

Guidance for Industry: Dual-Use UAS Development, Testing and Evaluation

CAP 3319

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Civil Aviation Authority
Aviation House
Beehive Ring Road
Crawley
West Sussex
RH6 0YR

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Enquiries regarding the content of this publication should be addressed to:
testand.evaluationteam@caa.co.uk

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Foreword

Uncrewed Aircraft Systems (UAS) are transforming how aviation capability is developed, tested and deployed. Many emerging technologies, from autonomy and resilient navigation to advanced communications and airspace integration services, have clear applications across both civil and defence sectors. As development cycles become increasingly agile, organisations are seeking greater flexibility to test and mature these capabilities while generating evidence that supports future operational approvals, regulatory acceptance and, where appropriate, defence adoption.

This document was written to bring together existing policy and guidance from the CAA, and aims to help industry navigate the available civil regulatory pathways for UAS development, testing and evaluation. It explains how existing frameworks can support safe innovation, and evidence gathering, while maintaining appropriate levels of regulatory oversight.

Most importantly it recognises that the value of testing extends beyond demonstrating a capability in flight; it is about generating robust evidence that informs future operations, supports policy development and helps unlock the next generation of uncrewed aviation capability.

Future versions of the document will also capture relevant guidance from the MAA.

Revision history

October 2026

1.0 Initial Publication

Chapter 1

Introduction

Purpose

The distinction between civil and defence UAS technologies is becoming increasingly blurred. Many emerging capabilities are inherently dual-use, with the same aircraft, systems and supporting technologies delivering value across both civil and defence applications. For the purposes of this guidance, dual-use refers to systems, technologies, or capabilities that may have both civil and defence applications.

Industry feedback indicates a growing need for greater flexibility, clarity and alignment between civil and defence regulatory frameworks. Organisations are increasingly developing systems intended primarily for future defence applications whilst conducting testing and evidence generation under CAA oversight prior to formal MOD sponsorship or entry into the MAA regulatory framework.

The pace of innovation has also changed. Many programmes require rapid prototyping, frequent modifications to aircraft and software, changes in operating locations, and capability enhancement cycles that are often shorter than traditional aviation.

The challenge is no longer limited to testing the aircraft itself. Increasingly, capability development focuses on wider system-level technologies, including:

- Navigation and positioning systems.
- Connectivity and communications architectures.
- Detect and Avoid (DAA) technologies.
- Automation and autonomy.
- Airspace management systems.
- Command and control architectures.
- Electronic conspicuity solutions.
- Resilient Positioning, Navigation and Timing (PNT) technologies.
- AI-enabled decision support systems.

Many of these technologies address both civil safety challenges and defence capability requirements. For example, a navigation solution capable of maintaining accurate positioning independent of GNSS infrastructure may simultaneously support resilience against interference in defence operations and improve safety in civil operations.

This guidance aims to provide industry with a clear framework for developing, testing and evaluating dual-use capabilities whilst maintaining appropriate levels of safety and regulatory oversight.

Objectives

The guidance seeks to:

- Clarify civil testing pathways for dual-use systems.
- Improve understanding of available regulatory mechanisms.
- Support evidence generation through civil testing environments.
- Encourage sharing and reuse of evidence where appropriate.
- Support future certification and defence adoption pathways.

Key Principles

- **Dual-Use by Design:** Recognise that many emerging technologies are inherently dual-use and that evidence generated in civil environments may support future defence applications.
- **Proportionate Regulation:** Enable innovation through risk-based regulation whilst maintaining appropriate safety outcomes.
- **Flexibility and Agility:** Support rapid prototyping, iterative development and capability enhancement activities.
- **Evidence-Led Development:** Promote the generation and use of operational evidence to support regulatory, policy and capability development.
- **System-Level Testing:** Recognise that testing increasingly focuses on enabling technologies and supporting systems rather than solely the aircraft platform.
- **Regulatory Clarity:** Provide industry with a clear understanding of the relationship between CAA and MAA oversight.

Evolution of this Guidance

The aim of this document in the long term is to improve industry understanding of how civil and defence development pathways align. Working with the MAA, the document will be updated in future to clearly define the boundaries between testing under Civil and Military regulations, and the high-level requirements for both.

Chapter 2

Regulatory Landscape

Role of the CAA

The CAA is the UK's competent authority for civil aviation and is responsible for regulating Civil UAS operations across a range of frameworks. This includes Open Category operations, Specific Category authorisations issued under PDRA-01 and UK SORA, and the pre-assessed test site framework established under CAP3145. The CAA is also developing policy for the Light UAS Operator Certificate (LUC), which will enable qualifying entities to self-authorise operations within defined privileges. Across all these frameworks, the CAA sets the conditions under which Civil UAS testing and evaluation activities may be conducted, and expects operators to engage with the appropriate regulatory pathway for their proposed activity.

Where a dual-use system conducts flights in civil airspace or without MAA sponsorship, CAA regulatory requirements apply in full, and operators must engage with the appropriate civil authorisation framework irrespective of the platform's wider intended end use.

