means that IAPs serving smaller and less well-equipped aerodromes is now possible.

The ability to provide an IAP into a smaller aerodrome without an Approach Control service and/or with a non-instrument runway may contribute to improvements in the overall safety of operations at the aerodrome along with supporting the viability of the aerodrome. This document provides policy, guidance and AMC[6] to assist those aerodromes to apply for the implementation of an Required Navigation Performance (RNP) approach using a risk-based approach to mitigate the deficiencies in runway and/or service provision.

4 Air Navigation Order 2016 Article 187 requires that an IFP must not be notified (i.e. published) unless it has been designed or approved by the CAA.

5 CAP 168 Licensing of Aerodromes.

6 AMC may not be used in the design of an IAP; it is only applicable to the safety arguments addressing potential deficiencies in air traffic services and runway provision.

Chapter 2
Policy

Introduction

Historic policy

Instrument and non-instrument runways

Instrument runways may be classified as precision instrument or non-precision instrument depending on whether both lateral and vertical guidance or lateral guidance only is provided. As IAPs to these runways permit descent in Instrument Meteorological Conditions (IMC) to very low altitudes the runways have to meet minimum standards for runway strip dimensions, obstacle limitation surfaces, holding points, signs, markings and Aeronautical Ground Lighting (AGL). Runways which are required to meet less onerous standards within CAP 168 are known as non-instrument runways to which IAPs may be flown but only to a point beyond which the approach may continue in Visual Meteorological Conditions (VMC).

Approach control

Currently the Air Navigation Order (ANO) Article 183 requires an Approach Control service to be provided at UK aerodromes for which there is 'equipment for providing aid for an approach to landing by radio or radar'. At such aerodromes, the Approach Control service provides safety mitigation to reduce the risk of, for example, mid-air collision.

RNP approaches

RNP approaches using a Global Navigation Satellite System (GNSS) have been approved for use at a number of UK aerodromes in conformance with a specific set of policy requirements: the aerodrome must be licensed, the RNP approach must be to an instrument runway, an Approach Control service must be provided, aerodrome survey information must be current and appropriate, compliant meteorological information must be made available, the aircraft conducting such an approach must be suitably equipped and the pilot qualified to conduct the flight procedure. RNP APCH approaches are currently categorised as follows:

- Non-Precision Approaches (NPAs) with lateral only guidance where the minima is published as Lateral Navigation Obstacle Clearance Altitude (Height) (LNAV OCA(H)).
- Approach with Vertical guidance (APV); these approaches provide lateral and vertical guidance as follows:
  - Barometric Vertical Navigation (BaroVNAV), where the vertical advisory is provided by the aircraft's barometric system against a

position generated in the aircraft's navigation/flight management system, and the minima is published as LNAV/VNAV OCA(H).

- Satellite-Based Augmentation System (SBAS) where the vertical guidance is provided against a geometrical path in space rather than a barometric altitude. In Europe the augmentation is provided by the European Geostationary Navigation Overlay System (EGNOS), and the minima is published as Localiser with Precision Vertical Guidance (LPV) OCA(H).

As both BaroVNAV and SBAS elements of RNP IAPs take account of height loss in the design, a pilot can utilise the published OCA(H) as a decision altitude/height DA(H) rather than a minimum descent altitude MDA(H). It is to be noted that LPVs are not in use in the UK.

The case for change

The case for change is driven not only by safety considerations but also commercial efficiency. Current policy, combined with the associated costs, renders provision of an IAP outside of the financial reach of many smaller aerodromes. Only a relatively small number of UK aerodromes offer any form of instrument approach. Moreover, much of the ground-based infrastructure required to provide a conventional approach, such as Non-Directional Beacon (NDB) and Very high frequency Omnidirectional Radio range (VOR), are being phased out. The lower costs associated with use of GNSS technology make it more financially attractive to aerodrome operators, to develop an RNP IAP. At smaller aerodromes this will facilitate some continuation of operations in conditions of reduced visibility and lower cloud-base and enhance overall safety by providing accurate navigational information that reduces the risk of Controlled Flight Into Terrain (CFIT).

Legal considerations

Sponsors should note Regulation (EU) 73/2010 as retained (and amended in UK domestic law) under the European Union (Withdrawal) Act 2018. This legislation deals with Aeronautical Data Quality (ADQ) which applies to aerodromes which have an IAP and would therefore require sponsors under the arrangements outlined in this document to comply with requirements in this field. To assist all parties involved in the data chain, understanding of, and compliance with the requirements pertaining to origination and processing of aeronautical data and aeronautical information published in Aeronautical Information Products, the CAA published CAP 1054[7].

[7] CAP 1054 Aeronautical Information Management

Required regulatory approach

Implementation of this policy requires a change in regulatory approach from one based upon standards to one based on risk. Such an approach requires an sponsor to consider the mitigations against risk which are provided by the current standards. Safety assurance arguments specific to the aerodrome and airspace environment must then be provided that show how the associated risks can be mitigated locally by other means where the current requirements are not achieved.

The instrument runway requirement, for example, includes provisions for markings and lighting which aid visual detection and which together with a protected 'runway strip' provide some mitigation of the risk of CFIT and, to a degree, the risk of runway excursions and overruns. Approach Control provides some mitigation of the mid-air collision and other risks and IAP OCA(H) restricted to a minimum value per aircraft category mitigates the lack of runway insfrastructure in a non-instrument runway.

Use of the safety case methodology is considered the appropriate way to present the safety assurance arguments and guidance material on the conduct of such safety assessments is available to sponsors in CAP 760[8]. Guidance on the broad boundaries of what may reasonably be considered in scope for a risk-based approach from sponsors in terms of aerodrome licensing status, level of Air Traffic Service (ATS), meteorological service provision and runway facilities, is provided later in this document.

Such a case-by-case approach offers scope for approval of IAPs at aerodromes without Approach Control and/or with non-instrument runways in those circumstances where it can be shown that the risks of CFIT, collision on the runway, runway excursion, mid-air collision etc. can be managed to an acceptable level of safety. Unlike a process which requires the demonstration of predetermined standards, a risk-based method offers the sponsor no guarantee that alternative safety arguments will be successful until the process had been completed. An equally possible conclusion to the process could be that the most appropriate safety assurance could only be met by providing both runway facilities to instrument standards and Approach Control.

A risk-based methodology and process is outlined later in this document that may assist sponsors in structuring their safety assurance arguments. It is not intended that this process should be used to modify arrangements retrospectively at aerodromes where IAPs have been established and which already mitigate safety risks by complying with extant regulations. The guidance provided in this document reflects, for a given requirement, the circumstances under which an effective, alternative mitigation means and/or restrictions may be applied as part of the sponsor's safety assessment process.

8 CAP 760 - Guidance on the Conduct of Hazard Identification, Risk Assessment and the Production of Safety Cases: For Aerodrome Operators and Air Traffic Service Providers.

Legacy issues

As a result of this revised policy and the development of a more progressive risk-based process to deal with applications, the relatively small number of IAPs that still exist today under ‘non-standard’ arrangements are progressively being approved and published in the UK Aeronautical Information Publication (AIP). These ‘Discrete’ IAPs (DIAPs) have operated predominantly in remote locations of the UK for several years with some of the procedures effectively ‘owned’ by the aircraft operators and approved under private conditions of use. It will be necessary for these ownership arrangements to be regularised and for risk-ownership to be transferred to the respective aerodrome operators and the procedures published in the UK AIP with suitable caveats in terms of Prior Permission Required (PPR) and how the procedures may be used. The term ‘Discrete’ will no longer be accepted and these procedures will operate as approved IAPs promulgated in the UK AIP. Therefore, a 5-year periodic review of DIAPs will need to be carried out as part of the CAP 1616 Pt 1c process for these IAPs to be approved and published in the UK AIP.

For ATS and meteorological aspects, these will form part of the Air Navigation Service Provider’s (ANSP) safety assurance and associated documentation developed in support of European Certification and subsequent CAA oversight; this documentation may form the basis of the new safety arguments for approval.

The advice of the CAA should be sought prior to commencing any work in order to ensure the correct process and procedures are followed to enable the approval and promulgation of the IAP and termination of the Discrete status.

Chapter 3

Implementation

The assessment and management of safety risk

An sponsor seeking to implement an instrument approach without an Approach Control service and/or which will terminate at a non-instrument runway will need to present an acceptable safety case to the CAA which demonstrates that relevant safety risks have been adequately assessed and mitigations put in place to minimise the risk of accident as far as reasonably practicable. Such IAPs will have an OCH of 500ft for CAT A and B aircraft, 600ft for CAT C and 700ft for CAT D applied as a minimum in all cases. In assessing the effectiveness of the proposed alternatives to a runway configured to instrument standards and/or to the provision of an Approach Control service, the sponsor will, as owner of the risk, need to be satisfied that the proposed alternative arrangements will provide a degree of residual risk which is sufficiently low to be acceptable. This process should be completed in accordance with, and managed through, the sponsor's Safety Management System (SMS).

The safety assessment by the sponsor is a key step toward gaining CAA approval for an IAP to be established under these terms and which will require carefully argued safety assurance documentation to be submitted to the CAA in accordance with the process described in CAP 1616, Pt 1c. Each sponsor will face a different set of local circumstances and the alternative safety arrangements will also vary from one aerodrome location to the next. The sponsor's assessment of proposed safety assurance will, therefore, be a most important step.

It is important for sponsors to note that approvals for the establishment of IAP under the arrangements outlined in this publication will be made on the basis of risk-based judgement. Where the sponsor has failed to provide acceptable safety assurance, via the safety case and the IAP design submission the CAA will be unable to accept the proposal.

Safety assurance process and documentation

As part of the Airspace Change Process (ACP), the sponsor will be required to carry out a safety assessment and produce a Safety Case in support of the application. Further guidance for sponsors is available in CAP 760.

Guidance in developing and assessing the merit of alternative safety mitigations which could be considered by sponsors and subsequently put forward to the CAA is provided at Chapters 4 and 5 to this document. Chapter 4 indicates where each part of the existing regulations currently provides mitigation against a specific accident type or types and Chapter 5 provides examples of potential alternative safety arguments for sponsors. These Chapters are intended to act as a guide to sponsors and CAA staff but should not be considered to be the sole means of assessing and reviewing the safety risk associated with proposed alternative arrangements for the establishment of an IAP and the preparation and consideration of the associated Safety Case.

