

# Airspace Policy Concept: Airspace Requirements for the Integration of Beyond Visual Line of Sight (BVLOS) Unmanned Aircraft

CAP 2533

A large, abstract graphic composed of overlapping blue and purple shapes, resembling a stylized aircraft or a wing, occupies the lower half of the page. It features a gradient from light blue to dark purple.

Published by the Civil Aviation Authority, 2023

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First published April 2023

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## Document Change Record

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<b>Edition Number</b>	<b>Edition Date</b>	<b>Reason for Change</b>	<b>Pages Affected</b>
3 Feb 2023	0.1	First working draft	All
22 Feb 2023	0.2	Draft following engagement with CAA stakeholders	All
22 Mar 2023	0.3	Draft submitted to AMAG for approval	All
14 Apr 2023	1.0	Released issue (agreed at AMAG)	All

## Foreword

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The CAA's Airspace Modernisation Strategy presents the roadmap for the development and modernisation of UK airspace until 2040. One element considered within that strategy is the way that unmanned aircraft systems (UAS) operating beyond visual line of sight (BVLOS) will be integrated within the airspace system.

There is an expectation that this mode of aviation will expand rapidly in the coming years. To do so successfully, there is a need for such aircraft to be able to enter the airspace system routinely, without the need for 'special provisions', and to integrate safely in unsegregated airspace. As of April 2023, that is not yet possible, therefore BVLOS UAS operations must take place in segregated airspace.

The purpose of this document is to present an airspace policy concept that describes a pathway forward to deliver that integration. The concept utilises specific types of airspace structures to transition from segregated BVLOS operations, through the managed accommodation of a varied range of airspace operations, toward the ultimate objective of enabling integrated, unsegregated operations for all airspace users in standard ICAO classifications of airspace.

It is inevitable that this transition will require the development and testing of new technology solutions. This document describes the airspace structures and the associated requirements that will facilitate that evolution.

Our intention is that this airspace policy concept be trialled by appropriate industry stakeholders so that it may be refined and, in time, implemented as CAA policy.

## Chapter 1

# Introduction

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## Background

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- 1.1 In describing its vision for the integration of beyond visual line of sight (BVLOS) unmanned aircraft systems (UAS) into UK airspace, the CAA's Airspace Modernisation Strategy (AMS) describes a transition from the use of segregated airspace (i.e. temporary danger areas (TDAs)), towards operations in unsegregated airspace supported by transponder mandatory zones (TMZ). At this point, such aircraft will be considered to have been 'integrated' into UK airspace; i.e. they are able to enter the airspace system routinely without the need for 'special provisions'. Given the limitations of today's technology and 'ruleset', an incremental approach is required to transition from segregated airspace to unsegregated airspace.
- 1.2 Since their introduction, the operation of BVLOS unmanned aircraft (UA) in UK class G 'uncontrolled' airspace has been segregated from other airspace users through the use of temporary danger areas (TDA). The rationale for this segregation can be summarised as follows:
- (a) that, given the size of many UA, other aircraft are highly unlikely to be able to visually acquire them in order to take effective avoiding action;
  - (b) that the technology is not yet sufficiently mature or widespread to allow the UAS to demonstrate a capability that is at least equivalent to the ability of a pilot of a manned aircraft to detect potential collisions and take such action as will best avert collision; and
  - (c) that the Rules of the Air<sup>1</sup> are not yet adapted to accommodate the operation of UA, with UA being unable to comply with the extant Rules of the Air which form the foundation for the safe operation of aircraft in all classes of airspace. This is discussed further in [Chapter 2](#).
- 1.3 Some UA flights have been undertaken within controlled airspace, with the management arrangements for the flight being considered and developed on a case-by-case basis. However, the potential scope and scale of UA operations has now reached the point where a consistent policy is required that can be applied across the UK to seek to integrate the operation of BVLOS UA alongside other airspace users. Such a policy must address the challenges of operating

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<sup>1</sup> The 'Rules of the Air' is a collective term for those rules contained within the Annex to UK Reg (EU) No 923/2012 the 'Standardised European Rules of the Air' and the Rules of the Air Regulations 2015.

BVLOS UA today, whilst providing a ‘roadmap’ that facilitates true integration for all airspace users in the future.

**Note.** The purpose of controlled airspace is not to segregate airspace users. The purpose of controlled airspace is to “create a known air traffic environment to achieve the objectives of the air traffic control (ATC) service”<sup>2</sup>. As such, it seeks to enable the safe integration of other airspace users, with a graduated increase (through the varying airspace classifications<sup>3</sup>) in the number and types of safety barriers to mitigate the risks of mid-air collision (MAC) and controlled flight into terrain (CFIT).

- 1.4 This airspace policy concept is based upon a safety-principles led approach, with the objective of describing the airspace structures that will help to safely enable the transition of BVLOS UAS operations from segregated to unsegregated airspace.

## What is an Airspace Policy Concept?

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- 1.5 The Civil Aviation Authority (Air Navigation) Directions 2017 require the CAA to “develop and publish procedures, and guidance on such procedures, for the development, making and consideration of a proposal [...] for an airspace trial.”
- 1.6 In fulfilling this obligation, and as industry seeks to trial and develop the operation of BVLOS UA, we have developed this airspace policy concept to describe the airspace structures that we consider to be appropriate to support this activity now and, in the future, as we transition toward integrated and unsegregated operations. However, the CAA is mindful that we need to assess and refine this concept in the light of operational experience. Therefore, at this stage, the concept described herein is considered to have trial status. The CAA will assess and refine the concept based on feedback from appropriate industry stakeholders who will be invited to trial this airspace policy concept through our Regulatory Sandbox.
- 1.7 Importantly, this airspace policy concept reflects the limitations of today’s technology and ‘ruleset’ and provides a solution that can deliver managed BVLOS UA operations within those constraints. As technology develops and matures, and feedback on the concept is received from industry, the applicable requirements will adapt to reflect the capabilities of aircraft and airspace management systems. In due course, informed by feedback from stakeholders, the policy concept will develop into formal CAA policy.