Determination of Lead Regulator

The CAA and the MAA work closely together to determine which regulator is best placed to oversee a proposed UAS activity where there may be uncertainty regarding the applicable regulatory framework. This is particularly relevant for capabilities with dual civil/defence applications, or where the intended use may evolve.

As a general principle, UAS operations conducted in civil airspace and without MOD sponsorship remain subject to CAA regulation. However, certain activities, including those involving military-sponsored programmes, direct support to military operations, or the carriage of weapons, munitions, or defence-specific payloads, may fall within the scope of MAA oversight.

The CAA and MAA operate a joint process through which applications and proposed activities can be reviewed collaboratively. The assessment considers factors such as the intended operator, ownership arrangements, operational purpose, planned operating environment, payloads, and any anticipated transition into military service. Where necessary, additional information may be requested to help determine the most appropriate regulatory route.

Industry should engage with the relevant regulator at an early stage, particularly where a capability is intended for future defence use or there is uncertainty regarding the appropriate regulatory framework. Early engagement can help avoid delays, and ensure

that evidence generated during development remains relevant to future regulatory or operational requirements. In general, if the intended use is both civil *and* military, then engagement should initially be sought with the CAA.

Chapter 3

Advanced Systems

Considerations

Many emerging dual-use UAS capabilities are driven by the development of enabling systems rather than the aircraft platform itself. These technologies are often applicable across multiple aircraft types and may support both civil and defence operational requirements. As a result, T&E activity may focus on the evaluation of a specific system, service, or capability.

Examples of advanced systems relevant to dual-use capability development include:

- **Detect and Avoid (DAA) systems:** Defined within the ICAO RPAS Manual as providing “the capability to see, sense or detect conflicting traffic or other hazards and take the appropriate action”. The DAA system therefore enables the Remote Pilot (RP) to exercise their collision avoidance responsibilities with regard to other aircraft, as required within the Standardised European Rules of the Air (SERA).
- **Electronic Conspicuity (EC):** Systems that improve situational awareness by electronically sharing aircraft position and identification data with other airspace users and air traffic management systems such as ADS-B
- **Alternative Navigation Systems:** Navigation solutions that supplement or replace GNSS-dependent positioning methods, including vision-based, terrain-referenced, and infrastructure-assisted approaches.
- **Resilient Position, Navigation and Timing (PNT):** Technologies designed to maintain navigation capability in degraded, or denied GNSS environments.
- **Connectivity Technologies:** Advanced communications systems, datalinks, and network architectures supporting command and control, payload data transfer, and integration with wider digital ecosystems.
- **Airspace Management Systems:** Services and technologies supporting the safe integration of UAS into shared airspace, such as strategic deconfliction and UTM.
- **Autonomy and Decision-Support Systems:** Capabilities that support automated flight operations, mission management, dynamic replanning, and operator decision-making.

Relevance to Dual-Use Capability Development

These technology areas represent key enablers for future UAS operations and are relevant to both civil and defence stakeholders. In many cases, the same underlying technology may support a variety of use cases across sectors, with differences arising primarily from the operational context rather than the technology.

Testing and evaluation of these systems can provide evidence relating to safety, performance, interoperability, resilience, and operational effectiveness. Such evidence may support regulatory approval, operational authorisation, capability maturation, and future deployment decisions.

Chapter 4

Civil Regulatory Pathways

The following sections summarise the different regulatory routes available through the CAA, however, are not intended to replace the formal policy and guidance material provided by the CAA. Once the appropriate regulatory route has been established, it is recommended to visit the CAA website for further detail before applying.

Open Category

The [Open Category](#) is the lowest risk of the UK's three UAS operating categories (Open, Specific, Certified) and does not require CAA authorisation before flying. Operations must stay below 120m (400ft), remain within visual line of sight, and avoid restricted airspace.

There are 3 subcategories:

- **A1 (Over People):** For low-risk, simple flying. Drones over uninvolved people are permitted, but not over crowds, and flying is allowed within residential, commercial, industrial and recreational areas. Applies to sub-250g maximum take off mass (MTOM) aircraft (UK0/UK1, or C0/C1 under transitional arrangements).
- **A2 (Near People):** Applies to UAS 250g-4kg MTOM, flight as close as 50 metres horizontally from uninvolved people is permitted with C2 class drones, but this requires passing the A2 Certificate of Competency alongside the standard Flyer ID test.
- **A3 (Far from People):** Applies 4kg-25kg MTOM and requires keeping a safe distance from people – not closer than 50m horizontally to uninvolved people, no flying over people, and not closer than 150m horizontally to residential, recreational, commercial or industrial areas.

Identification and Competency

A [Flyer ID](#) is required for any drone or model aircraft weighing 100g or more, and an [Operator ID](#) is required for aircraft weighing 100g or more with a camera. A2 operations additionally require the [A2 Certificate of Competency](#) (CofC), delivered by CAA-recognised training providers and valid for five years.