Post implementation continuing safety assurance

If an IAP is approved and, under this process has entered operational service, safety assurance activity must continue and will form part of the post implementation review which will normally be undertaken 12 months after the implementation of the IAP. The requirements for the post implementation review will be set out in the decision document published by the CAA.

Post-implementation review is part of routine CAA risk-based oversight activities at licensed aerodromes and certified ANSPs.

Sponsors of the IAPs need to ensure that IAP safeguarding, and 5-year periodic reviews are all completed by an Approved Procedure Design Organisation (APDO), as nominated by the sponsor, to maintain the safety during the lifespan of the IAP, in respect of the obstacle environment and any changes in procedure design criteria.

Chapter 4
Baseline Safety Arguments

Figure 1: Baseline top level strategy and goals

Goal 1 **The IAP at (aerodrome name) will be operated with an acceptable degree of safety**						
Strategy 1 Argument that the standards-based approach which requires approach control (iaw ANO Art 183) and a runway equipped to CAP168 Instrument Runway standards when used in combination with other risk-reduction measures, provides an acceptable degree of safety.						
The risk of a CFIT accident is acceptably low. (CFIT)	The risk of a runway excursion accident is acceptably low. (REXC)	The risk of a runway collision accident is acceptably low. (RCOLL)	The risk of a mid-air collision accident is acceptably low. (MAC)	The risk of a loss of control accident is acceptably low (LOC)	The risk of an accident during the introduction to service of a new IAP at this aerodrome is acceptably low. (INTRO)	The risk of an accident during the through-life operation of an IAP at this aerodrome is acceptably low. (THRULIFE)
Goal 1.1	**Goal 1.2**	**Goal 1.3**	**Goal 1.4**	**Goal 1.5**	**Goal 1.6**	**Goal 1.7**

The table above 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 in the table which follows form a baseline that describes the current approach for aerodromes providing Approach Control and a runway meeting CAP 168 Instrument Runway standards.

The IAP at (aerodrome name) will be operated with an acceptable degree of safety.

The argument that the standards-based approach which requires Approach Control iaw ANO Art 183 and a runway equipped to CAP 168 Instrument Runway standards, when used in combination with other risk-reduction measures will provide an acceptable degree of safety.

Goal 1.1: The risk of a CFIT accident is acceptably low. (CFIT)	
CFIT 1 CAP 168 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.
	CFIT 1.2 Instrument runway marking and lighting assists crews in visually detecting the runway by day and night and subsequently following an appropriate approach path to touchdown which will keep them clear of terrain and obstacles. In particular, AGL provides flight crew with location, orientation and alignment information in adverse visibility conditions and at night.
CFIT 2 ANO 183 Requirement for Approach Control is met.	**CFIT 2.1** An ANSP with certification that includes Meteorlogical provision reduces the risk of CFIT by enabling Approach controller to provide accurate Altimeter setting (QNH) instructions, and Approach controller provides a confirmatory check of pilot readback.
	CFIT 2.2 An ANSP with certifcation that includes Meteorolgical provision reduces the risk of CFIT by enabling Approach controller to provide accurate meteorological information in the form of cloud base and visibility information.
	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 3 The Aerodrome operator provides and maintains aerodrome terrain and obstacle data.	**CFIT 3.1** All aerodromes in the scope of CAP 1616, Pt 1c are also in the scope of CAP1732[9] , CAP 738[10], CAP 785[11], which reduce the risk of CFIT by providing and maintaining aerodrome terrain and obstacle data. The aerodrome survey will be used by the APDO to design, safeguard and conduct 5-year periodic review of the IAP on behalf of the Aerodrome operator. This work is to ensure the ongoing safety of the aerodrome and the IAP as promulgated in the AIP.
CFIT 4 The IAP design has been conducted iaw PANS- OPS 8168 Vol II and the procedure	**CFIT 4.1** Use of PANS-OPS IAP Design criteria reduce 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 simulator or flight validation process) provide participating aircraft with a flightpath which, if followed in flight, will keep them clear of terrain and obstacles.

[9] CAP 1732 Aerodrome Survey Guidance

[10] CAP 738 Aerodrome Safeguarding

[11] CAP 785 Approvla Requirements for Instrument Flight Procedures for use in UK Airspace

notified in the UK AIP.	
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.
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** The flight crew training and qualification standards which must be met are sufficient to provide for IAPs to be flown safely and accurately, remaining clear of terrain and obstacles.
CFIT 7 The integrity and accuracy of the meteorological information provided by Approach and/or Aerodrome Control meets the required standards.	**CFIT 7.1** At aerodromes that provide an Approach and /or Aerodrome Control service the risk of CFIT is reduced by the provision of meteorological information of the required integrity and accuracy including QNH, cloud base and visibility. As an ANSP with certifcation that includes Meteorolgical provision there is a requirement to ensure that all meteorological equipment used on the aerodrome shall meet the specifications stated in CAP 746[12] and shall ensure that staff providing meteorological information have and maintain Meteorological Observing competency in accordance with CAP 746.

[12] CAP 746 Requirements for meteorological observations at aerodromes

Goal 1.2: The risk of a runway excursion accident is acceptably low. (REXC)	
REXC 1 CAP 168 Instrument Runway Standards are met.	**REXC 1.1** CAP 168 compliant Runway Dimensions, Markings, and lighting 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.
	REXC 1.2 CAP 168 compliant instrument runway strip and Runway End Safety Area (RESA) assist in mitigating the effects should a runway excursion occur.
REXC 2 ANO 183 Requirement for Approach Control is met.	**REXC 2.1** Approach control provides crew with information on runway condition which will assist in reducing the risk of a runway excursion accident.
	REXC 2.2 An ANSP with certifcation that includes Meteorolgical provision reduces the risk of REXC by enabling Approach controller to provide accurate surface wind information which will assist in reducing the risk of a runway excursion accident.
REXC 3 The IAP design has been conducted iaw PANS OPS 8168 vol II and Appendix B of this document and the procedure notified in the UK AIP. The AIP is used as the source data for RNP coding of the RNP approaches in aircraft 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 IAP meet the required standards.	**REXC 4.1** The integrity and accuracy of the navigation aids used for IAPs 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** The flight crew training and qualification standards which must be met are sufficient to provide for IAPs to be flown safely and accurately, to a position in space from which a safe landing can be made on the runway or a missed approach can be executed safely.
REXC 6 Runway excursions include runway overruns, where an aircraft is unable to stop before it reaches the end of the runway. They can also happen because of, for example pilot error, poor weather or a	**REXC 6.1** Pilots have the time available to fly the IAP including the missed approach (MAP) should it be required to be flown, to ensure the approach is stabilised and not rushed. (Runway excursions can occur because of an IAP being continued when the MAP should have been flown.)
	REXC 6.2 IAP designs are standard and straight forward to enable pilots to understand the requirements of the IAP as published in the AIP.

fault with the aircraft. A stabilised approach helps to minimise the occurrence of runway excursions.	

Goal 1.3: The risk of a runway collision accident is acceptably low. (RCOLL)	
RCOLL 1 ANO 183 Requirement for Approach Control is met.	**RCOLL 1.1** Approach control provides sequencing of instrument approach traffic to reduce the risk of runway collision between participating instrument traffic.
RCOLL 2 CAP 168 Instrument Runway Standards are met.	**RCOLL 2.1** CAP 168 compliant signage, runway 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.
RCOLL 3 Aerodrome ATS is provided.	**RCOLL 3.1** Provision of an aerodrome ATS reduces risk of runway collision between instrument and visual traffic.
	RCOLL 3.2 Provision of an aerodrome ATS reduces risk of runway collision between instrument traffic and vehicles/towed aircraft, etc.
	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 4 The crew members of aircraft participating in the IAP and others using the aerodrome are suitably qualified and proficient to operate safely	**RCOLL 4.1** The flight crew training and qualification standards which must be met are sufficient to provide for aircraft operations in the vicinity of the runway, including the IAPs, to be conducted safely and minimise the risk of collisions with other aircraft, vehicles, personnel, wildlife or other foreign objects.

in the vicinity of the runway.	
RCOLL 5 Pilots use of R/T advises all users on the ground of their intentions prior to taxy to/from the runway.	**RCOLL 5.1** Provision of information by pilots enables other aerodrome users to have a correct situational awareness at the time of aircraft departures and arrivals.

Goal 1.4: The risk of a mid-air collision accident is acceptably low. (MAC)	
MAC 1 ANO 183 Requirement for Approach Control is met.	**MAC 1.1** Approach control reduces the risk of mid-air collision between participating instrument traffic by providing deconfliction.
	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 1.3 Where surveillance is not provided and the see and avoid principle cannot be deployed, Approach Control will issue instructions to participating aircraft to ensure separation is achieved, similar methods of deconfliction, or enhanced traffic information may also be provided between participating and other known traffic by the controller, to ensure the safe conduct of flight.
MAC 2 An aerodrome ATS is provided.	**MAC 2.1** Aerodrome ATC reduces the risk of collision between instrument traffic and other known traffic in the aerodrome environment - i.e. by sequencing visual circuit traffic, and providing traffic information on both transiting traffic and infringing traffic which is detected visually or by other means.
MAC 3 Airspace design measures are in place in the vicinity of the aerodrome.	**MAC 3.1** An Aerodrome Traffic Zone (ATZ) provides a ‘known’ environment close to the aerodrome itself which reduces the risk of collision between instrument traffic within the ATZ and non-participating visual traffic outside the ATZ.
	MAC 3.2 Where the nature and level of traffic requires it, CAS or other airspace management processes such as Transponder Mandatory Zone (TMZ) 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 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 or prompting them to contact the aerodrome to gain flight information thereby reducing the risk of mid-air collisions with non-participating traffic.
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** During 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.

Goal 1.5: The risk of a loss of control accident is acceptably low. (LOC)	
LOC 1 ANO 183 Requirement for Approach Control is met.	**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 2 An aerodrome ATS is provided.	**LOC 2.1** Aerodrome ATC reduces the risk of a loss of control accident arising from wake turbulence by sequencing and issuing warnings to visual landing traffic and participating instrument approach traffic.
LOC 3 The crew members of aircraft participating in the IAP are suitably qualified and proficient to fly	**LOC 3.1** The flight crew training and qualification standards which must be met are sufficient to provide for IAPs to be flown safely and accurately, with appropriate training/awareness of wake turbulence considerations.

the IAP safely and under control.	