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<sup>2</sup> [CAA Policy for the Design of Controlled Airspace Structures](#) dated 11 August 2022, paragraph 2.1.

<sup>3</sup> See UK SERA.6001.



## Purpose

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- 1.8 The purpose of this airspace policy concept is to:
- (a) explain how we will achieve the CAA AMS' roadmap to transition away from the use of TDA and towards unsegregated operations in airspace supported by TMZ;
  - (b) describe how the CAA proposes to start the integration of BVLOS UA operations within UK airspace;
  - (c) provide a means by which industry and the CAA may trial BVLOS UA flight until such time as the concept can be validated, refined and, if appropriate, adopted as policy; and,
  - (d) detail the rationale for this approach.

## Scope

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- 1.9 This policy concept applies to the operation of BVLOS UA in the 'specific'<sup>4</sup> and 'certified'<sup>5</sup> categories throughout:
- United Kingdom (UK) airspace<sup>6</sup>; and,
  - 'high seas'<sup>7</sup> airspace which lies within the London and Scottish flight information regions (FIR) and upper information regions (UIR).
- 1.10 The CAA notes that further work is being undertaken globally to analyse the requirement for and, when necessary, define:
- (a) separation minima applied by air traffic control (ATC) between:
    - i. 'manned' IFR flights and UA within controlled airspace; and,
    - ii. UA within controlled airspace.

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<sup>4</sup> More information on the 'specific' and 'certified' categories of UAS is available within [UK Reg \(EU\) 2019/947 on the rules and procedures for the operation of unmanned aircraft \(the UAS IR\)](#).

<sup>5</sup> The regulatory ruleset to support 'certified' category UAS operations is currently under development; however, this does not preclude the operation of 'certified' category UAS within the scope of this policy concept.

<sup>6</sup> 'UK airspace' refers to the airspace above the territory of the UK which encompasses the land areas and territorial waters adjacent to, and under the sovereignty of, the UK; i.e. that airspace that is within 12 nautical miles (NM) of the low water mark baseline for the UK's coast.

<sup>7</sup> The term 'high seas' means all parts of the sea that are not included in the territorial sea or in the internal waters of a State (UN Convention on the High Seas 1958). Broadly, it is taken to mean those parts of the sea that are beyond the 12 NM territorial limit of a State. The United Nations (UN) Convention on the Law of the Sea (CLOS) establishes the freedom of overflight of high seas airspace.

- (b) what might be termed as ‘collision avoidance minima’ between:
- i. ‘manned’ flights and UA; and,
  - ii. UA and other UA.

in airspace where the combination of the airspace classification and the flight rules means that a ‘see-and-avoid’ environment currently exists.

## Definitions

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1.11 The following definitions apply in the context of this policy concept:

- ‘airborne collision avoidance system (ACAS)’ means an aircraft system based on secondary surveillance radar (SSR) transponder signals which operates independently of ground-based equipment to provide advice to the pilot on potential conflicting aircraft that are equipped with SSR transponders (UK Reg (EU) No 923/2012 Article 2(17)).
- ‘air traffic control service’ means a service provided for the purpose of:
  - (a) preventing collisions:
    - i. between aircraft; and
    - ii. on the manoeuvring area between aircraft and obstructions; and
  - (b) expediting and maintaining an orderly flow of air traffic (UK Reg (EU) No 923/2012 Article 2(30)).
- ‘air traffic management (ATM)’ means the aggregation of the airborne and ground-based functions (air traffic services, airspace management and air traffic flow management) required to ensure the safe and efficient movement of aircraft during all phases of operations (UK Reg (EC) No 549/2004 Article 2(10)).

**Note.** The use of the term ‘aircraft’ above includes UAS; thus ATM includes the management of these aircraft which has been referred to as ‘UAS traffic management (UTM)’ and, within the EU, as ‘U-Space Services’. ICAO<sup>8</sup> describes UTM as “a specific aspect of ATM which manages UAS operations safely, economically and efficiently through the provision of facilities and a seamless set of services in collaboration with all parties and involving airborne and ground-based functions”.

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<sup>8</sup> [Unmanned Aircraft Systems Traffic Management \(UTM\) – A Common Framework with Core Principles for Global Harmonization Edition 3.](#)

- ‘air traffic service (ATS)’ means a generic term meaning variously, flight information service, alerting service, air traffic advisory service, air traffic control service (area control service, approach control service or aerodrome control service) (UK Reg (EU) No 923/2012 Article 2(32)).
- ‘Beyond visual line of sight operation (BVLOS)’ means a type of UAS operation which is not conducted in VLOS (UK Reg (EU) 2019/947 Article 2(8)).
- ‘Command unit (CU)’ means the equipment or system of equipment to control unmanned aircraft remotely as defined in point 32 of Article 3 of UK Reg (EU) 2018/1139 which supports the control or the monitoring of the unmanned aircraft during any phase of flight, with the exception of any infrastructure supporting the command and control (C2) link service (UK Reg (EU) 2019/947 Article 2(26)).
- ‘Control area (CTA)’ means a controlled airspace extending upwards from a specified limit above the earth (UK Reg (EU) No 923/2012 Article 2(56)).
- ‘Controlled airspace’ means an airspace of defined dimensions within which air traffic control service is provided in accordance with the airspace classification (UK Reg (EU) No 923/2012 Article 2(58)).