Class Marking and Legacy Aircraft

The UK is transitioning to its own [class-marking scheme](#), though EU C-class drones remain usable under equivalent UK classes on a transitional basis until 31 December 2027. Legacy (unmarked) aircraft under 250g can continue operating in A1 indefinitely, while legacy aircraft between 250g and 25kg are generally restricted to A3

Privately Build Aircraft

Privately-built UAS fall under legacy provisions, as they have not been through a conformity assessment and therefore carry no class mark. Under 250g, they may operate in A1, consistent with other sub-250g legacy aircraft. Between 250g and 25kg, they are restricted to A3. Privately-built aircraft cannot access A2 under any circumstances while unmarked.

The Open Category provides an accessible entry point for UAS testing and evaluation activity. However subcategory constraints, including VLOS requirements, operational area limitations, and MTOM thresholds, mean it is best suited to early-stage development.

It may be suitable for:

- **Aircraft performance testing:** Flight envelope, endurance, and basic handling assessments within subcategory limits.
- **Sensor integration:** Functional and compatibility trials of payloads in a controlled environment.
- **Communications testing:** Validation of datalink and C2 system performance.
- **Navigation testing:** Assessment of navigation system performance and accuracy.
- **Initial automation testing:** Evaluation of basic autonomous flight modes and failsafe behaviours.
- **Rapid iteration of aircraft configurations:** The accessible nature of the Open Category allows configuration changes to be tested quickly without the overhead of repeated authorisation processes, provided they remain within the limitations of the Open Category.
- **Evidence generation:** Structured data collection to support a subsequent Specific Category authorisation application as part of a phased test programme.

Guidance on flying in the Open Category can be found [on the CAA website](#).

PDRA-01 for Testing

PDRA01 is a predefined risk assessment authorisation in the Specific Category. It authorises activities not permitted in Open Category A3, specifically flying UAS between 250g and 25kg within 150m of residential, commercial, industrial and recreational areas, and overflight of uninvolved people provided this is kept to a minimum. All flights must remain within VLOS and within 500m of the remote pilot.

Key Conditions

Aircraft must have an MTOM under 25kg. Flights must not come within 50m of uninvolved persons (reducible to 30m during take-off and landing) or at less than 50m *horizontal separation* of assemblies of people, and overflight of assemblies of people is not permitted. Remote Pilots must hold a valid Flyer ID and either a Level 1 Remote Pilot

Certificate (RPC-L1) or General VLOS Certificate (GVC), and must be employed or contracted by the UAS Operator. Standard requirements also apply around insurance, occurrence reporting, control system failure mitigation, and radio spectrum compliance.

Operator Requirements

- **Operator ID:** The correct Operator ID for the entity applying — individual or organisation. Sole traders wanting the authorisation issued in a trading name need an organisation Operator ID.
- **Operations Manual:** A valid Operations Manual meeting PDRA01 requirements, using the CAA's template where appropriate. This is not uploaded at application but must be maintained and available for audit.
- **List of aircraft:** The makes and models of all UAS to be used under the authorisation, along with hours flown in the past 12 months where available. Optional for first-time applicants, mandatory when reapplying.

Oversight

Authorisation holders may be audited by the CAA at any time and must provide operations manuals, technical logs, and flight logs on request. Failure to meet requirements may result in revocation or suspension of the authorisation.

PDRA-01 routes to authorisation may be suitable for a range of T&E activities where operations remain within VLOS, such as:

- **Developmental testing:** Early-stage platform testing in environments that exceed Open Category constraints.
- **Operational concept validation:** Evaluating how a system performs in representative operational environments, particularly where proximity to infrastructure is a realistic feature of the intended use case.
- **System-level testing:** Assessing integrated platform performance including sensors, communications, and automation behaviours under Specific Category conditions.
- **Repetitive testing programmes:** Where a defined and recurring test profile falls within PDRA-01 conditions, the 12-month authorisation period provides a stable framework for sustained developmental activity without repeated authorisation applications.
- **Safety case and operations manual development:** The process of obtaining and operating under a PDRA-01 authorisation provides a useful stepping stone for organisations building towards a full Specific Category operational authorisation, allowing safety management processes, operational procedures, and operations manual content to be developed.

Further information on PDRA-01 conditions and requirements can be found on the [CAA website](#).

UK SORA

UK SORA is the primary risk assessment methodology for Specific Category operational authorisations and is well-suited to T&E activities that fall outside the scope of predefined routes. Its scalable framework can accommodate a wide range of operational profiles, making it the appropriate pathway for more complex or higher-risk testing.

UK SORA can accommodate developmental programmes in which the aircraft, payload, software, or operational concept continues to evolve throughout the test campaign. This makes it the most suitable route for experimental and capability maturation activities, provided changes are managed through an appropriate safety assurance process.