Goal 1.6: The risk of an accident during the introduction to service of the new IAP 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 and arrangements for the provision of meteorological information etc. have been satisfactorily completed before the IAP can be used operationally. (CAP 785 refers.)

Goal 1.7: The risk of an accident during the through-life operation of the IAP is acceptably low. (INTRO)
THRULIFE 1 A formal process is followed for the ongoing, 5 year periodic review and safeguarding of an IAP (CAP 785 refers), all completed by an APDO 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.

The above baseline provides a structure which is intended to give guidance to sponsors in developing effective risk-based alternative safety arguments for presentation as part of their application for an IAP safety case under the policy outlined in CAP 1616, Pt 1c. It will also assist CAA staff in their task of reviewing safety arguments in support of applications. It is not the intention of this document to provide guidance on the conduct of the required safety assessment itself: this should be done in accordance with the processes and procedures documented in the sponsor's SMS where provided. Further guidance in the form of candidate alternative safety arguments is provided at Chapter 5.

Chapter 5

Candidate alternative safety arguments

In developing the safety case for the introduction of an IAP, under circumstances where the runway does not meet instrument runway criteria and/or an Approach Control service is not to be provided, sponsors may be guided by CAP 760 and CAP 1059[13]

The CAA ATM Safety Questionnaire has been developed for sponsors and shall be the starting point of the process. The questionnaire shall also be used by those who have started to develop their safety arguments. Sponsors who have started to develop their safety arguments and those who have already prepared a safety case must still complete the ATM Safety Questionnaire as part of the process outlined in this document.

This section is intended to assist with the process and the sponsor's subsequent development of the safety assessment documentation (e.g. safety case) which must be submitted in support of an application.

Figure 2: Alternative top level strategy and goals

Argument that alternative solutions will be used in combination with other risk-based measures to provide an acceptable degree of safety	
Goal 1.1	The risk of a CFIT 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] CAP 1059 Safety Management Systems: Guidance for small, non-complex organisations

Goal 1.1 The risk of a CFIT is acceptably low. (CFIT)	
Safety baseline	**Candidate alternative safety arguments**
CFIT 1	CAP168 Instrument runway standards are met.
CFIT 1.1 CAP 168 compliant 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.	**CFIT 1.1.1 Runway Strip – Higher Minima**. An argument for a reduction in the size of the runway strip provided could be made on the basis of the aircraft categories approved for the IAP.
	CFIT 1.1.2 Runway Strip – Restrictions on Use. An argument could be made that safety mitigation could be claimed for a reduced runway strip on the basis that use of the IAP is managed by some form of PPR requiring specific briefing on these local limitations. Where this is the case, evidence should be available that operators have been consulted and that the operation of specific a/c categories, or by pilots with particular qualifications and experience provides the necessary safety mitigation.
CFIT 1.2 Instrument runway marking and lighting assists crews in visually acquiring the runway by day and night and subsequently following an appropriate approach path to touchdown which will keep them clear of terrain and obstacles. In particular	**CFIT 1.2.1 Aerodrome Lighting – Day Use Only.** An argument could be made for a lower standard of lighting to be provided on the basis that the IAP will be promulgated for use during day operations only and published as such in the UK AIP and associated approach plate. Arguments would need to focus upon the types of operations to be supported and the potential for new technology lighting to be considered where appropriate. This type of argument could be used to justify the absence of an aerodrome beacon or provision of a less sophisticated type of aerodrome beacon. It also recognises that low intensity lighting is of only limited use in daylight although arguments would need to reflect the value of lighting in poor visibility conditions. Arguments could also be constructed around the use of visual approach slope indicators which can aid visual perception of the approach path to the runway.
	CFIT 1.2.2 Aerodrome Lighting – Higher Minima. An argument could be made for a reduction in the scale of aerodrome lighting on the basis of an associated increase in IAP OCA(H).
	CFIT 1.2.3 Runway Marking – Higher Minima. Arguments for a reduction in the scale of runway marking could be made on the basis of an associated increase in procedure OCA(H). This may be particularly applicable to runways with grass or natural surfaces. Arguments could, for example, also be made

AGL provides flight crew with location, orientation and alignment information in adverse visibility conditions and at night.	here for the permanent use of suitable black & white boards for use where threshold is not conspicuous as described in CAP 168 Chapter 7.
	CFIT 1.2.4 Runway Marking and Lighting Standards – Variations. Arguments could be constructed for variations from the standard of runway marking and lighting required for 'precision' and 'non-precision' operations by CAP 168. Such arguments could be constructed around the specific benefits of the aerodrome and procedure. Such arguments would be strengthened by proposed deployment of lighting installations such as Abbreviated Precision Approach Path Indicators ((A) PAPI) which can provide specific additional benefit in visually acquiring the aerodrome. Arguments which included the deployment of visual approach aids and an associated survey/checking regime would carry additional weight.
	CFIT 1.2.5 Runway Lighting and Marking Standards. Arguments could be made for provision of a reduced form of aerodrome lighting and/or runway marking on the basis that the IAP would be some form of 'IAP with Higher Minima' procedure as described at Appendix C. Such arguments could be used to support the use of a non-instrument runway with lighting appropriate to its purely visual day use (or no lighting). Where this type of IAP is used an argument could be made for use at night using AGL which conformed to CAP 168 standards for night VFR operations. Arguments which included the deployment of visual approach aids and an associated survey/checking regime would carry additional weight. However, much higher minima would be required and the utility of the IAP in poor visibility and/or low cloud conditions would be more limited operationally than for other types of IAP.
	CFIT 1.2.6 Runway Lighting and Marking – Restrictions on Use. An argument could be made that safety mitigation could be claimed for a reduced form of runway marking and/or lighting on the basis that use of the IAP is managed by specific briefing on these local limitations. This type of argument would be more applicable to the small privately-owned aerodrome or airstrip with only a single operator or small number of users. Note 1: A particular consideration with the evaluation of all the above arguments in the context of the CFIT risk would be the local topography. Note 2: In each case, safety arguments for variations from the CAP 168 standard would need to be much more strongly justified where Public Transport operations are contemplated.
CFIT 2	ANO Art 183 requirement for Approach Control is met.
CFIT 2.1	**CFIT 2.1.1 Altimeter Setting** - Where an ANSP with certifcation that includes Meteorolgical provision is not established at the aerodrome an alternative argument could be made if the QNH passed to an aircraft is provided by observers that meet the Basic Observer Competence standard specified in

	CAP 746 Appendix H and the equipment used to establish the QNH is installed, maintained and calibrated in accordance with CAP 746, Chapters 6 & 7.
CFIT 2.2	**CFIT 2.2.1 Weather Reporting.** Where an ANSP with certifcation that includes Meteorolgical provision is not established at the aerodrome an alternative argument could be made if unofficial meteorological observations passed to an aircraft are provided by observers that meet the Basic Observer Competence standard specified in CAP 746 Appendix H and the equipment used to obtain meteorological data is installed, maintained and calibrated in accordance with CAP 746, Chapters 6 & 7 where appropriate.
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 Requirement for Monitoring of Lateral and Vertical Flight Path – Type of Operation.** A safety argument should be presented that ensures the pilot is aware of the applicable terrain safe levels. Further safety arguments related to surveillance display systems based on Primary Surveillance Radar (PSR)/Secondary Surveillance Radar (SSR) /Automatic Dependent Surveillance – Broadcast (ADS-B) /Other may be submitted.
CFIT 3	The Aerodrome operator provides and maintains aerodrome terrain and obstacle data
CFIT 3.1 All aerodromes in the scope of CAP 1616, Pt 1c are also in the scope of CAP 1732 and CAP 738 both of which reduce the risk of CFIT by providing and maintaining aerodrome terrain and obstacle data.	**CFIT 3.1.1 Aerodrome Surveys – Data from other Sources.** The obstacle data required for the design of the IAP is used by the APDO. The sponsor will need to ensure they have IAP safeguarding and 5-year periodic review processes in place with their APDO to ensure the IAP remains safe.

CFIT 4	The IAP design has been developed iaw PANS-OPS and additional design criteria described in Appendix C and the associated coding data in the UK AIP is used as the source data by DAT providers for creating the navigation databases.
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 4.1.1 Use of IAP.** An argument could be made by an sponsor for an IAP with Higher Minima to be designed and make use of more conservative OCA(H). The CAA will consider safety arguments from an APDO for construction of an IAP with higher minima using the process described at Appendix B. An adequate means of periodic review of continued accuracy of the IAP and associated aerodrome data would need to be developed and provided by the sponsor in support of such arguments.
CFIT 4.2 The established procedures for designing and approving IAP designs provide participating aircraft with a flightpath which, if followed in flight, will keep them clear of terrain and obstacles.	**CFIT 4.2.1 Use of IAP – Aircraft Category Limitation.** A safety argument will need to be provided that details why the IAP minima is appropriate for the types of aircraft expected to use the approach.
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	**CFIT 5.1.1** The integrity of navigation aids is a measure of the reliance that can be put on the aid in radiating a correct signal. The integrity depends on the ability of the aid to radiate an in-tolerance signal and of the inbuilt monitoring systems to recognise when the signal is out of tolerance and shutdown the faulty system. The integrity of ground-based navigation aids is assessed when

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.	the aid is first approved for use, with manufacturers' evidence of reliability of all parts of the system being taken into account. The ongoing reliability of those parts of the system will give confidence that the integrity requirements continue to be met. CAP 670 provides further guidance on Communications, Navigation & Surveillance equipment.
	CFIT 5.1.2 Cross checking of Other Sources of Information by Aircraft Commander. As a mitigation for integrity failures, when systems radiate incorrect information, Pilots will cross check other systems to give confidence that all is as it should be or to alert them that there is a problem with the guidance being used. For example, a pilot making an ILS approach will check the height of the aircraft at a certain DME range to be sure the glide path information is correct.
	CFIT 5.1.3 GPS has no internal monitoring system to give timely warning of incorrect guidance being transmitted, instead Integrity monitoring relies on augmentations such as the use of receivers equipped with RAIM (Receiver Autonomous Integrity Monitoring). In lieu of manufacturers evidence to support the approval of an approach using GPS guidance, the CAA makes available historical monitoring data to allow the assessment of the integrity in conjunction with the certified integrity of the airborne receiver and the availability of RAIM and Fault Detection and Exclusion (FDE) algorithms.
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 The flight crew training and qualification standards which must be met are sufficient to provide for IAPs to be flown safely and accurately, remaining clear of terrain and obstacles.	No alternative safety argument is considered appropriate for this baseline safety solution.
CFIT 7	The integrity and accuracy of the meteorological information provided by Approach and/or Aerodrome Control meets the required standards.