**Note.** Controlled airspace is a generic term which covers ATS airspace classes A, B, C, D and E (UK Reg (EU) No 923/2012 Article 2(58) GM1).

- ‘Control zone (CTR)’ means a controlled airspace extending upwards from the surface of the earth to a specified upper limit (UK Reg (EU) No 923/2012 Article 2(61)).
- ‘C2 link service’ means a communication service supplied by a third party, providing command and control (C2) between the unmanned aircraft and the CU (UK Reg (EU) 2019/947 Article 2(27)).
- ‘Danger area (DA)’ means an airspace of defined dimensions within which activities dangerous to the flight of aircraft may exist at specified times (UK Reg (EU) No 923/2012 Article 2(65)).
- ‘Detect and avoid’ means the capability to see, sense or detect conflicting traffic or other hazards and take the appropriate action (ICAO)<sup>9</sup>.

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<sup>9</sup> The CAA, alongside international partners, is developing our thinking on the concept of ‘detect and avoid (DAA)’. The objective of DAA might be achieved through a system onboard the BVLOS UAS which acts autonomously, or through the remote pilot, to mitigate the risk of mid-air collision. Equally, the CAA considers that the definition of DAA could be fulfilled by a ground-based system which transmits information to the BVLOS UAS or the remote pilot, or in a more ‘traditional’ way with an ATS provider issuing a remote pilot with traffic information and traffic avoidance advice, which the remote pilot then puts into effect.

- ‘functional system’ means a combination of procedures, human resources and equipment, including hardware and software, organised to perform a function within the context of air traffic management (ATM)/air navigation services (ANS) and other ATM network functions (UK Reg (EU) 2017/373 Annex I(56)).
- ‘Instrument flight procedure (IFP)’ is a generic term meaning a standard instrument arrival (STAR), an instrument approach procedure (IAP), or a standard instrument departure (SID) (CAP 785A Oversight of UK Approved Procedure Design Organisation and CAP 785B Implementation and Safeguarding of Instrument Flight Procedures (IFPs) in the UK).
- ‘Known traffic’ means traffic, the current flight details and intentions of which are known to the air traffic controller/FISO (CAA).
- ‘Recognised air traffic environment’ means the situation which results from the deployment of a transponder mandatory zone (TMZ) where all air traffic within a defined volume of airspace is conspicuous to air traffic services through the carriage and operation of a Mode S SSR transponder (unless operating in compliance with alternative provisions prescribed for that particular airspace by the TMZ Controlling authority that will achieve a cooperative electronic conspicuity environment), but where there is no requirement for air traffic to maintain continuous air-ground voice communication watch (CAA CAP 1430).
- ‘Remain-well-clear (RWC)’ means the ability to detect, analyse and manoeuvre in order to ensure that a remotely piloted aircraft is not being operated in such proximity to other aircraft as to create a collision hazard (Proposed for incorporation into ICAO Annex 10 Volume II).
- ‘Remote pilot’ means a natural person responsible for safely conducting the flight of an unmanned aircraft by operating its flight controls, either manually or, when the unmanned aircraft flies automatically, by monitoring its course and remaining able to intervene and change the course at any time (UK Reg (EU) 2018/1139 Article 3(31)).
- ‘Resolution advisory (RA)’ means a combination of alerting and guidance given to the flight crew recommending:
  - (a) a vertical and/or horizontal manoeuvre intended to mitigate a collision hazard from all current threats; or
  - (b) a vertical and/or horizontal manoeuvre restriction intended to limit the risk of collision (Proposed for incorporation into ICAO Annex 10 Volume II).
- ‘Segregated airspace’ means airspace of specified dimensions allocated for exclusive use to a specific user(s), with operations that are not able to be safely integrated with other airspace users (ICAO).

- 'Special Use Airspace (SUA)' is a generic term used for airspace volumes designated for specific operations, such as military training, exercises and operations, of a nature such that required limitations on airspace access may be imposed on other aircraft not participating in those activities. These may include, but are not limited to, restricted, danger and prohibited areas or temporary segregated areas (TSA) and temporary reserved areas (TRA) (CAA).
- 'Temporary Reserved Area (TRA)' means an airspace that is temporarily reserved and allocated for the specific use of a particular user during a determined period of time and through which other traffic may or may not be allowed to transit in accordance with the air traffic management arrangements notified for that volume of airspace (CAA).
- 'Temporary segregated area (TSA)' means a defined volume of airspace, temporarily segregated and allocated for the exclusive use of a particular user during a determined period of time and through which other traffic will not be allowed to transit (CAA).
- 'Transponder mandatory zone (TMZ)' means an airspace of defined dimensions wherein the carriage and operation of pressure-altitude reporting transponders is mandatory (UK Reg (EU) No 923/2012 Article 2(136)).
- 'Unmanned aircraft system (UAS)' means an unmanned aircraft and the equipment to control it remotely (UK Reg (EU) 2019/947 Article 2(1)).
- 'UAS Geographical zones' means a portion of airspace established by the Secretary of State that facilitates, restricts or excludes UAS operations in order to address risks pertaining to safety, privacy, protection of personal data, security or the environment, arising from UAS operations (UK Reg (EU) 2019/947 Article 2(4))
- 'visual line of sight (VLOS) operation' means a type of UAS operation in which, the remote pilot is able to maintain continuous unaided visual contact with the unmanned aircraft, allowing the remote pilot to control the flight path of the unmanned aircraft in relation to other aircraft, people and obstacles for the purpose of avoiding collisions (UK Reg (EU) 2019/947 Article 2(7)).

