

PAS 1905:2024

Future flight systems – Regulatory principles, management systems and life cycle assurance processes – Guide



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Foreword

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Relationship with other publications

This BSI Flex is part of the Future Flight programme, which includes the following standards:

- BSI Flex 1903 v.2.0:2024-06, *Future flight systems – Vocabulary*;
- BSI Flex 1904 v.1.0:2024-09, *Operational design domain taxonomy for a future flight aircraft system – Specification*;
- BSI Flex 1906 v1.0, *Future flight systems – Acceptable means of compliance to Specific Operation Risk Assessment (SORA) for uncrewed aircraft systems (UAS) – Guide¹⁾*

¹⁾ In preparation.

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Use of this document

As a guide, this PAS takes the form of guidance and advisory recommendations. It is not to be quoted as if it were a specification or a code of practice.

Presentational conventions

The guidance in this document is presented in roman (i.e. upright) type. Any recommendations are expressed in sentences in which the principal auxiliary verb is “should”.

Additional commentary, explanation and general informative material is presented in smaller italic type.

Where words have alternative spellings, the preferred spelling of the *Shorter Oxford English Dictionary* is used (e.g. “organization” rather than “organisation”).

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Compliance with a PAS cannot confer immunity from legal obligations.

In particular, attention is drawn to the following specific Acts and regulations:

- a) Convention on International Civil Aviation [1], including its annexes;
- b) UK Acts and regulations pertinent to unmanned/uncrewed aircraft systems (UAS) and their operation, including:
 - 1) Civil Aviation Act 1982 [2];
 - 2) Air Navigation (Amendment) Order 2022 [3];
 - 3) Standardised Rules of the Air – UK Reg. (EU) 923/2012 [4];
 - 4) Basic Regulation (implementing rules and UK CAA AMC GM CS) – UK Reg. (EU) 2018/1139 [5];
 - 5) UAS Delegated Regulation – UK Reg. (EU) 2019/945 [6];
 - 6) UAS Implementing Regulation – UK Reg. (EU) 2019/947 [7];

- 7) UK General Data Protection Regulation (UK GDPR) – Regulation (EU) 2016/679 [8]; and
- 8) Data Protection Act 2018 [9].

NOTE 1 *The UK Civil Aviation Authority (CAA) provides additional guidance on these regulations and associated processes in various Civil Aviation Publications (CAPs).*

- c) European Union Aviation Safety Agency (EASA) regulations pertinent to UAS and their operation, including:
- 1) Basic Regulation – Reg. (EU) 2018/1139 [10];
 - 2) UAS Delegated Regulation – Reg. (EU) 2019/945 [11];
 - 3) UAS Implementing Regulation – Reg. (EU) 2019/947 [12];
 - 4) Initial airworthiness – Reg. (EU) 748/2012 [13];
 - 5) Continuing airworthiness – Reg. (EU) 1321/2014 [14];
 - 6) Requirements for the management of information security risks, Implementing Regulation – Reg. (EU) 2023/203 [15];
 - 7) Requirements for manned aviation operating in the U-space, Implementing Regulation – Reg. (EU) 2021/666 [16];
 - 8) Requirements for ATM/ANS and other traffic management functions in the U-space, Implementing Regulation – Reg. (EU) 2021/665 [17]; and
 - 9) Regulatory framework for the U-space, Implementing Regulation – Reg. (EU) 2021/664 [18].

NOTE 2 *The EASA regulations are provided to support those who are considering operating within member states of the European Union.*

Introduction

This PAS has been developed as part of the Future Flight Standards Programme, in which BSI is working with Future Flight members and a wider ecosystem of industry stakeholders to prioritize and progress areas for standardization to support the safe development and trialling of innovative aircraft and drones, as well as infrastructure and operations.

The aim of this PAS is to provide a general overview of the aviation regulatory management and assurance systems used in this sector, so that when it comes to regulation and other future standards, all those involved have a common understanding of them and of their objectives.

The context of the information is for potential operations within the regulatory regime of the United Kingdom (UK). It is also broadly applicable to UK overseas territories that maintain their own regulatory frameworks based on UK systems.

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1 Scope

This PAS provides guidance on key aviation regulatory principles, management systems and assurance system frameworks that underpin the aviation product life cycle, support safe routine operations within the shared airspace, and which are essential for successful scaling and industrialization.