CFIT 7.1 The integrity and accuracy of the meteorological information provided are such that they will provide the crew of participating aircraft with sufficiently reliable and accurate information to enable them to make safe decisions when considering whether to commence the approach, and to anticipate whether a missed approach may be possible.	**CFIT 7.1.1 Meteorological information – provided by an ANSP with certifcation that includes Meteorolgical provision.** At aerodromes where meteorological information is provided by a certificated ANSP an argument could be made that information is made available in accordance with the requirements contained in CAP 746 and as such is of an appropriate quality. ANSP's that are certificated to provide Local Routine Reports only may need to provide additional assurance that staff providing meteorological information have and maintain basic meteorological observing competency.
	CFIT 7.1.2 Meteorological information – provided by aerodromes without an ANSP with certifcation that includes Meteorolgical provision. At aerodromes where there is no ANSP with certifcation that includes Meteorolgical provision, assurance would need to be provided that meteorological equipment (as a minimum sensors for wind, pressure, temperature) is installed in accordance with the manufacturer's or supplier's instructions and there is a routine care and maintenance schedule which ensures that equipment continues to operate effectively, and that staff providing meteorological information have and maintain basic meteorological observing competency. An argument could be made that the aerodrome complies with the applicable requirements as contained in CAP 746. At aerodromes where there is no ANSP with certifcation that includes Meteorolgical provision all meteorological information provided must be clearly identified as "unofficial" and prefixed as such when being passed to aircraft. Additional mitigation may be needed in the form of the use of higher minima for an IAP. Where an IAP, as described at Appendix B, is to be used, an argument could be made that the use of an unofficial weather observation could be acceptable on the basis that with this type of approach more conservative aerodrome operating minima would be applied which would leave an adequate safety margin.

Goal 1.2 **The risk of a runway excursion is acceptably low. (REXC)**	
Safety baseline	**Candidate alternative safety arguments**
REXC 1	CAP 168 Instrument Runway Standards are met.
REXC 1.1 CAP 168 compliant runway dimensions, markings, and lighting 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.	**REXC 1.1.1 Use Of IAP.** Arguments could be made for provision of a reduced form of aerodrome lighting and/or runway marking on the basis that an IAP as described at Appendix B is used which would terminate at an altitude and distance from the aerodrome using suitably OCA(H) which would allow more time for visual acquisition of the local runway environment. Arguments which included the deployment of visual approach aids and an associated survey/checking regime would carry additional weight.
REXC 2	ANO 183 Requirement for Approach Control is met.
REXC 2.1 Approach control provides crew with information on runway condition which will	**REXC 2.1.1 Runway Condition – Aerodrome ATS or Aerodrome Flight Information Service (AFIS).** Where an aerodrome ATS or AFIS is provided, in the absence of Approach Control, an argument could be made that the runway condition/ information could still be provided by the controller or Aerodrome Flight Information Service Officer (AFISO). The basis of such an argument could be that this provides an equivalent level of risk (to that provided at aerodromes where the duties of approach and aerodrome controller are periodically discharged by a single individual.

assist in reducing the risk of a runway excursion accident.	
REXC 2.2 An ANSP with certifcation that includes Meteorolgical provision reduces the risk of REXC by enabling Approach controller to provide accurate surface wind information which will assist in reducing the risk of a runway excursion accident.	**REXC 2.2.1 Surface Wind information – provided by an ANSP with certifcation that includes Meteorolgical provision.** At aerodromes where meteorological information is provided by an ANSP with certifcation that includes Meteorolgical provision an argument could be made that surface wind information is made available in accordance with the requirements contained in CAP 746 and as such is of an appropriate quality. ANSPs that are certificated to provide Local Routine Reports only may need to provide additional assurance that staff providing meteorological information have and maintain basic meteorological observing competency.
	REXC 2.2.2 Surface Wind information – provided by aerodromes without an ANSP with certifcation that includes Meteorolgical provision. At aerodromes where there is no ANSP with certifcation that includes Meteorolgical provision assurance would need to be provided that Surface Wind sensors are installed in accordance with the manufacturer's or supplier's instructions and there is a routine care and maintenance schedule which ensures that equipment continues to operate effectively, and that staff providing meteorological information have and maintain basic meteorological observing competency. An argument could be made that the aerodrome complies with the applicable requirements as contained in CAP 746. At aerodromes where there is no ANSP with certifcation that includes Meteorolgical provision all meteorological information, including surface wind, provided must be clearly identified as "unofficial" and prefixed as such when being passed to aircraft.
REXC 3	The IAP design has been developed iaw PANS-OPS and additional design criteria described in Appendix C of this document and the procedure notified in the UK AIP which is used as the source data by DAT providers for creating the commercially coded 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	**REXC 3.1.1 Use of IAP Design Methodology – Aircraft Category Limitation.** An argument for the use of an IAP design approach as explained in more detail at Appendix C could be enhanced by limiting use of the procedure to aircraft within the lower speed categories A, B or H, under additional limiting conditions such as those outlined at Appendix C.

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 4.1.1 Integrity of Ground Based Navigation Aids.** The integrity of navigation aids is a measure of the reliance that can be put on the aid in radiating a correct signal. The integrity depends on the ability of the aid to radiate an in-tolerance signal and of the inbuilt monitoring systems to recognise when the signal is out of tolerance and shutdown the faulty system. The integrity of ground-based navigation aids is assessed when the aid is first approved for use, with manufacturers evidence of reliability of all parts of the system being taken into account. The ongoing reliability of those parts of the system will give confidence that the integrity requirements continue to be met. Ground based nav aids will require to be flight inspected for IAP introduction in addition to the IAP validation requirements.
	REXC 4.1.2 Cross checking of Other Sources of Information by Aircraft Commander. As a mitigation for rare integrity failures, when systems radiate incorrect information, Pilots will cross check other systems to give confidence that all is as it should be or to alert them that there is a problem with the guidance being used. For example, a pilot making an Instrument Landing System (ILS) approach will check the height of the aircraft at a certain Distance Measuring Equipment (DME) range to be sure the glide path information is correct.
	REXC 4.1.3 GPS has no internal monitoring system to give timely warning of incorrect guidance being transmitted, instead Integrity monitoring relies on augmentations such as the use of receivers equipped with RAIM. In lieu of manufacturers evidence to support the approval of an approach using GPS guidance, CAA makes available historical monitoring data to allow the assessment of the integrity in conjunction with the certified reliability of the RAIM algorithm..
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 The flight crew training and qualification standards which must be met are sufficient to provide for IAPs to be flown safely and accurately, to a position in space from which a safe landing can be made on the runway or a missed approach can be executed safely.	No alternative safety argument is considered appropriate for this baseline safety solution; however, the design of the IAP should be standard and straight forward.

Goal 1.3 **The risk of a runway collision accident is acceptably low. (RCOLL)**	
Safety baseline	**Candidate alternative safety arguments**
RCOLL 1	ANO 183 Requirement for Approach Control is met.
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 Management of IAP Use.** In the absence of approach control, arguments would need to be made concerning the management of use of the IAP using some form of PPR and slot times with suitable arrangements for dealing with slippages/delays etc. It is essential that only one aircraft be allowed to conduct the approach at one time, the interval between approaches is key and should take into consideration early arrival, the approach, possible go-around and commence another approach and/or enough time to divert/leave the area. It will be specific to each unit but is likely to be in the order of 60 – 90 minutes It MUST be recognised and accepted that there will inevitably be a significant impact on airfield operations and movements during these slot periods. The slots need to ensure pilots have sufficient time to fly

	the IAP without being rushed which could lead to an unstable approach or an approach being continued when a MAP would be the safest option. Radio failure must also be considered in terms of management, procedures and training. This will need to be documented in the AD 2 section of the UK AIP.
RCOLL 2	CAP 168 Instrument Runway Standards are met.
RCOLL 2.1 CAP 168 compliant signage, runway 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.	**RCOLL 2.1.1 Management of IAP.** Arguments regarding mitigation of this risk at minor aerodromes, particularly those with a public right of way may need to include the use of enhanced markings and signage particularly as the lower Category aerodromes normally have a lower scale of signage and markings. Arguments could, for example, consider the benefits of AGL in reducing the risk of such incursions.
RCOLL 3	Aerodrome ATS is provided.
RCOLL 3.1 Provision of an aerodrome ATS reduces risk of runway collision between instrument and visual traffic.	**RCOLL 3.1.1 Aerodrome ATS.** Where an aerodrome ATS is provided, this baseline mitigation would continue to apply. Similarly, where information is provided by an AFISO an argument could be made that traffic information regarding runway occupancy provided by the AFISO provides mitigation of this risk.
	RCOLL 3.1.2 Without Aerodrome ATS. Where Air Ground Communication Service (AGCS) is provided mitigation of this risk may be limited to the ability of the aircraft commanders to detect conflicting runway traffic visually and could be less effective. A managed system of IAP slot times (PPR) under such circumstances would provide further strength to such arguments. Documented weather minima for circuit operations may be necessary to support such an argument, as could be the ability of the AGCS operator to observe the runway during IAPs.
RCOLL 3.2 Provision of an aerodrome ATS reduces risk of runway collision between instrument traffic and	**RCOLL 3.2.1 Aerodrome ATS.** Where an aerodrome ATS is provided, this baseline mitigation would continue to apply. Similarly, where information is provided by an AFISO an argument could be made that traffic information regarding runway occupancy provided by the AFISO provides mitigation of this risk. Documented weather minima for circuit operations may be necessary to support such an argument.

vehicles/towed aircraft etc.	**RCOLL 3.2.2 Without Aerodrome ATS.** Where AGCS is provided, mitigation of this risk maybe limited to the ability of the aircraft commanders to detect conflicting runway traffic visually and could be less effective. A managed system of IAP slot times (PPR) under such circumstances would provide further strength to such arguments. Documented weather minima for circuit operations may be necessary to support such an argument, as could be the ability of the AGCS operator to observe the runway during IAPs.
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 Aerodrome ATS.** Where an aerodrome ATS is provided, this baseline mitigation would continue to apply. Similarly, where information is provided by an AFISO an argument could be made that traffic information regarding runway occupancy provided by the AFISO provides mitigation of this risk.
	RCOLL 3.3.2 Runway Inspections by AGCS Operator. In the absence of ATS, safety arguments could be developed around the introduction of runway inspections by other staff such as AGCS operators prior to arrivals by aircraft using the IAP. In addition, the ability of the AGCS operator to observe the runway during IAPs could strength the safety argument.
	RCOLL 3.3.3 Aerodrome Security, Types of Operations and Risk Exposure. Effective arguments against this risk at minor aerodromes would be more difficult to develop and would need to centre upon aerodrome security arrangements, access gates, fencing etc and the vulnerability of the type of aircraft operations envisaged to the consequences of such collisions. Such arguments would be harder to justify in the case of night operations although this may be possible in the case of non-public transport operations using low inertia light aircraft where the effectiveness of landing lights may be argued. In this context risk exposure arguments could be developed relating the exposure of certain types of aircraft operators using the aerodrome in comparison with similar risks (collision with foreign objects, wildlife etc) as, for example, a road user.
	RCOLL 3.3.4 Helicopter Operations. An argument could be made about the lower risk posed to helicopter operations, particularly when a PinS approach is to be used.
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 The flight crew training and qualification standards which must be met are sufficient to provide for aircraft operations in	No alternative safety argument is considered appropriate for this baseline safety solution; however, the design of the IAP should be standard and straight forward

the vicinity of the runway, including the IAPs, to be conducted safely and minimise the risk of collisions with other aircraft, vehicles, personnel, wildlife or other foreign objects.	