## Enquiries

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- 1.12 Any queries relating to the airspace structures described within this airspace policy concept should be marked for the attention of **Airspace & ATM Policy** and sent to [ats.enquiries@caa.co.uk](mailto:ats.enquiries@caa.co.uk).
- 1.13 Any queries relating to the airspace change process and its associated requirements should be marked for the attention of **Airspace Regulation** and sent to [airspace@caa.co.uk](mailto:airspace@caa.co.uk).

- 1.14 Any queries from UAS operators within the context of a 'certified' or 'specific' category UAS operation should be marked for the attention of the **RPAS Policy Team** and sent to [uavenquiries@caa.co.uk](mailto:uavenquiries@caa.co.uk).
- 1.15 Any queries or further guidance required on the trial of this airspace policy concept should be marked for the attention of **Innovation Advisory Services** and sent to [innovationadvisoryteam@caa.co.uk](mailto:innovationadvisoryteam@caa.co.uk).

## Chapter 2

# Developing the Airspace Policy Concept

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## Introduction

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- 2.1 Accepting the limits of their applicability to certain types of aircraft, the Rules of the Air<sup>1</sup> describe key safety objectives, which confer a series of safety outcomes that enables safe flight in all classes of airspace. These safety objectives and the outcomes they confer are at the heart of this airspace policy concept and how it was developed. At their most basic, they relate to the avoidance of collisions and the requirement to not operate in such proximity to other aircraft as to create a collision hazard. They then build into a more comprehensive ‘rule set’ that, typically, is impractical to apply to BVLOS UAS in its entirety. This is reflected in Article 7(2) and 7(3) of UK Regulation (EU) 2019/947<sup>10</sup> which allows the CAA to define the operational requirements laid down within UK Reg (EU) No 923/2012 Standardised European Rules of the Air (SERA)<sup>11</sup> that are applicable to UAS in the ‘specific’ and ‘certified’ categories respectively.
- 2.2 We need to acknowledge that the extant Rules of the Air were not originally developed with BVLOS UAS operations in mind. A review and adaptation of the Rules of the Air to incorporate BVLOS UAS is needed, and there is a significant amount of work being undertaken across the world to do exactly this; NASA’s concept of [Digital Flight Rules](#) is one example of this work that may pose an opportunity to enable a truly integrated airspace.
- 2.3 However, these developments are still some years away, and so this concept considers how we can use the safety objectives built into the Rules of the Air to begin to deliver BVLOS UAS operations today, in a way that enables managed, safe integration. The continued segregation of airspace users, in particular BVLOS UAS, is not practical and we need to begin to unlock the potential benefits that they offer.

## Development

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- 2.4 This policy concept is based upon a safety-principles led approach, with the objective of describing the airspace structures that we believe will safely enable the transition of BVLOS UAS operations from segregated to unsegregated

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<sup>10</sup> UK Reg (EU) 2019/947 as retained (and amended in UK domestic law) under the European Union (Withdrawal) Act 2018, on the rules and procedures for the operation of unmanned aircraft.

<sup>11</sup> UK Reg (EU) No 923/2012 as retained (and amended in UK domestic law) under the European Union (Withdrawal) Act 2018, laying down the common rules of the air and operational provisions regarding services and procedures in air navigation.

airspace. To that end, the most basic requirements for the safe operation of aircraft in all airspace and under all flight rules were considered to be the essential foundations of this concept. These requirements relate to collision avoidance and are laid down in the Rules of the Air; there are two that are fundamental:

- (a) SERA.3201 places responsibility on the pilot-in-command to take such action, including collision avoidance manoeuvres based on resolution advisories provided by airborne collision avoidance system (ACAS) equipment, as will best avert collision.
- (b) SERA.3205 requires that an aircraft shall not be operated in such proximity to other aircraft as to create a collision hazard<sup>12</sup>.

2.5 It is considered that any UA that cannot satisfy the objective of these basic requirements, cannot be safely operated in anything other than segregated airspace. However, if it can be demonstrated that the UA can achieve the fundamental need to avoid collisions and to not operate in undue proximity to other aircraft, then that permits consideration of operations in airspace other than segregated airspace.

2.6 It is also important to recognise that the existing operational rulesets (the instrument flight rules (IFR) and visual flight rules (VFR)) which are fundamental to safe operations and laid down in the Rules of the Air, are predicated on airborne parties being able to take 'complementary action' to safely resolve identified collision risks. Safety is achieved through knowledge of the rulesets, and an ability for all parties to discharge their obligations correctly and in a timely manner. It requires a minimum level of capability and certain assumptions are required; for example, the ability of all pilots to detect other aircraft (either visually or through technology such as ACAS), and for all aircraft to be detectable by others. It is also true that if one party does not or cannot fulfil these assumptions, that may result in other parties not being able to discharge their own obligations to operate safely.

2.7 This safety focussed approach allows the description of three phases of transition towards the integration of UA where they "may be expected to enter the airspace system routinely without requiring special provisions"<sup>13</sup>.

### **Segregation      Accommodation      Integration**

2.8 The process of transition will depend upon multiple factors including, but not limited to, the capability, performance and intended task of the UAS and the airspace operating environment which includes the applicable operational requirements. Moreover, the transition will be informed by the operational risk

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<sup>12</sup> For UAS in the specific category, these are complemented by UAS.SPEC.060(3)(b) in the Annex to UK Reg (EU) 2019/947.