As well as providing an overview of the aviation systems, this PAS provides signposts to existing regulations and standards, highlighting the core information applicable to the wide range of emerging types of aircraft and their systems as covered within the scope of the Future Flight Challenge, including unmanned/uncrewed aircraft systems (UAS), remotely piloted aircraft systems (RPAS) and advanced air mobility (AAM) aircraft.

This PAS provides practical guidance and, where practicable, basic examples, including appropriate, generic use cases.

This PAS does not include:

- examples of compliance documents;
- major indexes of material;
- locations of existing regulations and standards; or
- recreational use cases.

This PAS is of use to new entrants who are developing, deploying, operating or supporting future flight systems, including supply chain partners, as well as existing organizations considering to scale within the sector.

It might also be of interest to wider stakeholder communities, including investment and insurance organizations looking to assess risk management aspects, local authorities and business opportunity planners, as well as communities across society that have concerns and an interest in how these new aviation sectors are regulated.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes provisions, or limits the application, of this document. For dated references, only the edition cited applies.²⁾ For undated references, the latest edition of the referenced document (including any amendments) applies.

BSI Flex 1903 v2.0:2024-06, *Future flight systems – Vocabulary*

²⁾ Documents that are referred to solely in an informative manner are listed in the Bibliography.

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in BSI Flex 1903 v2.0:2024-06 apply.

3.2 Abbreviated terms

For the purposes of this document, the following abbreviated terms apply.

AAM	advanced air mobility
AMC	acceptable means of compliance
AOC	air operator certificate
BSI	British Standards Institution
BVLOS	beyond visual line of sight
CAA	Civil Aviation Authority
CAMO	Continuing airworthiness management organization
CAP	Civil Aviation Publication
CONOPS	concept of operations
DOA	design organization approval
EASA	European Union Aviation Safety Agency
EUROCAE	European Organisation for Civil Aviation Equipment
eVTOL	electric vertical take-off and landing
GM	guidance material
ICAO	International Civil Aviation Organization
ISO	International Organization for Standardization
JARUS	Joint Authorities for Rulemaking of Unmanned Systems
NAAs	national aviation authorities
OA	operational authorization
OSC	operating safety case
PACT	pilot authorization and control of tasks
POA	production organization approval
QMS	quality management system
RPAS	remotely piloted aircraft systems
SAE	Society of Automotive Engineers
SMS	safety management system
SORA	Specific Operations Risk Assessment
TLOS	target level of safety
TSO	technical standards organization
UAS	unmanned/uncrewed aircraft systems
UTM	unmanned/uncrewed aircraft systems traffic management
VLOS	visual line of sight

4 Key principles

4.1 General

4.1.1 Aviation regulatory system

The UK aviation regulatory system, which is aligned with the Convention on International Civil Aviation (Chicago Convention) [1], provides a national framework for the design, manufacture, operation and maintenance of all types of aircraft along with associated services, including aerodromes, air traffic control and accident investigation.

Within this framework, an operator-centric approach is typically used. This means that the operator, as a recognized legal entity, is subject to the legal framework of the country in which the company is registered, and can therefore be held responsible under that state's oversight, governance and enforcement processes.

In terms of regulation, the level of governance is applied in a proportionate manner that looks to balance operational viability and safety with the process and information needs of the compliance demonstration, as well as the demands placed on the regulator or enforcement agencies. A key criterion for the regulations and their application is safety – and the management of risks that could result in the desired safety outcomes not being achieved. This means the highest degree of regulatory process and governance is applied to operations that are likely to result in the most significant outcomes, and less so for those that have more limited effects. This might be described as a proportionate, risk-based approach.

Initial compliance with the regulations and requirements serves as the entry criteria to obtain or maintain an approval, authorization or other form of certificate or licence. With continued clear achievement of compliance providing confidence in an organization's capabilities, the concept of performance-based oversight can be used by the regulator to enable flexibility in its oversight regimes. Within governance frameworks, operating entities are typically required to define their organizational structures, responsible and accountable persons, and the mechanisms, systems and processes by which the organization functions to address all necessary considerations. This includes basic business procedures and specific aspects of safety management, such as the competency of personnel, risk identification, outcome assessment and management/mitigation measures.