Goal 1.4 **The risk of a mid-air collision accident is acceptably low. (MAC)**	
Safety baseline	**Candidate alternative safety arguments**
MAC 1	ANO 183 Requirement for Approach Control is met.
MAC 1.1 Approach Control reduces the risk of mid-air collision between participating instrument traffic by providing separation[14].	**MAC 1.1.1 Deconfliction of Participants – ATC/AFIS/AGCS** In the absence of Approach Control an argument could be centred around a local formal agreement whereby aircraft intending to use the IAP make initial contact and receive a suitable form of ATS from an adjacent Air Traffic Service Unit (ATSU) which would ensure initial deconfliction between users. Such arrangements would need to be reflected in Manual of ATS (MATS) Pt 2/Manual of AFIS (MAFIS)/Local Instructions and supported by formal agreements such as Letters of Agreement (LoAs) or Memoranda of Understanding (MoU). Modifications to controller qualifications, local training arrangements, local competency schemes, SMS and LoAs shall be considered. Local procedures (associated with LoAs etc.) would need to involve direct communication between the ATSU and the aerodrome and would need to make adequate arrangements for dealing with potential conflicts between aircraft holding, making an approach, following the missed approach procedure and requiring priority handling. Further safety arguments related to surveillance display systems based on PSR/SSR/ADSB/Other may be submitted.

[14] This statement describes the mitigation provided by an Approach Control service as currently mandated by ANO Art 183 and which is provided without the use of data from surveillance sensors – it is known as 'Approach Control Procedural'.

	MAC 1.1.2 Deconflcition of Participants under Aerodrome ATC – Management of IAP use by Participating Aircraft Commanders. Where aerodrome ATC is provided, in the absence of an agreement with a local ATSU, an argument could be made that the operation of the IAP could be managed by aircraft commanders using some form of PPR and slot times with suitable arrangements for dealing with slippages/delays etc. such that users of the IAP are deconflicted in time. Such arguments would be strengthened by the provision of traffic information on IAP users by aerodrome ATC which would allow other participants to delay commencement of the IAP in the event of slippages, delays and missed approaches etc. Such arrangements would need to be promulgated on the approach charts and the associated UK AIP entry as a restriction in use. There will be a workload associated with “arranging” the approach and “managing” any traffic which may have been displaced, the unit should consider & assess the impact of this workload and include within their safety argument. It is essential that only one aircraft be allowed to conduct the approach at one time, the interval between approaches is key and should take into consideration early arrival, the approach, possible go-around and enough time for another approach and/or to divert/leave the area. It will be specific to each unit but likely to be in the order of 60 – 90 mins. It <u>MUST</u> be recognised and accepted that there will inevitably be a significant impact on airfield operations and movements during these slot periods. Further safety arguments related to surveillance display systems based on PSR/SSR/ADSB/Other may be submitted.
	MAC 1.1.3 Deconfliction of Participants under AFIS – Management of IAP use by Participating Aircraft Commanders. Where aerodrome FIS is provided, in the absence of an agreement with a local ATSU, an argument could be made that the operation of the IAP could be managed using some form of PPR and slot times with suitable arrangements for dealing with slippages/delays etc. such that only one user of the IAP is permitted at any given time. Such arguments would be strengthened by the provision of traffic information on IAP users by the AFISO which would allow other participants to delay commencement of the IAP in the event of slippages, delays and missed approaches etc. Such arrangements would need to be promulgated on the approach plates and the associated UK AIP entry as a restriction in use. There will be a workload associated with “arranging” the approach and “managing” any traffic which may have been displaced, the unit should

	consider & assess the impact of this workload and include within their safety argument. It is essential that only one aircraft be allowed to conduct the approach at one time, the interval between approaches is key and should take into consideration early arrival, the approach, possible go-around and enough time for another approach and/or to divert/leave the area. It will be specific to each unit but likely to be in the order of 60 – 90 mins. It MUST be recognised and accepted that there will inevitably be a significant impact on airfield operations and movements during these slot periods. Further safety arguments related to surveillance display systems based on PSR/SSR/ADSB/Other may be submitted.
	MAC 1.1.4 Deconfliction of Participants without ATS – Management of IAP use by Participating Aircraft Commanders. Where it is proposed to introduce an IAP at an aerodrome where no ATS is provided in the absence of an agreement with a local ATSU, an argument could be made that the operation of the IAP could be managed using some form of PPR and slot times with suitable arrangements for dealing with slippages/delays etc. such that only one user of the IAP is permitted at any given time. Such arguments would be strengthened by the provision of traffic information on IAP users by the AGCS operator which would allow other participants to delay commencement of the IAP in the event of slippages, delays and missed approaches etc. Such arrangements would need to be promulgated on the approach charts and the associated UK AIP entry/other similar document as a restriction in use. There will be a workload associated with “arranging” the approach and “managing” any traffic which may have been displaced, the unit should consider & assess the impact of this workload and include within their safety argument. It is essential that only one aircraft be allowed to conduct the approach at one time, the interval between approaches is key and should take into consideration early arrival, the approach, possible go-around and enough time to divert/leave the area. It will be specific to each unit but likely to be in the order of 60 – 90 mins. It MUST be recognised and accepted that there will inevitably be a significant impact on airfield operations and movements during these slot periods. Further safety arguments related to surveillance display systems based on PSR/SSR/ADSB/Other may be submitted.
	MAC 1.1.5 Deconfliction of Participants General – Management of IAP use by Participating Aircraft Commanders. The use of mitigation

	guidance within this annex may contribute significantly to reducing the risk of IMC flight without surveillance/visual reference. Pilots shall however be reminded, via briefing documentation, that flight in IMC introduces inherent risk that is owned by the flight crew/pilot and to an extent, the aerodrome. Where safety arguments are dependent on technology these shall recognise the differing requirements in different classes of airspace for systems such as communications and/or Airborne Collision Avoidance System (ACAS) carriage.
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 Non-Participating Aircraft Conflict Risk – ATSU – Aerodrome ATC.** In the absence of an Approach Control service using surveillance, an argument could be centred around a local agreement whereby aircraft intending to use the IAP make initial contact and receive a suitable form of ATS (such as an UK FIS Deconfliction Service) from an adjacent ATSU. However, unless this extended to a formal agreement for the adjacent unit to provide an Approach Control service with all the associated requirements for unit procedures, training, and regulation pertinent to such a service, such an arrangement would not include the sequencing and integration of multiple aircraft using the instrument approach. However, traffic information and/or deconfliction advice appropriate to the level of UK FIS could be provided on conflicting aircraft. This would therefore extend the argument beyond initial integration of users and provide increased mitigation against conflict with detected non-participating traffic. Local procedures may need to involve direct communication between the ATSU and the aerodrome as identified through the SMS process of the adjacent ATSU. The relative merits of such arguments would be dependent upon the extent of surveillance coverage provided in the vicinity of the aerodrome at the altitudes in question. Aerodromes located in environs that cannot satisfactorily demonstrate their remoteness shall strongly consider the provision of surveillance within their safety arguments. Further safety arguments related to surveillance display systems based on PSR/SSR/ADSB/Other may be submitted.
	MAC 1.2.2 Non-Participating Aircraft Conflict Risk – ATSU – AFIS. In the absence of an Approach Control service using surveillance, an argument could be centred around a local agreement whereby aircraft intending to use the IAP make initial contact and receive a suitable form of ATS (such as and UK FIS Deconfliction Service) from an adjacent ATSU. However, unless this extended to a formal agreement for the adjacent unit to provide an Approach Control service with all the associated requirements for unit procedures, training, and regulation pertinent to such a service. Such an arrangement would not include the sequencing and integration of multiple aircraft using the instrument approach. However, traffic information and/or deconfliction advice appropriate to the level of UK FIS could be provided on conflicting aircraft. This would therefore extend the argument beyond initial integration between users and provide increased mitigation against

	conflict with detected non-participating traffic. Local procedures may need to involve direct communication between the ATSU and the aerodrome as identified through the SMS process of the adjacent ATSU. The relative merits of such arguments would be dependent upon the extent of surveillance coverage provided in the vicinity of the aerodrome at the altitudes in question. Aerodromes located in environs that cannot satisfactorily demonstrate their remoteness shall strongly consider the provision of surveillance within their safety arguments. Further safety arguments related to surveillance display systems based on PSR/SSR/ADSB/Other may be submitted.
	MAC 1.2.3 Non-Participating Aircraft Conflict Risk – without ATS. In the absence of an approach control service using surveillance, an argument could be centred around a local agreement whereby aircraft intending to use the IAP make initial contact and receive a suitable form of ATS (such as an UK FIS Deconfliction Service) from an adjacent ATSU. However, unless this extended to a formal agreement for the adjacent unit to provide an Approach Control service with all the associated requirements for unit procedures, training, and regulation pertinent to such a service, such an arrangement would not include the sequencing and integration of multiple aircraft using the instrument approach. However, traffic information and/or deconfliction advice appropriate to the level of UK-FIS could be provided on conflicting aircraft. This would therefore extend the argument beyond initial integration of users and provide increased mitigation against conflict with detected non-participating traffic. Local procedures may need to involve direct communication between the ATSU and the aerodrome as identified through the SMS process of the adjacent ATSU. The relative merits of such arguments would be dependent upon the extent of surveillance coverage provided in the vicinity of the aerodrome at the altitudes in question. Aerodromes located in environs that cannot satisfactorily demonstrate their remoteness shall strongly consider the provision of surveillance within their safety arguments. Further safety arguments related to surveillance display systems based on PSR/SSR/ADSB/Other may be submitted.
MAC 2	An aerodrome ATS is provided.
MAC 2.1 Aerodrome ATC (ADI) reduces the risk of collision between Instrument Traffic and other known traffic in the aerodrome environment - i.e. by sequencing visual	**MAC 2.1.1 Managed Use of IAP and Benign Traffic Environment – ATSU – Aerodrome ATC** Where traffic levels are low and the IAP is to be used infrequently, it may be possible to make an argument that an aerodrome ATCO (who would need to hold an Aerodrome Control Instrument (ADI) rating in order to comply with the requirements of Regulation (EC) 2015/340 as retained (and amended in UK domestic law) under the European Union (Withdrawal) Act 2018) could be used to issue deconfliction instructions to visual traffic as required in order to provide spacing for traffic using the IAP.