It may be suitable for:

- **VLOS and BVLOS operations:** Where operations extend beyond VLOS, UK SORA provides the framework to assess and mitigate associated risks through appropriate operational safety objectives.
- **Advanced autonomy:** Testing of highly automated or autonomous behaviours where the risk profile requires a structured, evidence-based assessment rather than a predefined route.
- **Novel operational concepts:** Evaluation of systems or concepts that do not fit existing predefined frameworks, including those with unique platform characteristics or unconventional operational profiles.
- **Higher-risk developmental activities:** Where test activity introduces elevated risk, UK SORA allows that risk to be formally assessed and mitigated through a tailored safety case.
- **System-level testing:** Integrated assessment of platform, payload, communications, and autonomy systems in representative environments.
- **Complex Dual-use and Defence-relevant capability development:** UK SORA can provide a civil regulatory framework for evaluating platforms that may ultimately support defence or security applications where complex operational requirements need to be demonstrated.

Applications

Applications are made through the CAA's UK SORA-based Application Service, an online tool that guides applicants through the risk assessment and authorisation process.

Applicants require an Operator ID, and the process involves three stages:

1. **Calculate SAIL and containment**

Applicants use the online tool to enter details of their proposed operation. The service calculates the Ground Risk Class (GRC) and Air Risk Class (ARC), which together determine the SAIL level (1–6) and containment level required. This stage is free and non-committal, allowing different configurations to be explored before fixing the SAIL and proceeding.

2. **Assessment 1**

The applicant submits their proposed risk mitigations through the online tool for CAA review, confirming the operation is suitable for authorisation before full evidence is compiled. Some SAIL levels and mitigations may require working with a 3rd party Recognised Assessment Entity for Flightworthiness (RAE(F)).

3. **Assessment 2**

The applicant submits their compliance approach and evidence against the applicable Operational Safety Objectives (OSOs) via the same platform. There is a charge at this stage, except at SAIL 1. Approval results in the operational authorisation being granted.

Frequent Platform Modifications

Configuration changes may affect the basis of the safety case and should be assessed against the scope of the existing authorisation. Operators should refer to [CAP 722L](#) for guidance on engaging with the CAA and managing modifications in a manner that maintains safety assurance proportionate to the nature and extent of the change. CAP 722L covers:

- **Payload changes:** Substitution or addition of payloads may alter the risk profile and require the authorisation to be reviewed or updated.
- **Software updates:** Changes to flight control, autonomy, or mission software should be evaluated for their impact on the operational safety objectives underpinning the authorisation.
- **Changes to operating locations:** Moving test activities to new locations will require reassessment of ground risk and airspace considerations.
- **Incremental capability enhancement:** Where a programme progressively expands the operational envelope, each increment should be assessed to determine whether it remains within the existing authorisation or requires a variation.

Flightworthiness Assurance

Flightworthiness is an important component of the UK SORA framework and provides confidence that a UAS is capable of conducting the proposed operation safely. As operations become more complex and SAIL levels increase, applicants may be required to provide increasing levels of evidence relating to aircraft design, construction, reliability, maintenance, and operational suitability.

The CAA has established the Recognised Assessment Entity for Flightworthiness (RAE(F)) framework to support independent assessment of UAS flightworthiness within the Specific Category. RAE(F)s are organisations approved by the CAA to assess whether a UAS, or specific UAS configuration, meets defined UK SORA flightworthiness requirements and to provide recommendations to support operational authorisation applications.

For dual-use development programmes, flightworthiness evidence may be generated progressively throughout a testing campaign. Sources of evidence may include:

- Ground and flight testing.
- Reliability data.
- Maintenance and inspection programmes.
- Software assurance activities.
- Configuration management processes.
- Safety and failure analysis.
- Operational experience from previous testing activities.

Early consideration of flightworthiness requirements can help ensure that developmental testing generates evidence that remains relevant as programmes move towards more complex operations, higher SAIL levels, routine deployment, future certification activities, or defence airworthiness assessments.

The CAA has also introduced the SAIL Mark Certificate concept, under which a UAS may be independently assessed against defined UK SORA technical requirements applicable to specific SAIL levels. As the SAIL Mark framework matures, operators may be able to utilise SAIL-marked aircraft as a means of demonstrating compliance with certain technical requirements within UK SORA applications.

Further information can be found at:

[CAP722J: Unmanned Aircraft System Operations in UK Airspace – Recognised Assessment Entity for Flightworthiness RAE\(F\)](#)

Remote Pilot Competance

Remote pilot competency is a key component of the UK SORA framework and forms part of the safety assurance package supporting a Specific Category operational authorisation. The competency requirements applicable to an operation are determined through the UK SORA process and are proportionate to the complexity, risk profile and operational characteristics of the proposed activity.

The CAA has introduced a framework of Remote Pilot Certificates (RPCs) intended to support progressively more complex operations. Alongside the existing General VLOS Certificate (GVC) which is being phased out by the end of 2027, the RPC framework provides competency pathways that can be matched to the operational requirements identified through the UK SORA assessment process.

For dual-use testing programmes, competency considerations should be addressed early within the development process, particularly where activities involve:

- BVLOS operations.
- Advanced automation or autonomy.
- Multiple Simultaneous Operations (MSO).
- Novel operational concepts.