<sup>13</sup> [ICAO RPAS CONOPS for International IFR Operations.](#)



assessment conducted by the UAS operator<sup>14</sup>, and the safety assessment of the change to the functional system undertaken by the air navigation service provider (ANSP)<sup>15</sup>.

- 2.9 ICAO has coined the term ‘accommodation’ to describe “the condition when an UA can operate along with some level of adaptation or support that compensates for its inability to comply within existing operational constructs”<sup>13</sup>. A temporary reserved area (TRA)<sup>16</sup> provides an appropriate airspace structure with the flexibility to define the specific airspace management arrangements and flight operation procedures necessary to ‘accommodate’ UA operations, whilst enabling managed access to permitted airspace users. From ICAO’s definition of the term ‘accommodation’ it can also be inferred that, where it is not possible to compensate, the UA must be segregated from other airspace users.
- 2.10 Overlaying the three phases of transition is the concept of what has been described by the CAA as an ‘atypical air environment’<sup>17</sup>. An ‘atypical air environment’ is not a separate classification of airspace or airspace structure. Broadly, it can be considered to be a volume of airspace in which it can be reasonably anticipated for there to be an ‘improbable encounter rate’ with manned air traffic due to the proximity of certain ground infrastructure rendering it hazardous for most traditional forms of aviation; for example, within 50 feet of buildings or structures, or above ground level. Further work is required by the CAA to determine the specifics, including the lateral and vertical limits of such an environment; however, we accept the principle that UA may not need to be within segregated airspace when operating within an ‘atypical air environment’. The Atypical air environment concept will be published separately.
- 2.11 In terms of determining a path through the accommodation phase towards integration, detect-and-avoid (DAA) systems (ground-based, air-based or a combination of both) are likely to be a critical enabling technology. DAA is expected to provide a level of equivalence to the ‘see and avoid’ task undertaken by the pilot of a manned flight, and enable the UAS to operate in such a way as to ensure that it does not come into “such proximity to other aircraft as to create a collision hazard”<sup>18</sup>; essentially, achieving compliance with the objectives of SERA.3201 and SERA.3205<sup>19</sup>. At this stage, electronic conspicuity is considered very likely to be an essential enabler for DAA and is therefore likely to be

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<sup>14</sup> UK Reg (EU) 2019/947 Article 11.

<sup>15</sup> UK Reg (EU) 2017/373 Annex IV Part-ATS ATS.OR.205.

<sup>16</sup> Segregated airspace (danger areas (DA) and temporary segregated areas (TSA)) and temporary reserved areas (TRA) implement the concept of UAS geographical zones defined and described within UK Reg (EU) 2019/947.

<sup>17</sup> Termed as ‘atypical airspace’ by the Joint Authorities for Rulemaking of Unmanned Systems (JARUS).

<sup>18</sup> UK SERA.3205.

<sup>19</sup> Note that AMC1 Article 7(2) UK Reg (EU) 2019/947 requires “certain BVLOS operations” to comply with SERA.3201 and “all specific category UAS operations” to comply with SERA.3205.

essential for operations within TRAs that are established for the purpose of integrating BVLOS operations.

- 2.12 This airspace policy concept reflects the current limitations of today's technology and ruleset whilst providing a solution to deliver BVLOS UA operations within those constraints. As technology develops and matures, the applicable requirements will adapt to reflect the capabilities of aircraft and airspace management systems.
- 2.13 The airspace structures that are envisaged to be used during the accommodation phase are not anticipated to be the end-state which allows us to integrate BVLOS operations in unsegregated airspace. They are an initial, incremental step on the path towards the ultimate objective of unsegregated operations for all airspace users in standard ICAO classifications of airspace.
- 2.14 The accommodation phase is intended to facilitate further trialling and testing of technology and procedures through limited, managed integration. Once it can be demonstrated that the developments are sufficiently mature and there is data available to support safety arguments, that will start to signal the closure of the accommodation phase. Seeing UA integrated within standard classifications of UK airspace, permitting them to operate BVLOS without the need for additional requirements to be placed upon them to address their specific operating characteristics<sup>20</sup>.

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<sup>20</sup> Albeit it is considered that data from electronic conspicuity systems will be essential to enable the functionality of detect-and-avoid (DAA) systems onboard UA. Consequently, it is highly likely that a TMZ will be needed to enable a recognised air traffic environment and said DAA functionality.

## Chapter 3

# The Airspace Policy Concept

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## Airspace Change

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- 3.1 The establishment and dis-establishment of a danger area (DA), temporary segregated area (TSA) and/or a temporary reserved area (TRA), and any associated airspace 'overlays' (e.g. a TMZ), is an airspace change. Change sponsors must consider the guidance contained within [CAP 1616 Airspace Change](#). Where a temporary rather than permanent change to the notified airspace design is required, the procedure in Part 1a of CAP 1616 Airspace Change should be followed.

## Airspace Structures

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- 3.2 The key safety factors in determining whether a UA needs to be segregated from other airspace users is whether it can take action "as will best avert collision" and operate in such a way as to ensure that it does not come into "such proximity to other aircraft as to create a collision hazard". These are the objectives of SERA.3201 and SERA.3205.

## Airspace Segregation

- 3.3 Where the intention is to:
- (a) operate a BVLOS UA within a defined volume of airspace and it is unable to comply with the objectives of SERA.3201 and SERA.3205; and
  - (b) such operations could coincide with the operation of 'manned' aircraft within the same volume of airspace<sup>21</sup>; and,
  - (c) the UA is not operating within an 'atypical air environment',
- segregated airspace must be established to contain the operations of the UA.
- 3.4 Within UK class G airspace and controlled airspace over the high seas<sup>22</sup>, the volume of segregated airspace should be notified as a DA; either temporary or

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<sup>21</sup> Note that, due to the nature of uncontrolled airspace, it must be assumed that 'manned' aircraft will be operating concurrently with BVLOS UA within that volume of airspace. Therefore a defined volume of segregated airspace is required.