circuit traffic, and providing traffic information on both transiting traffic and infringing traffic which is detected visually or by other means.	**MAC 2.1.2 Managed Use of IAP and Benign Traffic Environment – ATSU – AFIS**. Where ATS is provided by an AFISO it is not possible for mandatory instructions to be issued from the ground which would provide spacing between visual and instrument traffic. An argument would therefore need to be made around managed use of some form of PPR/slot times as a promulgated condition of use and a benign airspace environment in which no visual circuit traffic is simultaneously present. Arguments, without mitigation, based upon an assertion that the risk of conflict with non-participating traffic is very low are only likely to be accepted at aerodromes in remote areas of the UK. At other locations it would be necessary to demonstrate that the aerodrome operator has procedures in place which would provide an effective means of deconflicting operations at the aerodrome between aircraft using the aerodrome traffic circuit under VFR and those operating under IFR using the IAP, including the associated missed approach procedure. This would require the aerodrome operator to have an effective process in place to close the aerodrome traffic circuit by instructing the AFISO/AGCS Operator to include within the aerodrome information which is broadcast to aircraft, information that the aerodrome traffic circuit was closed whenever the IAP was in use and vice versa. Such arguments would be strengthened by the associated use of other airspace design measures such as the use of an ATZ and Radio Mandatory Zone (RMZ) or Transponder Mandatory Zone (TMZ) (as indicated below). It is, however, considered very unlikely that a cogent safety argument could be made for an IAP to be established which would introduce instrument traffic at a busy aerodrome with an active visual traffic pattern without provision of Air Traffic Control. It is essential that only one aircraft be allowed to conduct the approach at one time, the interval between approaches is key and should take into consideration early arrival, the approach, possible go-around and enough time for another approach and/or to divert/leave the area. It will be specific to each unit but likely to be in the order of 60 – 90 mins. It <u>MUST</u> be recognised and accepted that there will inevitably be a significant impact on airfield operations and movements during these slot periods.
	MAC 2.1.3 Managed Use of IAP and Benign Traffic Environment without ATS. AGCS Operators are not permitted to pass mandatory instructions which would provide spacing between visual and instrument traffic. An argument would therefore need to be made around managed use of an IAP using some form of PPR/slot times as a promulgated condition of use and a benign airspace environment in which no visual circuit traffic is simultaneously present.

	Arguments, without mitigation, based upon an assertion that the risk of conflict with non-participating traffic is very low are only likely to be accepted at aerodromes in remote areas of the UK. At other locations it would be necessary to demonstrate that the aerodrome operator has procedures in place which would provide an effective means of deconflicting operations at the aerodrome between aircraft using the aerodrome traffic circuit under VFR and those operating under IFR using the IAP, including the associated missed approach procedure. This would require the aerodrome operator to have an effective process in place to close the aerodrome traffic circuit by instructing the AGCS Operators to include within the aerodrome information which is broadcast to aircraft, information that the aerodrome traffic circuit was closed whenever the IAP was in use and vice versa. Such arguments would be strengthened by the associated use of other airspace design measures such as the use of ATZ and RMZ/TMZ (as indicated below). It is essential that only one aircraft be allowed to conduct the approach at one time, the interval between approaches is key and should take into consideration early arrival, the approach, possible go-around and enough time for another approach and/or to divert/leave the area. It will be specific to each unit but likely to be in the order of 60 – 90 mins. It <u>MUST</u> be recognised and accepted that there will inevitably be a significant impact on airfield operations and movements during these slot periods. Further safety arguments related to surveillance display systems based on PSR/SSR/ADSB/Other may be submitted. The ability of the AGCS operator to observe the approach during IAPs is essential.
MAC 3	Airspace design measures are in place in the vicinity of the aerodrome.
MAC 3.1 Where the nature and level of traffic requires it, Controlled Airspace (CAS) or other airspace management processes such as TMZ further reduce the risk of collision between instrument traffic and non-participating visual traffic by providing a known, controlled	**MAC 3.1.1 Presence of existing CAS and suitable ATS.** An argument could be made in support of the introduction of such an IAP where the aerodrome location lies beneath or immediately adjacent to existing CAS and an effective working arrangement can be established with the controlling unit for the provision of a suitable form of ATS which whilst not constituting a dedicated 'Approach Control Service' would nonetheless, when properly established through a suitable vehicle such as an MoU, serve to reduce the risk of collision and airspace infringement. Where such proximity to CAS exists and formal arrangements do not exist, a safety argument shall be necessary that demonstrate that the risk of airspace infringement is sufficiently managed, and procedures are agreed with the airspace owner should an infringement occur. Attention and mitigation should be afforded to IAP designs that overlay or are proximate to Visual Reference Points

local air traffic environment which extends further beyond the ATZ.	(VRPs). Further safety arguments related to surveillance display systems based on PSR/SSR/ADSB/Other may be submitted.
	MAC 3.1.2 Use of TMZ/RMZ. An argument could be made for the creation of TMZ and/or RMZ in support of such an IAP and which could be used to provide a known traffic environment. The process for establishing an airspace structure such as a TMZ or RMZ is detailed in CAP 1616. Sponsors considering their use should contact CAA Airspace Regulation[15] for additional advice and guidance. There could be no guarantee that such an application would be successful.
MAC 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.
MAC 4.1 Marking the Aerodrome and instrument approach paths (feathered arrows) on aviation charts assists pilots of nonparticipating aircraft in avoiding these areas, thereby reducing the risk of mid-air collisions with nonparticipating traffic.	**MAC 4.1.1 Marking of IAP Locations on Aeronautical Charts.** In the same way as some safety mitigation is provided for existing IAPs through making other airspace users aware of the presence of instrument approach paths so they can be avoided, such action could also be used to strengthen arguments for the introduction of a new IAP under the policy outlined in this document. The safety benefit of this measure would need to be argued in the context of the parallel need to reduce the associated risk of map clutter. A threshold value would probably need to be established, centred around anticipated numbers of movements, which would trigger the creation of appropriate symbology.
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 During 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** See and avoid is only a mitigation where those parts of the IAP are flown in VMC. This mitigation can only be deployed by the flight crew/pilot and cannot be assumed by the sponsor, but references to flight in VMC and use of the see and avoid principles should be included in flight briefing documentation.

[15] airspace.policy@caa.co.uk

Goal 1.5 **The risk of a loss of control accident is acceptably low. (LOC)**	
Safety baseline	**Candidate alternative safety arguments**
LOC 1	ANO 183 Requirement for Approach Control is met.
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 Managed use of IAP.** An argument could be made here on the basis of the use of a form of PPR/slot-time system to mitigate this risk in the absence of an Approach Control service. Such arguments would be strengthened where use of the approach is limited to certain categories of aircraft (typically, A, B and H) which would also reduce the risk from wake turbulence encounters. This mitigation combined with a PPR/slot time system would also provide mitigation against this risk where no ATS is provided.
LOC 2	An aerodrome ATS is provided.
LOC 2.1 Aerodrome ATC reduces the risk of a loss of control accident arising from Wake Turbulence by sequencing and issuing warnings to visual landing traffic and participating instrument approach traffic.	**LOC 2.1.1 Managed use of IAP and ATC Instructions.** At aerodromes where ATC is provided, arguments based on the use of the PPR/slot-time system to mitigate the wake vortex turbulence risk and MATs Part 1 & 2 & CAP 413[16] procedures shall be considered.
	LOC 2.1.2 Managed use of IAP and AFISO - At aerodromes where ATS is provided, arguments based on the use of a form of PPR/slot-time system to mitigate the wake vortex turbulence risk & CAP 797[17] & CAP 413 together with closure of the aerodrome traffic circuit shall be considered.
	LOC 2.1.3 Managed use of IAP without ATS - At aerodromes where AGCS is provided, arguments based on the use of a form of PPR/slot-time system to mitigate the wake vortex turbulence risk together with closure of the aerodrome traffic circuit shall be considered.
LOC 3	The crew members of aircraft participating in the IAP are suitably qualified and proficient to fly the IAP safely and under control.

[16] CAP 413 Radiotelephony Manual

[17] CAP 797 Flight Information Service Officer Manual

LOC 3.1 The flight crew training and qualification standards which must be met are sufficient to provide for IAPs to be flown safely and accurately, with appropriate training/awareness of wake turbulence considerations.	No alternative safety argument is considered appropriate for this baseline safety solution; however, the design of the IAP should be standard and straightforward.

Goal 1.6 **The risk of an accident during the introduction to service of a new IAP at this aerodrome is acceptably low. (INTRO)**	
Safety baseline	**Candidate alternative safety arguments**
INTRO 1	
An argument that the introduction to service of the IAP together with all the required safety mitigations and notifications to airspace users and other stakeholders will be conducted in a structured and carefully managed way. Such arguments should be suitably comprehensive, and include as a minimum, arrangements for the safe introduction of the IAP in the context of training, testing and validation of: ▪ The people who will be involved or affected by the introduction of the IAP, their training and any associated communication activities for awareness purposes. ▪ The procedures which are to be followed by aerodrome personnel or participating flight crews and any associated organisational arrangements which need to be put in place before the IAP can be put into use. ▪ Equipment which will be associated with the operation of the IAP, its suitability, fitness for purpose and availability. ▪ Unit procedures should also be included for a post-implementation safety review of the IAP and its associated safety arguments. The expectation is that the aerodrome operator's SMS will be fully applied, with records being retained and made available for review as required by the CAA.	