- Complex airspace environments.
- Higher SAIL operations.

As operational complexity increases, operators should consider not only the competence of the remote pilot, but also the capability of any supporting personnel, including flight monitors, mission commanders, system supervisors and other roles that contribute to safe operation. Training, checking and currency arrangements should form part of the overall safety management approach supporting the operation.

The CAA has also established the Recognised Assessment Entity for Pilot Competence (RAE(PC)) framework, enabling approved organisations to assess and issue remote pilot qualifications against defined competency standards. Operators developing advanced or novel capabilities should consider how competency evidence generated during developmental testing can support future operational approvals and capability deployment.

Further information can be found at:

[CAP 722B: Recognised Assessment Entity for Remote Pilot Competence RAE\(PC\)](#)

[CAP3288: Training Manual Template RPC-L2](#)

Utilisation of pre-assessed Test Sites

Operating from CAP3145 pre-assessed test sites simplifies elements of the SORA process by providing an established environment with known risk characteristics. More detail can be found in the following section.

Costs and Duration

Costs for SORA based authorisation vary based on the complexity of the operation, [with details available on the CAA website](#). At higher SAILs there may also be costs for work carried out by an RAE(F) on behalf of the CAA. Authorisations last 12 months. Operators may reapply from 28 days before expiry, though no change of scope is possible on reapplication. Significant changes require a new application however the CAA recognises that T&E programmes are iterative by nature and will seek to apply proportionate approaches to managing change whilst maintaining appropriate safety assurance.

The UK SORA-based Application Service can be accessed via [the CAA website](#), where further guidance on operational volume, GRC, ARC, and OSOs is also available.

Additional useful information on SORA Application can be found at:

[CAP3285: UK SORA General Operations Manual \(GOM\)](#)

[CAP3239A: UK SORA Best Practice Submission of Operational Details](#)

UAS Operations at Test Sites – CAP3145

CAP 3145 pre-assessed test sites provide environments where the ground and air risk profile has been assessed by the CAA in advance, allowing operators to incorporate that pre-agreed risk profile into their own UK SORA application without conducting a full site-level risk assessment from scratch. The UAS Operations at Test Sites - Policy Concept applies to both those applying to become a CAA Pre-assessed Test Site and UAS Operators intending to utilise a CAA Pre-assessed Test Site. The CAA pre-assessment, results in faster authorisations, and simplified applications for operators. The framework is designed to support innovation and evidence generation by providing a streamlined route to authorisation for T&E activities.

Under the current framework, pre-assessed test sites support operations up to SAIL II, covering both VLOS and BVLOS operations. To achieve this, pre-assessed sites are typically located in areas of low population density or have controlled/managed ground risk areas, and often have access to segregated airspace.

The full guidance document is available at: [UAS Operations at Test Sites](#).

Dual-User Capability Development

Pre-assessed test sites are well-positioned to support dual-use capability development, offering a stable and repeatable operational environment for T&E activity. They may be suitable for:

- **Rapid capability maturation:** A pre-assessed environment removes the need to re-establish site risk parameters between test campaigns/flights, enabling operators to focus resource on platform and system development, and rapid turnarounds between testing.
- **Advanced testing:** The availability of segregated airspace and controlled ground areas at many sites supports more complex test profiles, including BVLOS operations and higher-risk activities such as UA-UA collision testing.
- **Iterative development:** The streamlined authorisation process reduces the overhead associated with repeated or evolving test programmes, supporting increasing operation complexity.
- **Early operational deployment concepts:** Sites provide a representative environment in which operational concepts can be evaluated before deployment in unsegregated airspace.
- **Generation of evidence for civil and defence stakeholders:** Structured T&E activity at pre-assessed sites can still produce evidential datasets relevant to both civil regulatory development and defence capability assessment.

CAP 3145 pre-assessed test sites provide a bridge between early-stage platform development and operational deployment or MOD-sponsored programmes. By reducing the regulatory burden associated with site-specific risk assessment, they enable dual-use

systems to mature capability, and generate evidence to support both civil regulatory objectives and defence capability development.

LUC Enabled Testing

The Light UAS Operator Certificate (LUC) is a proposed alternative pathway for Specific Category operations, granting privileges based on demonstrated organisational competence rather than case-by-case approval. The concept is set out in [CAP 3222](#). The CAA is currently running a 12-month trial with a small number of participating organisations to evaluate whether the approach can maintain safety and compliance while enabling greater operational flexibility and reducing regulatory burden.

For T&E purposes, an LUC may offer potential benefits including:

- **Greater operational flexibility:** Privileges granted under an LUC are based on the organisation's demonstrated safety management capability, reducing reliance on individual, case-by-case authorisations for each test activity.
- **Reduced need for repeated authorisation changes:** Where an organisation holds appropriate privileges, evolving test parameters may be managed internally rather than requiring a variation to a CAA-issued authorisation each time.
- **Support for iterative testing programmes:** The self-authorising nature of the LUC framework aligns well with T&E activities that progress through successive stages of development.
- **Support for rapid prototyping and capability enhancement activities:** Reduced administrative overhead between test iterations may allow organisations to respond more quickly to emerging findings and evolving platform capabilities.

