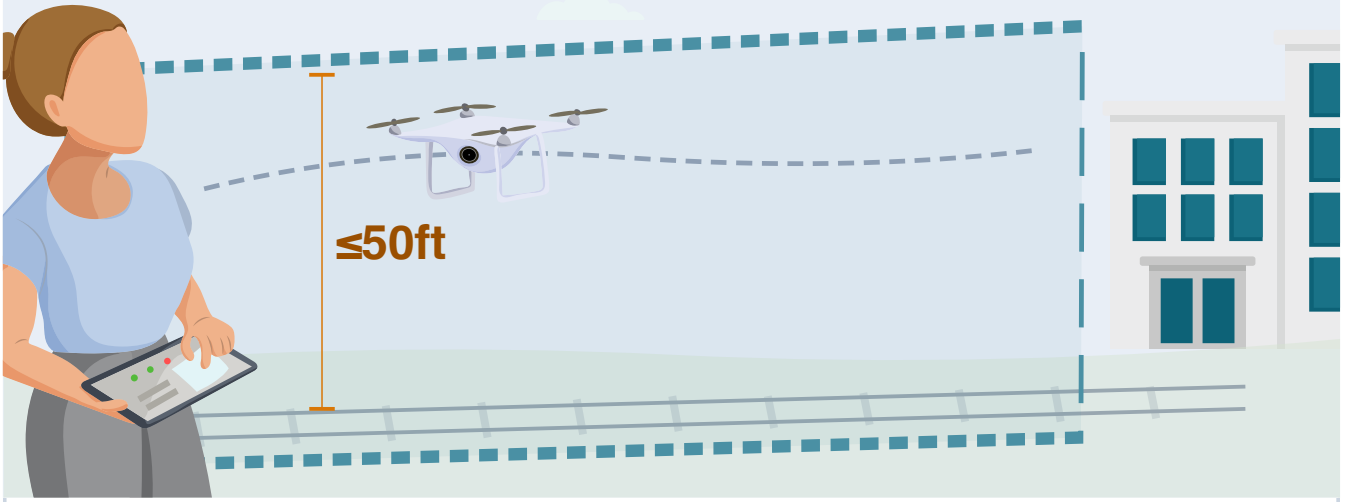
UK Civil Aviation Authority

UK SORA Best Practice

Operating within an Atypical Air Environment (AAE)

CAP3239B



- A best practice guide on how to provide justification that a proposed operation will be conducted within an Atypical Air Environment (AAE).
- This evidence will be used to demonstrate that the operation occurs in a volume of airspace where the encounter rate with crewed aircraft can be considered improbable.

⚠ An atypical air environment enables UAS operators to conduct Beyond Visual Line Of Sight (BVLOS) operations without the need for DAA or segregated airspace.

High-Level Process

Operating an Unmanned Aircraft (UA) within an AAE reduces the likelihood of a mid-air collision (MAC) between UA and other conventionally piloted aircraft. This is particularly useful when operating BVLOS outside of segregated airspace without a detect & avoid (DAA) capability.

What is an AAE?

There is no single definition for an AAE however, it can be considered as a volume of airspace within which it can be reasonably anticipated that there will be a greatly reduced number of conventionally piloted aircraft due to the close proximity of specific ground infrastructure. The AAE Policy Concept (CAP3040) is guidance that supports an applicant in deciding what may reasonably be considered an AAE as well as what operational, strategic and technical mitigations might be appropriate for such an operation.

How to Justify an AAE?

To operate in an AAE under UK SORA, you must provide evidence to justify it and show the right mitigations, following the requirements in AMC1 to Article 11 of UK Regulation (EU) 2019/947 and CAP3040.