Goal 1.7 **The risk of an accident during the through-life operation of an IAP at this aerodrome is acceptably low. (THRULIFE)**	
Safety baseline	**Candidate alternative safety arguments**
THRULIFE 1	
An argument that the aerodrome operator’s SMS will be used to ensure that safety monitoring and feedback regarding the operation of the IAP will be obtained and used to monitor the continued validity of the alternative safety arguments and provide a trigger for additional safety management activity if new hazards are discovered or the level of risk is deemed to have changed. All incidents relating to the IAP regardless of whether an MOR is raised or not will be recorded. An IAP safeguarding and periodic reviews to be completed by an APDO will be actioned to ensure the continued safety of the AIP published in the IAP (CAP 785) and aerodrome safeguarding periodically conducted. The expectation is that the aerodrome operator’s SMS will be fully applied, with records being retained and made available for review as required by the CAA, which may include ongoing oversight.	

APPENDIX A

Abbreviations and Glossary

Abbreviations

ABAS	Aircraft Based Augmentation System
ADS-B	Automatic Dependent Surveillance - Broadcast
ANSP	Air Navigation Service Provider
APDO	Approved Procedure Design Organisation
APV	Approach Procedure with Vertical Guidance
ATM	Air Traffic Management
ATS	Air Traffic Service(s)
CAT	Commercial Air Transport
DA(H)	Decision Altitude (Height)
DME	Distance Measuring Equipment
DVOF	Digital Vertical Obstructions File (MOD)
EASA	European Aviation Safety Agency
EGNOS	European Geostationary Navigation Overlay Service
FAF	Final Approach Fix
FMS	Flight Management System
GA	General Aviation
GNSS	Global Navigational Satellite System
GPS	Global Positioning System
IAP	Instrument Approach Procedure
ICAO	International Civil Aviation Organisation
ILS	Instrument Landing System
IMC	Instrument Meteorological Conditions
IFR	Instrument Flight Rules
IR	Instrument Rating
LNAV	Lateral Navigation
LNAV/VNAV	Lateral Navigation with Barometric Vertical Navigation

LPV	Localizer Precision with Vertical Guidance
MDA(H)	Minimum Descent Altitude (Height)
MSA	Minimum Sector Altitude
MOC	Minimum Obstacle Clearance
NAVAID	Navigation Aid
NAVSTAR	Navigation Satellite Timing And Ranging
NDB	Non-Directional Beacon
NPA	Non-Precision Approach
MAP	Missed Approach
MAPt	Missed Approach Point
OCA(H)	Obstacle Clearance Altitude (Height)
OCH	Obstacle Clearance Height
PBN	Performance-based Navigation
PSR	Primary Surveillance Radar
RAIM	Receiver Autonomous Integrity Monitoring
RNAV	Area Navigation
RNP	Required Navigation Performance
SBAS	Satellite Based Augmentation System
SSR	Secondary Surveillance Radar
TAA	Terminal Arrival Altitude
UK AIP	United Kingdom Aeronautical Information Publication
VNAV	Vertical Navigation
VOR	Very High Frequency Omnidirectional Radio Range
VMC	Visual Meteorological Conditions

Glossary of terms

Aircraft-based augmentation system (ABAS) An augmentation system that augments and/or integrates the information obtained from the other GNSS elements with information available on board the aircraft. Note: The most common form of ABAS is receiver autonomous integrity monitoring (RAIM).

Approach procedure with vertical guidance (APV) An instrument procedure which utilizes lateral and vertical guidance but does not meet the requirements established for precision approach and landing operations.

Area navigation A method of navigation which permits aircraft operation on any desired flight path within the coverage of ground or space-based navigation aids or within the limits of the capability of self-contained aids, or a combination of these. Note: Area navigation includes Performance-based Navigation as well as other RNAV operations that do not meet the definition of performance-based navigation.

ATS surveillance service A term used to indicate a service provided directly by means of an ATS surveillance system.

ATS surveillance system A generic term meaning variously, ADS-B, PSR, SSR or any comparable ground-based system that enables the identification of aircraft. Note: A comparable ground-based system is one that has been demonstrated, by comparative assessment or other methodology, to have a level of safety and performance equal to or better than monopulse SSR.

Constellation Refers to either the specific set of satellites used in calculating positions or all the satellites visible to a GPS receiver at one time.

DA(H) Decision altitude (DA) or Decision height (DH). A specified altitude or height in the precision approach or approach with vertical guidance at which a missed approach must be initiated if the required visual reference to continue the approach has not been established.

EGNOS The European Geostationary Navigation Overlay Service augments the two military satellite navigation systems now operating, the US GPS and Russian GLONASS systems, and makes them suitable for safety critical applications such as flying. Consisting of three geostationary satellites and a network of ground stations, EGNOS achieves its aim by transmitting a signal containing information on the reliability and accuracy of the positioning signals sent out by GPS and GLONASS. It allows users in Europe and beyond to determine their position to within 2 metres, compared with about 20 metres for GPS and GLONASS alone.

GNSS Global Navigation Satellite Systems. Generic term for all satellite navigation systems.

GPS The Global Positioning System is a U.S. military space-based radio navigation system that provides reliable positioning, navigation, and timing services to civilian users on a continuous worldwide basis, freely available to all.

MDA(H) Minimum descent altitude or minimum descent height. The lowest altitude, in feet amsl, to which descent is authorised on final approach during a non-precision instrument landing (i.e. where no glideslope guidance is given) without visual reference to the runway.

Navigation aid (NAVAID) infrastructure NAVAID infrastructure refers to space-based and or ground-based NAVAIDs available to meet the requirements in the navigation specification.

Navigation application The application of a navigation specification and the supporting NAVAID infrastructure, to routes, procedures, and/or defined airspace volume, in accordance with the intended airspace concept. Note: The navigation application is one element, along with communication, ATS surveillance and ATM procedures, which meet the strategic objectives in a defined airspace concept.

Navigation function The detailed capability of the navigation system (such as the execution of leg transitions, parallel offset capabilities, holding patterns, navigation databases) required to meet the airspace concept. Note: Navigational functional requirements are one of the drivers for the selection of a particular navigation specification

Navigation specification A set of aircraft and aircrew requirements needed to support Performance-based Navigation operations within a defined airspace. There are two kinds of navigation specification:

RNAV specification A navigation specification based on area navigation that does not include the requirement for on-board performance monitoring and alerting, designated by the prefix RNAV, e.g. RNAV 5, RNAV 1.

RNP specification A navigation specification based on area navigation that includes the requirement for on-board performance monitoring and alerting, designated by the prefix RNP, e.g. RNP 4, RNP APCH

NAVSTAR The name given to US Department of Defense GPS satellites.

OCA(H) Obstacle clearance altitude (OCA) or obstacle clearance height (OCH). The lowest altitude or the lowest height above the elevation of the relevant runway threshold or the aerodrome elevation, as applicable, used in establishing compliance with appropriate obstacle clearance criteria.

Performance-based navigation Area navigation based on performance requirements for aircraft operating along an ATS route, on an instrument approach procedure or in a designated airspace. Note: Performance requirements are expressed in navigation specifications in terms of accuracy, integrity, continuity and functionality needed for the proposed operation in the context of a particular airspace concept.

Receiver autonomous integrity monitoring (RAIM) A form of ABAS whereby a GNSS receiver processor determines the integrity of the GNSS navigation signals using only GPS signals or GPS signals augmented with altitude (baro-aiding). This determination is achieved by a consistency check among redundant pseudo-range measurements. At least one additional satellite needs to be available with the correct geometry over and above that needed for the position estimation, for the receiver to perform the RAIM function.

RNAV operations Aircraft operations using area navigation for RNAV applications.

RNAV system A navigation system which permits aircraft operation on any desired flight path within the coverage of station-referenced NAVAIDs or within the limits of the capability of self-contained aids, or a combination of these. An RNAV system may be included as part of a flight management system (FMS).

RNP operations Aircraft operations using an RNP system for RNP navigation applications.

RNP route An ATS route established for the use of aircraft adhering to a prescribed RNP navigation specification.

RNP system An area navigation system which supports on-board performance monitoring and alerting.

Vertical Navigation A method of navigation, which permits aircraft operation on a vertical flight profile using altimetry sources, external flight path references, or a combination of these.

APPENDIX B

IAP to a non-instrument runway and/or an aerodrome which does not provide an Approach Control service

General

This appendix outlines a methodology which sponsors may wish to employ together with associated safety mitigations in order to provide an IAP with restrictions where it is operationally acceptable at aerodromes which have a non-instrument runway and/or do not provide an Approach Control service.

The IAPs outlined in this section would be suitable for operational use subject to acceptance of the results of safety assessment, firstly by the aerodrome operator (the 'risk owner') and secondly by the CAA as part of the IAP approval process. This would also have the effect of adding to the existing network of available IAPs in the UK which can be used to support IFR operations. It is not the CAA's intention that these IAPs, with a more restrictive OCH, should be deployed at aerodromes which already meet the runway and/or ATS standards required for provision of an IAP as this would have the contrary effect of reducing the availability of UK aerodromes which can provide an Obstacle Clearance Height (OCH) at the IAP system minima.

The underpinning principles associated with the type of IAP outlined in this appendix are:

1. IAP designs will be in accordance with current UK standards and compliant with PANS-OPS 8168 Design criteria, AIP notified UK differences to Doc 8168 and the additional design criteria described in Appendix C of this document. The IAPs will only be designed by UK APDO in accordance with CAP 785 and validated in accordance with the UK Validation of Instrument Flight Procedures Policy Statement. This will ensure the normal rules applied to all UK IAPs will apply to these IAPs and will therefore be familiar to pilots in their content and how to be flown. Where elements of the IAPs are deemed by the CAA to be non-standard these will be clearly notified on the chart and within the AD 2 Section of AIP to ensure pilots are aware in advance of flying the IAPs.

2. The IAP minimum OCA(H) will be more restrictive than those which apply at aerodromes where IAPs are to instrument runways. This will reflect:

    - Safety mitigation for the reduced standards of aerodrome infrastructure as classified as a non-instrument runway.