As the LUC framework is still in trial and policy development, organisations interested in this pathway should monitor CAA publications for updates, including the outcome of the current trial and any subsequent routine application process.

Further information on the LUC trial, including participating organisations and programme updates, is available on the UK CAA's *LUC Policy Concept* webpage: [LUC Policy Concept | UK Civil Aviation Authority](#).

Use of Atypical Air Environment (AAE)

The use of an Atypical Air Environment (AAE) as an air risk mitigation within a UK SORA application is one of the most common approaches used to support BVLOS operations. [CAP3040](#) is the current Atypical Air Environment policy concept and presents the CAA's current position on the regulatory requirements applicable to organisations wishing to operate UAS BVLOS in AAE.

Similarly to operating in a danger area, it only provides a framework to mitigate the risk of encountering other air users during operations, so risk to persons on the ground should still be considered.

Chapter 5

Specific Testing Considerations

Counter UAS, UA-UA Interception and Collision Testing

The development of many emerging dual-use UAS capabilities requires testing the interaction of one uncrewed aircraft with another. This may include the detection, tracking, interception, disruption, capture, or physical engagement of a target UA. Such activities are relevant to both civil and defence applications, particularly in the development of counter-UAS systems and airspace security technologies.

The CAA cannot currently enable full operational deployment of CUAS capability through existing aviation regulation, however, the CAA can work to enable appropriate testing, trials and demonstrations through existing aviation regulatory pathways, where this can be undertaken safely. An operational deployment of a CUAS which automatically deploys an effector (such as another UAS) to intercept the UAS is unlikely to be feasible through existing CAA regulation alone - as it will require cross agency and government agreement.

Regulatory Considerations

UA–UA interception and collision testing typically presents a more complex risk profile than conventional developmental flying due to the potential for:

- Loss of control of one or multiple aircraft.
- Mid-air collision and debris generation.
- Operations involving autonomous decision-making.
- Dynamic flight paths and rapid manoeuvring.
- Testing of novel or experimental operational concepts.
- Extremely high aircraft velocities.

As a result, testing activities will generally require a Specific Category authorisation.

There is nothing within the current UK UAS regulatory framework that explicitly prevents intentional UA–UA collision activities. However, operators should be mindful of the Air Navigation Order (ANO), in particular Article 241, which states:

“A person must not recklessly or negligently cause or permit an aircraft to endanger any person or property.”

Accordingly, interception or intentional collision activities should be properly planned, risk assessed and conducted in a controlled manner so that they do not endanger people, property, or other airspace users.

Recommended Pathway

UA-UA collision/interception testing will typically require a UK SORA-based operational authorisation due to the intentional creation of airborne collision hazards and associated ground risk, although operators should assess whether their specific activity can be conducted lawfully under another applicable operational framework.

A SORA application should clearly describe:

- The interceptor and target aircraft characteristics
- The method of interception or collision
- Ground risk containment, including debris and recovery considerations
- Airspace management and deconfliction measures
- Operational limitations and safety mitigations

In addition, applicants should also consider:

- **Appropriate containment measures:** Such as controlled operating areas, ground risk containment, emergency recovery provisions, and clearly defined test boundaries.
- **Suitable test environments:** Locations with very low third-party risk, controlled ground areas, segregated airspace, or CAP3145 pre-assessed test sites where appropriate.

Flight Termination and Impact Mitigation Systems

Flight termination systems, parachutes, and geocaging are frequently the subject of T&E activity in their own right, particularly for dual-use platforms where these systems are being matured toward a defined performance standard.

Flight Termination Systems

Organisations developing an FTS should design and test against a recognised industry standard, such as BS EN 4709-006, to support future compliance claims. Reliability is a central consideration: the system must be shown to meet the mitigation probability required at the intended robustness level, and evidence of this reliability becomes more demanding as robustness increases. For example, declaration may suffice at medium robustness, but high robustness requires compliance evidence submitted for direct CAA evaluation. Where an FTS is also intended to meet containment requirements, test programmes should consider evidencing both termination and containment capabilities together, since a system meeting low robustness containment is deemed to automatically satisfy the related M2 technical design requirement.

Parachute Systems

Parachute development and testing should be conducted against existing standards such as ASTM F3322-24a or equivalent. Test programmes should establish and evidence deployment time and descent rate, both of which are platform-specific and directly affect ground risk buffer calculations. For smaller platforms (under 25kg MTOM, under 3m wingspan), demonstrating a net vector velocity of 10 m/s or less provides a route to automatic compliance; larger platforms will need to additionally demonstrate compliance through critical area reduction, which should be factored into the test campaign design. Where a parachute is intended to activate prior to potential structure collision, test evidence should support the representative velocity claimed for penetration analysis.