1

Define the Proposed AAE Geography

Provide an overview of your proposed operation and the relationship with the relevant infrastructure to support your AAE argument

2

Describe How the Residual Risk Will Be Addressed

Provide descriptions of how the strategic and tactical mitigations outlined in CAP3040 will be met

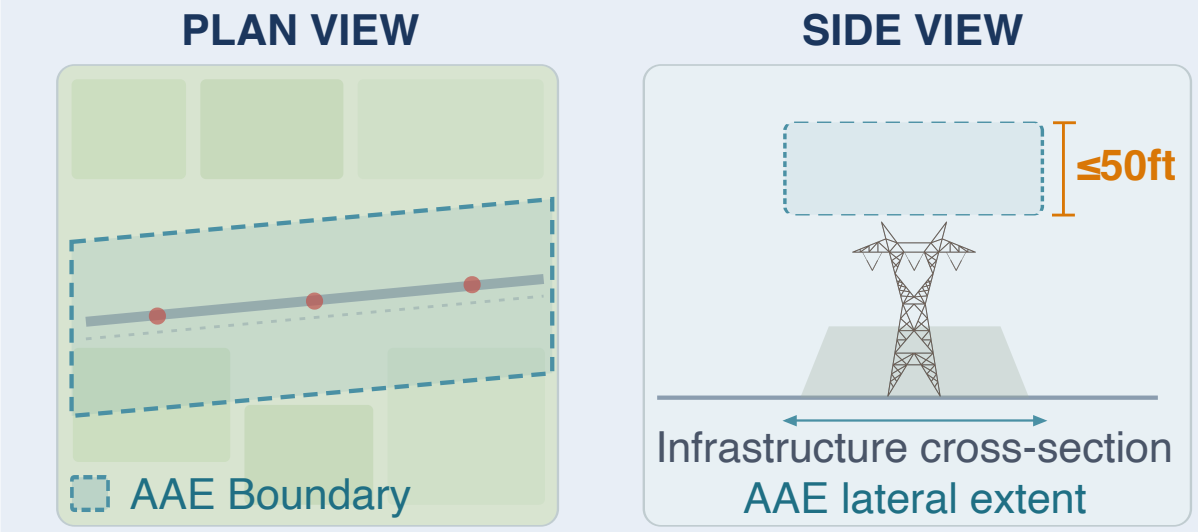
3

Describe How Potential Airspace Users Have Been Considered

Describe the airspace characteristics and outline how potential airspace users have been considered

1 Define the Proposed AAE Geography

Provide an overview of your proposed operation and the relationship with the relevant infrastructure to support your AAE argument



Foundation of the Application

This is the foundation of the entire application to justify that the operational volume qualifies as an AAE.

You must clearly provide the AAE geometry (corridor or box), coordinates and mapping, vertical limits, infrastructure reference point(s), datum used (e.g., AMSL or AGL), justification of proximity to infrastructure along with an explanation of why the environment reduces MAC likelihood.

AAE Geometry Requirements

- The AAE must be specific to a defined geographic location
- The operational volume, including contingency and emergency buffers, must fit entirely within the defined AAE
- These should be numerically defined, diagrammatically presented (plan and vertical view) and justified as robust

Geospatial & Visual Evidence

Provide geospatial and visual evidence supporting the definition and justification of the AAE, intended to:

- Validate the defined AAE geometry
- Demonstrate proximity to infrastructure
- Support the assessment of an improbable encounter rate

Key Requirement

The geospatial and visual evidence provided should support the defined AAE geometry, validate proximity to infrastructure, and reinforce the conclusion that encounter with crewed aircraft is improbable.

What Your Evidence Should Demonstrate

The strength of the physical constraint by infrastructure, that the operation will take place outside typical aviation envelopes, and there is a lack of credible use of airspace by crewed aircraft.

KML / GIS Data (Digital Evidence)

The following geospatial evidence would be beneficial to support the application:

AAE Area: Defining lateral and longitudinal AAE boundaries.

Operational Volume: Flight path and operational volume.

Satellite Imagery Evidence: High-resolution satellite imagery (e.g. Google Earth / Bing Maps).

As well as providing these files, it would be beneficial to extract specific images to support the details of the application.