<sup>22</sup> Note that, in terms of segregated airspace, we are only "permitted [...] to establish danger areas in [high seas] airspace, because prohibiting access to high seas airspace is not permitted" (ICAO Doc 10088 Manual of Civil-Military Cooperation in Air Traffic Management).

permanent. A DA Crossing Service (DACS) or a DA Activity Information Service (DAAIS) may be available for certain DAs within UK class G airspace<sup>23</sup>.

- 3.5 Within UK controlled airspace, the volume of segregated airspace should be notified as a TSA.

## The Accommodation Phase

- 3.6 Where the intention is to:

- (a) operate a BVLOS UA within a defined volume of airspace and it is able to comply with the objectives of SERA.3201 and SERA.3205 but where the operation could compromise the existing safety objectives conferred by the Rules of the Air for any airspace user; and,
- (b) such operations could coincide with the operation of 'manned' aircraft within the same volume of airspace<sup>2124</sup>; and,
- (c) the UA is not operating within an 'atypical air environment'.

a TRA must be established to contain the operations of the UA.

- 3.7 In order to "secure the most efficient use of airspace consistent with the safe operation of aircraft and expeditious flow of air traffic"<sup>25</sup>, the provision of managed access to the TRA for other airspace users is essential to the success of the accommodation phase. Access will be managed by an air navigation services provider, with air traffic services (ATS)<sup>26</sup> provided to all participating traffic, in accordance with the background airspace classification.

**Note.** Access and service provision arrangements will evolve as the UK develops its future traffic management solutions to integrate manned and unmanned traffic.

- 3.8 Given the requirement for managed access to the TRA, the need for the provision of ATS and the essential role of electronic conspicuity in integrating BVLOS operations, a TRA will normally be overlaid with a TMZ and/or a radio mandatory zone (RMZ).

## The 'Decision Tree'

- 3.9 The text in paragraphs 3.3 to 3.8 is set out as a flow chart in Figure 1.

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<sup>23</sup> [CAA Policy for Permanently Established Danger Areas and Temporary Danger Areas refers.](#)

<sup>24</sup> Irrespective of the airspace classification.

<sup>25</sup> Section 70(2) Transport Act 2000.

<sup>26</sup> The provision of flight information service must be supported by information from an ATS surveillance system.

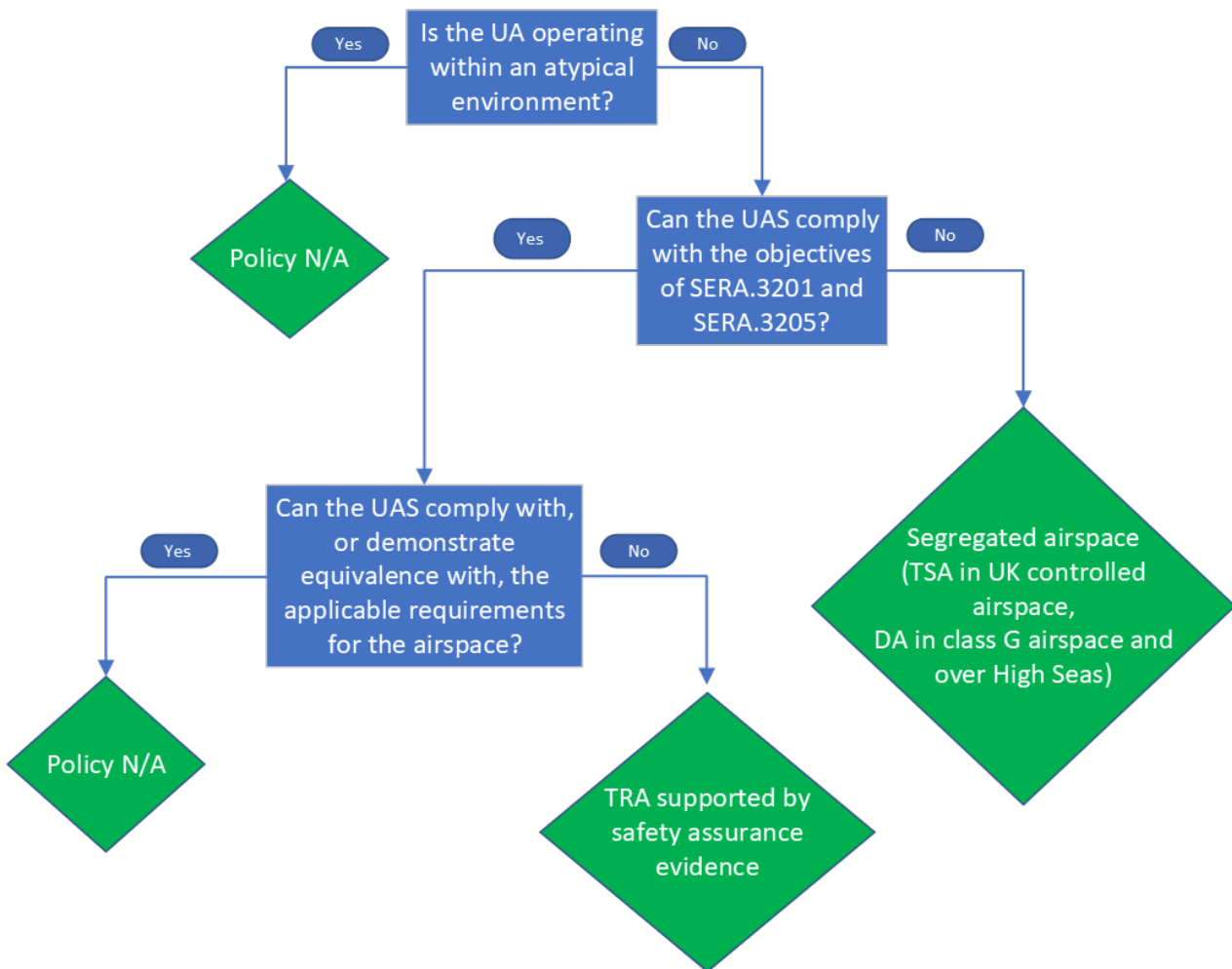


Figure 1. Airspace Structure 'Decision Tree'