Geocaging

Geocaging systems should be developed with evidencing their validity in the adjacent area as a specific test objective, since this is what may unlock reduced containment requirements. Test programmes should establish whether their evidence base supports a declarative approach (low robustness) or requires an agreed compliance basis with the CAA (medium robustness), and structure their evidence generation accordingly.

Multiple Simultaneous Operations (MSO)

Multiple Simultaneous Operations (MSO) involve a single remote pilot, flight monitor, or control system managing more than one uncrewed aircraft concurrently. MSO represents an important area of future civil and dual-use UAS capability development, enabling increased operational scalability, reduced personnel burden, and improved mission effectiveness.

Examples include:

- One-to-many operations.
- Fleet operations.
- Swarming concepts.
- Coordinated autonomous systems.
- Distributed sensing networks.
- Multiple aircraft operating under a common mission management system.

Regulatory Considerations

MSO introduces additional operational complexity beyond conventional one-to-one operations between a remote pilot and aircraft. Considerations may include:

- Remote pilot workload and task management.
- Human-machine interface design.
- Aircraft command and control arrangements.
- Contingency management across multiple aircraft.

- Airspace integration considerations.
- Coordination between autonomous and remotely piloted functions.
- Potential failure modes affecting multiple aircraft simultaneously.

As a result, MSO activities are assessed by the CAA as an additional element of a Specific Category operational authorisation. In addition to the standard UK SORA assessment, operators are required to demonstrate that the proposed MSO concept maintains an acceptable level of safety and appropriate management of human and technical risk factors.

Recommended Pathway

For developmental programmes, a phased approach is recommended:

- **Establish a baseline capability:** Obtain and demonstrate a conventional one-to-one operational authorisation for the intended aircraft and operating concept.
- **Generate operational evidence:** Conduct sufficient testing to demonstrate aircraft performance, control arrangements, operational procedures, and contingency management under normal operations.
- **If not operating at a pre-assessed test site, apply for MSO assessment:** Once the baseline capability has been established, seek approval for MSO as a variation to the existing operational authorisation. An MSO ConOps is to be submitted to the CAA, outlining how the extra complexity of the operations is managed safely.
- **If operating at a pre-assessed test site or in permanent danger area:** Proceed directly to submitting an application or variation to the CAA.
- **Incrementally expand complexity:** Progressively increase the number of aircraft, operational tasks, and levels of autonomy as evidence is gathered and safety assurance is maintained.

Where an operator already holds a UK SORA-based operational authorisation, the introduction of MSO should be treated as a significant operational change requiring additional assessment by the CAA.

Defence Specific Testing Considerations

Operations of UAS carrying specific defence payloads, or live ordnance, munitions or explosive stores fall outside of the regulatory oversight of the CAA, and cannot be conducted under civil regulations. Any operator wishing to carry out testing involving these must engage directly with the MAA.

Chapter 6

Data Collection and Evidence Generation

A core objective of UAS testing and evaluation should be the generation of structured, repeatable evidence that supports future operational approvals, capability development, and regulatory decision-making. Testing activities should be planned not only to demonstrate that a capability works, but also to generate evidence that it can be operated safely, reliably and consistently within its intended operating environment.

Evidence generated during developmental testing may support:

- Future UK SORA applications and operational authorisations.
- Expansion of operational privileges or operating envelopes.
- Validation of new operational concepts.
- Flightworthiness assessments.
- Future certification activities.
- Defence capability development and assessment.
- Procurement and investment decisions.
- Regulatory and policy development.

Organisations are encouraged to adopt a proportionate and structured approach to evidence generation from the earliest stages of development. Where possible, test objectives, success criteria, and data capture requirements should be defined before testing commences.

Aircraft Performance and Reliability

Evidence relating to aircraft performance can support both operational authorisations and future flightworthiness activities.

Examples may include:

- Aircraft handling characteristics.
- Flight envelope definition.
- Endurance and range performance.
- Environmental operating limits.
- System reliability and availability.
- Failure rates and failure modes.
- Recovery from abnormal and degraded conditions.
- Maintenance and inspection findings.

Particular value may be gained through collecting evidence across multiple flights and operating conditions, allowing confidence in repeatability and consistency to be established.

Navigation and Positioning Performance

Many emerging UAS systems depend on robust navigation capabilities, particularly where operations may be conducted in challenging or degraded environments.

Evidence may include:

- Navigation accuracy.
- Position integrity.
- GNSS performance.
- Alternative navigation system performance.
- Resilient PNT capability.
- Performance during GNSS degradation, loss, or interference.
- Navigation system fault detection and recovery.

Testing should seek to understand both nominal performance and behaviour during degraded conditions.

Communications and Command & Control (C2) Performance

Reliable command and control is fundamental to safe UAS operations. In a similar way to Navigation, systems may need to operate for periods of partial or complete link loss, so evidencing their robustness should be considered.