- The IAP will have more limited operational utility where the full aerodrome infrastructure and/or ATS standards have not all been met.

3. The IAP will normally be available for use by aircraft with approach speed Category A, B or H and may be further restricted by aerodrome operators to specific operating companies and/or individuals as part of the associated safety mitigations.
4. The IAP will be used only by IR or IRR qualified pilots using aircraft navigation equipment which is approved as suitable for use in IFR operations.
5. The IAP will be published in the UK AIP and, where appropriate, will be marked on air navigation charts.

The resultant IAP will be based on the following:

OCH	Not less than 500 ft (subject to there being no more limiting obstacles)
RVR/Visibility	Not less than 1800 m
Runway/Survey requirement	CAP 1732 Aerodrome Survey Guidance (content of the aerodrome survey package is different for EASA certificated aerodromes and all other aerodromes published in the UK AIP
Airspace/ATS environment	Approach Control and/or ATC (at least ADI) provided or means established to ensure no concurrent use of IAP and visual circuit traffic

Absence of an approach control service

Where a sponsor presents an argument that it would not be reasonably practicable to provide an approach control service, safety arrangements shall be developed to make provision for no more than one aircraft at a time to use the IAP and any associated holding pattern. Such procedures will need to be properly documented, restrictions made known to users, for example by marking them appropriately on the relevant approach charts and must be reviewed regularly for their effectiveness as part of an agreed process. Associated safety arguments would need to be centred on a PPR basis at specified times. Examples of such arrangements which could form the basis of safety arguments could include:

1. The procedure is only to be used by a single aircraft and the arrival times are deconflicted and managed to ensure safe spacing between arrivals.

2. A PPR requirement is in place for booking use of the instrument approach procedure with clear 'slot' times and sterile buffer times in between.

3. The aerodrome is in a remote area and has low levels of traffic both at the airfield and in the environs. (An application using this argument is more likely to be successful from a small aerodrome where the aircraft on the approach may be the only, or one of only a small number that operates to/from that aerodrome).

Runway environment

Arguments for the establishment of this type of IAP may be appropriate in circumstances where an aerodrome runway is classed as a non-instrument runway and where it would not be reasonably practicable to make the changes required to the runway environment at this location in order to meet the instrument runway standards. This type of IAP would provide operational benefit to aerodrome Instrument Rating (IR)/Instrument Rating Restricted (IRR) users/operators in circumstances where lower cloud bases and, to a lesser extent, poorer visibility would limit VFR operations.

Survey requirements

See Appendix C of this document for survey requirements and guidance to provide the data necessary for the purposes of IFP design. Additional guidance on data origination, processing and promulgation is provided in CAP 1054 (applicable to all parties in the data chain from data origination to publication of information in the Aeronautical Information Products).

Airspace/ATS environment

This type of IAP may be introduced with the appropriate mitigations where an approach control and/or ATC service is provided which would facilitate the integration of IFR and VFR traffic. This type of IAP could only be introduced safely at aerodromes which have either AFIS or no ATS, if robust arguments could be made to show that there could be no concurrent IFR and VFR activity in the aerodrome traffic circuit and that procedures can be deployed from the commencement of the IAP that provides the flight crew/pilot with sufficient detail on known conflicting aircraft . In remote locations such arguments could, exceptionally, be made on the basis of very low air traffic density. At other locations it would be necessary to demonstrate that the aerodrome operator has procedures in place which would provide an effective means of deconflicting operations between aircraft using the aerodrome traffic circuit under VFR and those operating using the IAP including the associated missed approach procedure. This would mean having a process to effectively close the aerodrome traffic circuit whenever the IAP was in use and vice versa. The presence of the proposed IAP shall not generate an unintended safety consequence to other airspace users or introduce a new unmitigated risk to existing airspace volumes/IAPs.

APPENDIX C

Instrument approach procedure

Design criteria and methodology for the calculation of OCA(H) for aircraft to non-instrument runways in the UK

General concepts

This appendix provides CAA approved procedure designers (APD) with additional design criteria to enable the design of IAPs to non-instrument runways in the UK. The general ICAO Pans-Ops Doc 8168 Vol II design criteria and AIP notified UK differences to Doc 8168 as amplified or modified by criteria in this appendix shall apply throughout the IAP designs.

Design assumptions

The runway status (Non-Instrument Runway) as designated by the CAA shall not be changed by the provision of an IAP to a runway.

IAPs will only be designed in accordance with CAP 785 and applications accepted for licensed aerodromes only.

IAPs shall be promulgated in the UK AIP, AD 2 Aerodromes.

Digital Vertical Obstruction File (DVOF) obstacle data shall be available to all CAA Approved Procedure Designers (APDs).

Only Non-Precision IAPs shall be designed to Non-Instrument Runways where only a CAP 232 Aerodrome Survey Classification 1 or CAP 1732 equivalent data is available. (See CAP 232 Chapter 1 Paragraph 6 Survey Areas – Table 1).

IAPs with vertical guidance (ILS for example) to Non Instrument Runways will be considered by the CAA where a CAP 232 Aerodrome Survey Classification 2 or CAP 1732 equivalent data is available. (See CAP 232 Chapter 1 Paragraph 6 Survey Areas - Table 1).

The lowest OCH that can be achieved under this policy is:

CAT A & B – 500ft

CAT C – 600ft

CAT D – 700ft

Sponsors for CAT C and D approaches may propose additional safety arguments and mitigations to support consideration of a reduction of the OCH but there could be no guarantee that such arguments would be accepted. Such arguments are likely to include, but are not limited to, provision of a runway that meets greater than Non-Instrument criteria and ATS provision e.g. Aerodrome Control (Instrument) that provides a more controlled environment at the latter stages of an approach. It is recommended that an sponsor and their APDO seek further guidance from the CAA before committing to making such a proposal.

Design criteria

A fundamental principle is that IAP designs proposed under this policy should be kept as simple and standard as possible; therefore, the following restrictions apply:

- Final Approach Track must be aligned to the extended runway centreline
- The final approach vertical profile shall be aligned to the visual signals on the ground
- Final approach angle of the designed IAP shall not exceed 4.48°, matched to a PAPI angle of 4.5°
- Placement of any waypoints between the FAF and MAPt will not be accepted
- Use of stepdown fixes will not be accepted
- Missed approach point (MAPt) to be co-located with the approach runway threshold unless there are obstacles in the MAP which would require the MAPt to be positioned prior to the runway threshold.
- Initial missed approaches shall be a “climb straight ahead” initially to an altitude or a point prior to the commencement of a turn (track adjustments of up to 15° are considered turns in this context)
- The standard missed approach climb gradient (MAP CG) of 2.5% will be used for all IAPs, therefore the additional use of an increased MAP CG will be negated by using the minimum OCH of 500ft.
- Missed approaches should terminate at a hold as a standard practice[18].

Minimum obstacle data required

Non Precision Instrument Approach Procedure

- CAP 232 Aerodrome Survey Classification 1 or CAP1732 equivalent.
- DVOF obstacle data.

[18] If proposals are made not to have a hold, the reasoning and safety arguments should be clearly justified and documented in the application but there could be no guarantee that such arguments would be accepted.

- Obstacle data obtained from spot heights captured from 50K and 250K base mapping, normally referred to as Manually Inserted Obstacles (MIO).

If it is apparent that there are trees in the vicinity of the manually inserted obstacle, then an additional allowance of 30m shall be applied. Following a comprehensive study of current CAP 232 survey data, the CAA have concluded that this allowance is appropriate for trees.

This 30m allowance shall be applied in all designs to manually inserted obstacles where only the CAP 232 Aerodrome Survey Classification 1 or CAP 1732 equivalent data is available.

Instrument Approach Procedure with Vertical Guidance

- The requirements listed above; and
- CAP 1732 Aerodrome Survey Package (appropriate content as described in CAP 1732 section 2.8)
- CAP 232 Aerodrome Classification 2.

In the cases above, an on-site visit by a CAA APD shall be part of the IAP design process.

Methodology for the calculation of OCH for straight in approaches to non instrument runways

Conventional Non Precision IAPs with or without DME, and RNAV Non Precision IAPs:

- shall use as a minimum CAP 232 Aerodrome Survey Classification 1/CAP 1732 equivalent data, DVOF and manually inserted obstacles, apply a tree allowance of 30m (if required) and apply standard Pans Ops minimum obstacle clearance (MOC) to obtain the procedure OCH.

IAPs with Vertical Guidance:

- shall use as a minimum CAP 232 Aerodrome Survey Classification 2/CAP 1732 equivalent data, DVOF and manually inserted obstacles and apply standard Pans Ops obstacle assessment surfaces (OAS) to obtain the procedure OCH.

The standard design assumptions are that if any of the above calculated OCH for CAT A and B are less than 500 ft, then 500 ft OCH shall be promulgated on the instrument approach chart. If any of the above calculated OCH for CAT C are below 600 ft or 700 ft for CAT D, then 600 ft OCH for CAT C or 700 ft OCH for CAT D, shall be promulgated on the instrument approach chart. These minimum OCHs are the lowest OCHs for visual manoeuvring and this is accepted as best practice by industry today to runways that do not meet either non precision or precision instrument runway standard requirements).

Methodology for the calculation of OCA(H) for visual manoeuvring

Standard Pans-Ops criteria shall be used.

If the dominant obstacle is a manually inserted obstacle with trees in the vicinity, then a 30m tree allowance shall be applied.

If the calculated min OCA(H) for visual manoeuvring is lower than the highest procedure minimum OCA(H) (there may be more than one procedure type at the aerodrome), then the published value shall be the highest procedure minimum OCA(H) at the aerodrome.

APPENDIX D

Helicopter PinS approaches

General

ICAO Doc 8168 Volume II (PANS OPS) makes provision for Area Navigation (RNAV) Point-In-Space (PinS) approach procedures for helicopters using GNSS or SBAS receivers. All approaches will be to a point in space where the pilot should have sufficient visual reference to continue the approach and landing to the intended landing site or initiate a missed approach.

The design criteria for a PinS approach is published in Pans Ops 8168 Vol II Part IV Helicopters Chapter 2 PinS to LNAV Minima. The design assumptions and calculation methodology of the procedure OCA(H) are contained in Appendix C to this document.

Applications for PinS approaches at locations without Approach Control should be completed in accordance with this document; however, all sponsors wishing to implement PinS approaches should engage with the CAA at the earliest opportunity to discuss and obtain guidance with respect to their application.