Recommended Supporting Images

Image	Purpose	Content
Total AAE area overview	Demonstrate infrastructure constraint and visualise relationship between infrastructure and AAE	Full route, infrastructure clearly visible, AAE area overlay
Typical cross-section	Demonstrate physical confinement and unsuitability of AAE for crewed aircraft	Zoomed section of infrastructure, clearly visible key infrastructure components (e.g. for rail: tracks, fencing, embankments, overhead structures)
Vertical obstruction context	Support argument that environment is hazardous to crewed aviation	Identification of key vertical obstructions (e.g. for rail: signal gantries, overhead line equipment (OLE), bridges)
Airspace and aviation activity	Provide context of operational environment	Airspace classification (Class G), nearby aerodromes, known helicopter routes (if available)

2 Describe How the Residual Risk Will Be Addressed

Provide descriptions of how the strategic and tactical mitigations outlined in CAP3040 will be met

CAP3040 RESIDUAL RISK MITIGATIONS

- Pre-Tactical Notification 1
- Electronic Conspicuity (EC) 2
- Anti-Collision Lighting 3
- Containment & Geo-Caging 4
- Safeguarding in CAS 5

Residual Risk Overview

Operating within an AAE reduces the risk of the operation, however to address the residual risk, CAP3040 outlines the following mitigations which are to be considered. An applicant may provide evidence to demonstrate if some of the mitigations are not required, or that alternatives are more suitable, for their specific operation, which must be supported by a robust safety argument.

Alternative Approaches

An applicant may provide robust justification for why an alternative approach will achieve the same level of risk mitigation, based on the specifics of the operating environment. The CAA will assess this evidence as part of the UK SORA application.

Pre-Tactical Flight Route Notification

To address the residual MAC risk posed by the UA towards other UA and conventionally piloted aircraft, the operator must pre-notify their intended operating route or Area of Operation (AO), and the process to achieve this must be described in the UK SORA operation details. The type of pre-notification considered appropriate will depend on several factors such as the location and intended duration of the operation.

Demonstrate: how your route/AO is pre-notified, what mechanism is used, lead times, who is responsible, and how records are retained.

Evidence: written procedure, example submission, record of internal approval, and confirmation of completion before flight.

Electronic Conspicuity (EC)

To help mitigate the MAC risk between UA and other aircraft operating at very low level in the vicinity of an AAE, a UA operating within an AAE should be equipped with a Universal Access Transceiver (UAT) device transmitting on 978MHz and receiving on dual frequencies 978 MHz and 1090 MHz.

Demonstrate: the EC system fitted to the aircraft, frequency and standard compliance, installation configuration, antenna placement, known performance limitations, and shielding considerations (body, terrain, infrastructure).

Evidence: technical specification sheets, functional test procedures, pre-flight check steps, in-flight monitoring procedure, and failure response procedure.

High Intensity Anti-Collision Lighting

To aid in the visual conspicuity of the UA to other air users, any UA operating within an AAE must be equipped with high intensity anti-collision lighting, which is operating throughout the flight by day or night. The CAA has not currently defined specific technical or operational requirements for high-intensity anti-collision lighting for UA operated within the Specific category however, the Federal Aviation Administration require an upwards facing white strobing light that must be visible from a minimum of three statute miles at night under clear atmospheric conditions with a strobe rate of 40-100 cycles per minute. In the absence of a UK standard, this is considered an appropriate best practice with several products readily available on the market which meet this requirement.

Demonstrate: lighting is fitted, it is suitable for conspicuity, it is operational during day and night, there is a pre-flight functional test, and there is a failure procedure.

Evidence: technical data, installation photos, pre-flight checklist inclusion, and maintenance schedule.

Containment and Geo-Caging

Any UA operating within an AAE must be equipped with a technically robust containment solution to ensure a breach of the operational volume is mitigated as far as reasonably practicable. This could be in the form of an onboard software based geo-caging function or, when available, an Unmanned Traffic Management service providers conformance monitoring service.

Demonstrate: technically robust containment, configured geo-cage parameters, verification testing, configuration control, boundary breach logic, and fail-safe alignment with AAE containment.

Evidence: screenshots or configuration logs, test records, SOP extract, and limitations.