Evidence may include:

- Link availability and reliability.
- Coverage and signal quality.
- Latency and response times.
- Lost-link performance.
- Recovery and re-establishment procedures.
- Network resilience.
- Behaviour during communications degradation or failure.

Where advanced connectivity technologies are under development, testing should generate evidence across representative operating environments and operating ranges.

More information is available in [CAP3154](#) C2 Link Policy Concept.

Detect and Avoid (DAA) and Airspace Integration

DAA technologies are expected to play an increasingly important role in enabling higher-risk and more complex operations. The CAA has published a DAA policy concept, [CAP3015](#).

Evidence may include:

- Detection performance.
- Alerting performance.
- Tracking accuracy.
- Avoidance effectiveness.
- Nuisance alert rates.
- Performance against cooperative and non-cooperative traffic.
- Human-machine interface effectiveness.
- Integration with other airspace users and airspace management services.

Evidence generated through structured testing can help build confidence in both the technology and the associated operating concept.

Automation and Autonomy

As autonomy becomes increasingly prevalent within both civil and defence applications, evidence should focus not only on mission success, but also on safety, predictability and operator oversight. It can also form part of evidence generation for other capabilities, such as DAA.

Evidence may include:

- Automated decision-making behaviour.
- Mission management performance.
- Behaviour at system boundaries.
- Human supervision requirements.
- Contingency and fallback actions.
- System transparency and explainability.
- Response to failures and unexpected events.

Test programmes should seek to demonstrate that autonomous functions behave consistently and remain appropriately bounded by the operational concept.

Human Factors

Human performance remains a critical component of UAS safety, particularly as operations increase in complexity.

Evidence may include:

- Remote pilot workload.
- Situational awareness.
- Human-machine interface usability.
- Crew coordination.
- Training effectiveness.
- Error identification and recovery.
- Performance during abnormal and emergency scenarios.

Where operational concepts rely upon multiple personnel or supervisory roles, testing should assess the effectiveness of the overall operational team rather than individual operators in isolation.

Configuration Control and Traceability

Organisations undertaking iterative development should ensure that test evidence is traceable to the configuration under test.

This should include, where appropriate:

- Aircraft configuration.
- Software version.
- Payload configuration.
- Operating procedures.
- Environmental conditions.
- Test objectives and acceptance criteria.

Maintaining traceability enables evidence generated across multiple test campaigns to be reused effectively and supports future regulatory, certification, and defence assurance activities.

Supporting Data-Driven Regulation

The CAA is increasingly adopting evidence-based and data-driven approaches to policy and regulatory development. Operational data generated through industry testing programmes provides valuable insight into emerging technologies, operational concepts, safety performance, human factors, and areas where future regulatory frameworks may need to evolve.

Organisations willing to share lessons learned, operational evidence, test results, or anonymised datasets are encouraged to engage with the CAA Test & Evaluation Team. Such collaboration can help inform future policy development, identify potential regulatory

barriers to innovation, and support the safe integration of new technologies into UK airspace.

Enquiries regarding testing, evaluation activities, or voluntary data sharing can be directed to:

testand.evaluationteam@caa.co.uk

ANNEX A

Abbreviations

AAE	Atypical Air Environment(s)
ADS-B	Automatic Dependent Surveillance-Broadcast
AGL	Above Ground Level
AI	Artificial Intelligence
AMC	Acceptable Means of Compliance
ANO	Air Navigation Order
ARC	Air Risk Class
ASTM	ASTM International (standards organisation)
BVLOS	Beyond Visual Line of Sight
C0 / C1 / C2	UAS Class Markings (EU class system)
C2 Link	Command and Control Link
CAA	Civil Aviation Authority
CAP	Civil Aviation Publication
CAP3145	UAS Operations at Test Sites Policy
DAA	Detect and Avoid
DfT	Department for Transport
EC	Electronic Conspicuity
FTS	Flight Termination System
GM	Guidance Material
GNSS	Global Navigation Satellite System
GOM	General Operations Manual
GRC	Ground Risk Class
GVC	General Visual Line of Sight Certificate
LUC	Light UAS Operator Certificate
MAA	Military Aviation Authority

MOD	Ministry of Defence
MSO	Multiple Simultaneous Operations
MTOM	Maximum Take-Off Mass
OSO	Operational Safety Objective
ORS9	Official Record Series 9
PNT	Position, Navigation and Timing
PDRA-01	Pre-Defined Risk Assessment 01
RAE(F)	Recognised Assessment Entity for Flightworthiness
RAE(PC)	Recognised Assessment Entity for Pilot Competence
RP	Remote Pilot
RPC	Remote Pilot Certificate
RPC-L1	Remote Pilot Certificate Level 1
RPC-L2	Remote Pilot Certificate Level 2
SAIL	Specific Assurance and Integrity Level
SERA	Standardised European Rules of the Air
SORA	Specific Operations Risk Assessment
T&E	Test and Evaluation
UAS	Uncrewed Aircraft System
UA	Uncrewed Aircraft
UTM	UAS Traffic Management
VLOS	Visual Line of Sight