## Notification of Airspace Structures

- 3.10 TSA should be notified within UK AIP ENR 2.1 and AD2.17 as appropriate. Permanent DAs should be notified within UK AIP ENR 5.1. DAs established over the high seas should additionally be notified via NOTAM to ensure that the activity is visible to State aircraft operating 'due regard'<sup>27</sup> within that airspace.
- 3.11 TRA established permanently for the purpose of managing BVLOS UA operations should be notified within UK AIP ENR 2.1 and AD2.17 as appropriate.
- 3.12 Where new DA, TSA and/or TRA are established at short notice to satisfy, for example, an urgent operational requirement, notification of the airspace should

<sup>27</sup> The term 'due regard' derives from Article 3(d) of the Convention on International Civil Aviation which directs that "Contracting States undertake, when issuing Regulations for their state aircraft, that they will have *due regard* for the safety of navigation of civil aircraft". Article 3(c) directs that "No state aircraft of a Contracting State shall fly over the territory of another State [...] without authorisation by special agreement". As such, state aircraft may fly over high seas airspace, outside the territorial airspace of a State, without such authorisation, in accordance with the freedom of overflight afforded by the UNCLOS.

be achieved via an AIP Supplement (SUP) and associated NOTAM until such time that the new airspace structure has been incorporated into the AIP. Exceptionally, when time does not permit an AIP SUP to be published, these structures can be notified via NOTAM only.

- 3.13 Establishment of a DA, TSA and/or TRA may be supported by appropriate awareness materials which could include an associated NOTAM and Aeronautical Information Circular as appropriate.

## Airspace Design and Management

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### Airspace Design

- 3.14 Whilst segregated airspace and TRAs adopt the background airspace classification, this does not automatically convey the applicable requirements of that airspace classification upon flights within that volume of airspace. The requirements for operation are determined through safety analysis and must be agreed between the ANSP and the UAS operator and approved by the CAA.
- 3.15 The design and establishment of segregated airspace or TRA must be informed by an operational risk assessment conducted by the UAS operator and a safety assessment of the change to the functional system undertaken by the ANSP.
- 3.16 The design of the segregated airspace or TRA should be informed by GM1 UAS.SPEC.050(1)(h)<sup>28</sup> and take into account the risks identified through the operational risk assessment<sup>29</sup> and the safety assessment of the change to the ATM/ANS functional system<sup>30</sup>.
- 3.17 The design of the segregated airspace and TRA, including the operating requirements and procedures utilised therein, must consider, but is not limited to, the following:
- (a) safety risk(s) posed by the UA leaving the defined volume of airspace.
  - (b) operating characteristics and technical capabilities of the UAS.
  - (c) airspace operating environment in which the segregated airspace and/or TRA is proposed to be established (i.e. existing traffic mix and density).
  - (d) types of flights that may be permitted to transit a TRA.
  - (e) effect of the segregated airspace/TRA on instrument flight procedures (IFPs) contained within the volume of airspace.

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<sup>28</sup> [ORS9 Decision No 16 amending Acceptable Means of Compliance \(AMC\) and Guidance Material \(GM\) for UK Reg \(EU\) 2019/947 regarding the rules and procedures for the operation of unmanned aircraft.](#)

<sup>29</sup> UK Reg (EU) 947/2019 refers.

<sup>30</sup> UK Reg (EU) 2017/373 Annex IV (Part-ATS) ATS.OR.205 Safety assessment and assurance of changes to the functional system.

- (f) effects of wake turbulence on the UA that is generated by manned aircraft operating within a volume of airspace that adjoins the segregated airspace/TRA laterally and/or vertically.
- (g) effects of meteorological conditions on the UA.
- (h) need to establish a 'recognised air traffic environment' and/or a 'known traffic' environment in order to mitigate the risk of mid-air collision (MAC)<sup>31</sup>.
- (i) abnormal and emergency situations.
- (j) State aircraft operating 'due regard'<sup>27</sup> in high seas airspace<sup>7</sup> that may not be electronically conspicuous.
- (k) right-of-way requirements (SERA.3210).

## Airspace Management

- 3.18 Within a TRA and where applicable<sup>32</sup>, the visual meteorological conditions (VMC) visibility and distance from cloud minima appropriate to the background airspace classification shall apply.
- 3.19 Where segregated airspace is established within controlled airspace, the air traffic control (ATC) service provider must define and apply separation minima between the volume of segregated airspace and other aircraft operating in the vicinity of that airspace, with those minima approved by the CAA<sup>33</sup>.
- 3.20 Where a TRA is established within controlled airspace, and where the safety assessment of the change to the functional system has identified that a specific type of flight may not transit the TRA under ATC clearance, the ATC service provider must define and apply separation minima between the TRA and those flights, with those minima approved by the CAA<sup>33</sup>.