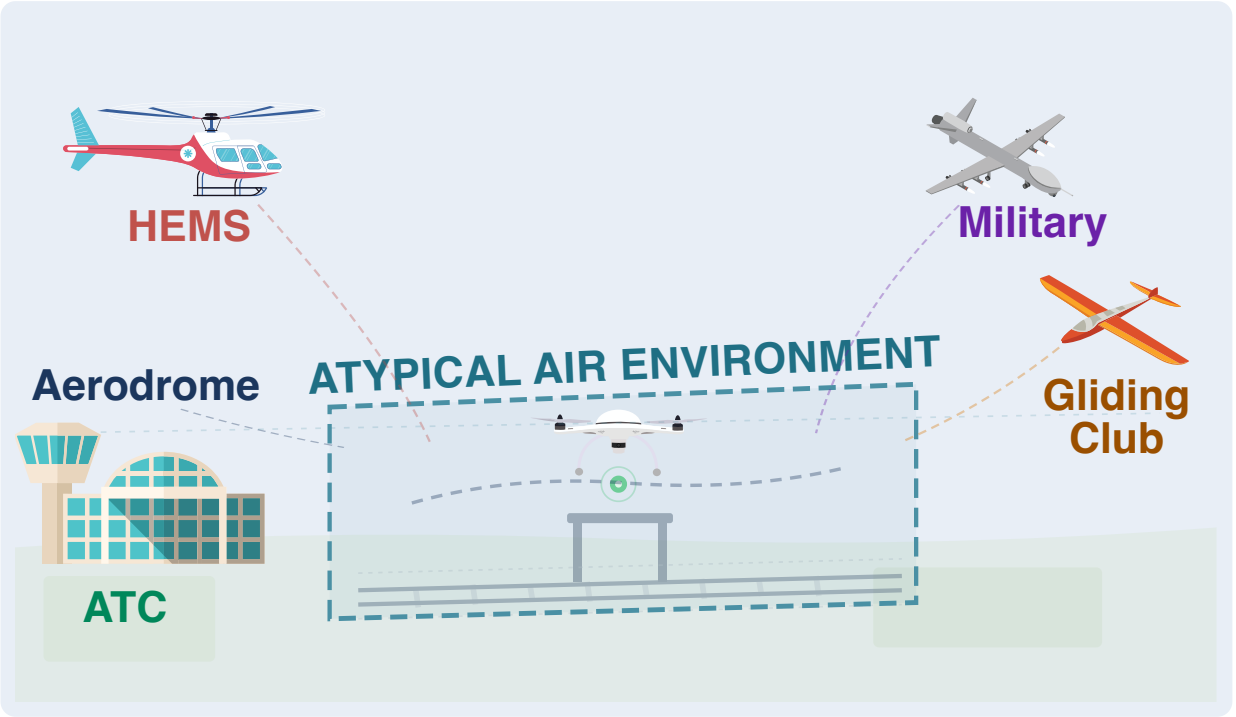
Safeguarding Operations in Controlled Airspace

AAE BVLOS operations within CAS can add additional complexity and risks and so the UAS operator must co-ordinate with the relevant Air Traffic Control (ATC) service provider prior to conducting an operation and comply with any conditions specified by the ATC unit, such as time restrictions.

If operating within or near controlled airspace the application should: describe ATC coordination procedure, show communication templates, provide example coordination evidence, and explain how ATC conditions are managed operationally.

3 Describe How Potential Airspace Users Have Been Considered

Describe the airspace characteristics and outline how potential airspace users have been considered



Liaison with Other Airspace Users

Where appropriate, you should show evidence that reasonable steps will be taken to coordinate with local emergency services (e.g. HEMS, NPAS), local aerodromes, model flying/gliding clubs and/or military low flying authorities.

This can be achieved by providing contact logs, communication templates, records of outreach, periodic review plans, and/or pre-flight planning inclusion.

Military Low Flying Consideration

Where appropriate, demonstrate that military low-level activity has been considered, appropriate coordination procedures exist, and evidence that the consideration is documented in pre-flight planning.

Collision Avoidance Procedure

Even in an AAE, collision avoidance responsibilities remain. Therefore, you must provide your tactical deconfliction procedure, remote pilot decision logic, criteria for flight discontinuation, training evidence and emergency response workflow.

Boundary Breach

You must demonstrate how boundary breach is prevented, what happens if containment fails and that fail-safe logic does not cause the aircraft to exit the AAE.