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<sup>31</sup> The CAA considers it highly likely that electronic conspicuity will be an essential enabler for detect-and-avoid (DAA) systems that are intended to deliver the capability for UA to demonstrate compliance with the Rules of the Air relating to collision avoidance and facilitate the transition from the accommodation phase into the integration phase.

<sup>32</sup> For example, UK Reg (EU) 2019/947 Article 7 paragraphs (2) and (3) state that UAS operations in the 'specific' and 'certified' categories shall be subject to the applicable operational requirements laid down in Commission Implementing Regulation (EU) No 923/2012.

<sup>33</sup> SERA.8010(c) places requirements upon ANSPs to notify details of separation minima "to pilots and aircraft operators through aeronautical information publications, where separation is based on the use by aircraft of specified navigation aids or specified navigation techniques".

## Chapter 4

# The Airspace Policy Concept - A UAS Operator's View

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## Summary of the Concept

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- 4.1 The capability of the UAS will determine whether it needs to be segregated from other airspace users. To be considered for entry into the “accommodation phase”, the remote pilot must be able to take the action necessary to avoid a mid-air collision (MAC) with another airspace user and to avoid controlled flight into terrain (CFIT) or any other obstacle.

## Legal Basis

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- 4.2 The following requirements relating specifically to UAS apply:
- (a) UK Regulation (EU) 2019/947 Article 7(2). UAS operations in the ‘specific’ category shall be subject to the applicable operational requirements laid down in [SERA]. The CAA set out, in AMC to this article, that this includes SERA.3201 and 3205.
  - (b) UK Regulation (EU) 2019/947 Article 7(3). UAS operations in the ‘certified’ category shall be subject to the applicable operational requirements laid down in [SERA]. The CAA has not yet published AMC relating to ‘certified’ category operations, further work is required to develop the ‘certified’ category regulatory framework.
  - (c) UK Regulation (EU) 2019/947 UAS.SPEC.060(3)(b). The remote pilot shall avoid any risk of collision with any manned aircraft and discontinue a flight when continuing it may pose a risk to other aircraft, people, animals, environment or property.
  - (d) The Air Navigation Order 2016 (as amended) Article 240. A person must not recklessly or negligently act in a manner likely to endanger an aircraft, or any person in an aircraft.



## Mitigating Air Risk

4.3 The CAA is proposing four ways of satisfying the legal requirements above, in regard to the mitigation of the air risk.

Phase	Description	Airspace Structure
<b>Atypical air environment – applicable to all phases</b>	An atypical air environment may be used as a mitigation where the UA will remain within a portion of airspace where it can be reasonably anticipated that there will be an ‘improbable encounter rate’ with manned air traffic due to the proximity of certain ground infrastructure, which would be hazardous for most traditional forms of aviation. Further work is required by the CAA to determine the specifics, including the lateral and vertical limits of such an environment; however, we accept the principle that UA may not need to be within segregated airspace when operating within an ‘atypical air environment’.	None required
<b>Segregation</b>	This option must be used by any BVLOS UAS that is not capable of taking action “as will best avert collision” nor operate in such a way as to ensure that it does not come into “such proximity to other aircraft as to create a collision hazard”. Essentially, the BVLOS UAS has no ‘detect and avoid’ capability.	Within UK controlled airspace: TSA  Within UK Class G airspace or controlled airspace over the high seas <sup>22</sup> ): Danger area (temporary or permanent <sup>34</sup> )
<b>Accommodation</b>	This option may be used where the BVLOS UAS is able to ‘detect and avoid’ (DAA) other aircraft but not necessarily operate within the accepted ‘ruleset’.  The BVLOS UAS may be integrated with other permitted airspace users within the TRA managed by the ANSP and supported by specific airspace management arrangements.	TRA  (will normally be overlaid with a TMZ and/or a RMZ)

<sup>34</sup> A DA Crossing Service (DACs) or a DA Activity Information Service (DAAIS) may be available for certain DAs within UK class G airspace. [CAA Policy for Permanently Established Danger Areas and Temporary Danger Areas refers.](#)

Phase	Description	Airspace Structure
	<p>To support entry into the accommodation phase, it is expected that some form of DAA is present, to provide a level of equivalence to the 'see and avoid' task undertaken by the pilot of a manned flight and enable the UAS to operate in such a way as to ensure compliance with the regulatory requirements set out above; i.e. to allow the UAS to take action "as will best avert collision" and to operate in such a way as to ensure that it does not come into "such proximity to other aircraft as to create a collision hazard.</p> <p>Electronic conspicuity is highly likely to be an essential enabler for DAA and therefore also for operations within TRAs.</p> <p>The DAA solution required will depend on the environment in which the UA is operating. The objective of DAA may be achieved through a system onboard the BVLOS UAS which acts autonomously, or through the remote pilot. Equally, the definition of DAA could be fulfilled by a ground-based system which transmits information to the BVLOS UAS or the remote pilot, or in a more 'traditional' way with an ATS provider issuing a remote pilot with traffic information and traffic avoidance advice, which the remote pilot then puts into effect.</p>	
<b>Integration</b>	<p>The BVLOS UAS is capable of operating in the same environment as other airspace users, without the need for additional requirements to be placed upon them to address their specific operating characteristics.</p> <p>Essentially, the BVLOS UAS must be able to comply with, or demonstrate equivalence with, the applicable requirements. For example, the ability to establish and maintain two-way radiocommunications with an air traffic services provider using approved equipment with the appropriate licences.</p> <p>The ruleset for this phase is under development, in order to identify those requirements which are necessary and proportionate.</p>	None required <sup>2031</sup>