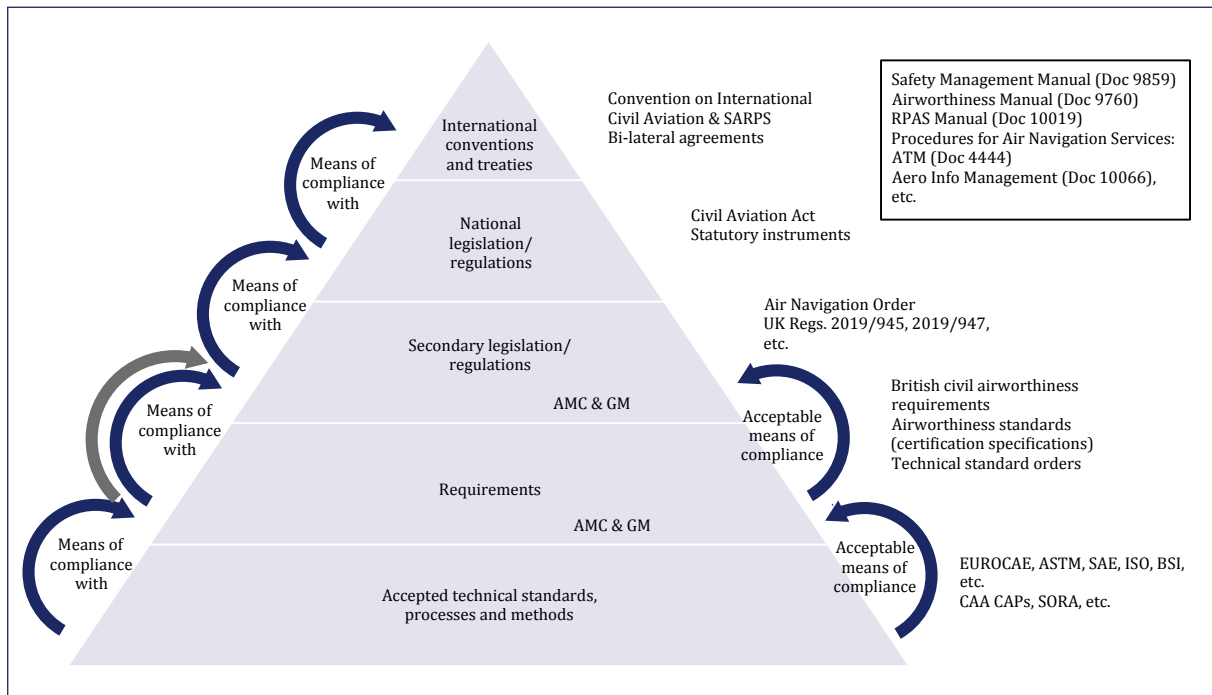
These are typically addressed in one or more documents (depending on complexity), with the top level typically referred to as an operations (or operating) manual. All other supporting processes and procedures are included either within the one document, or by simple reference to other supporting documents (in hard copy and/or electronic formats).

NOTE In UAS regulatory material, the term “operations manual” is generally used, whereas “organization handbook” and “organization exposition” are typically used in wider aviation organization approval regulations.

4.1.2 Regulation, requirements, guidance material and acceptable means of compliance

The aviation regulatory framework, like most legislative systems, is a multi-layered system that at its highest level sets key principles, which are expanded through increasing levels of detail as the specific topics are developed into usable material.

The main elements might also have associated material that explains the established acceptable means of compliance (AMC), along with associated guidance material (GM). However, in order to not constrain innovation, AMC is not the only means to do this, and organizations can propose alternatives. The general GM typically explains the background and detailed intent of the requirements or regulations such that a full and proper understanding of the purpose is known, again facilitating innovation and new approaches to the specific subject. A simple graphical representation of the respective layers is shown in Figure 1.

Figure 1 – Pyramid of regulations, requirements and standards

4.1.3 Certification, approval and licensing

The aviation system described in the Convention on International Civil Aviation [1] and annexes is a complex framework with many independent yet interconnected parts. In order to function efficiently, a number of common principles are used.

Those that relate to individuals and their competency are typically addressed under the term “licensing”, which facilitates individuals’ ability to manage and demonstrate their capability.

Those aspects that relate more to organizations and recognized capability are typically addressed using terms that reflect an approval, permission or authorization that is reflected in issuance of a certificate.

Those aspects that relate more to products or services provided by these organizations are typically addressed using terms that reflect a process of certification resulting in an “approval”, which is also reflected in issuance of a certificate.

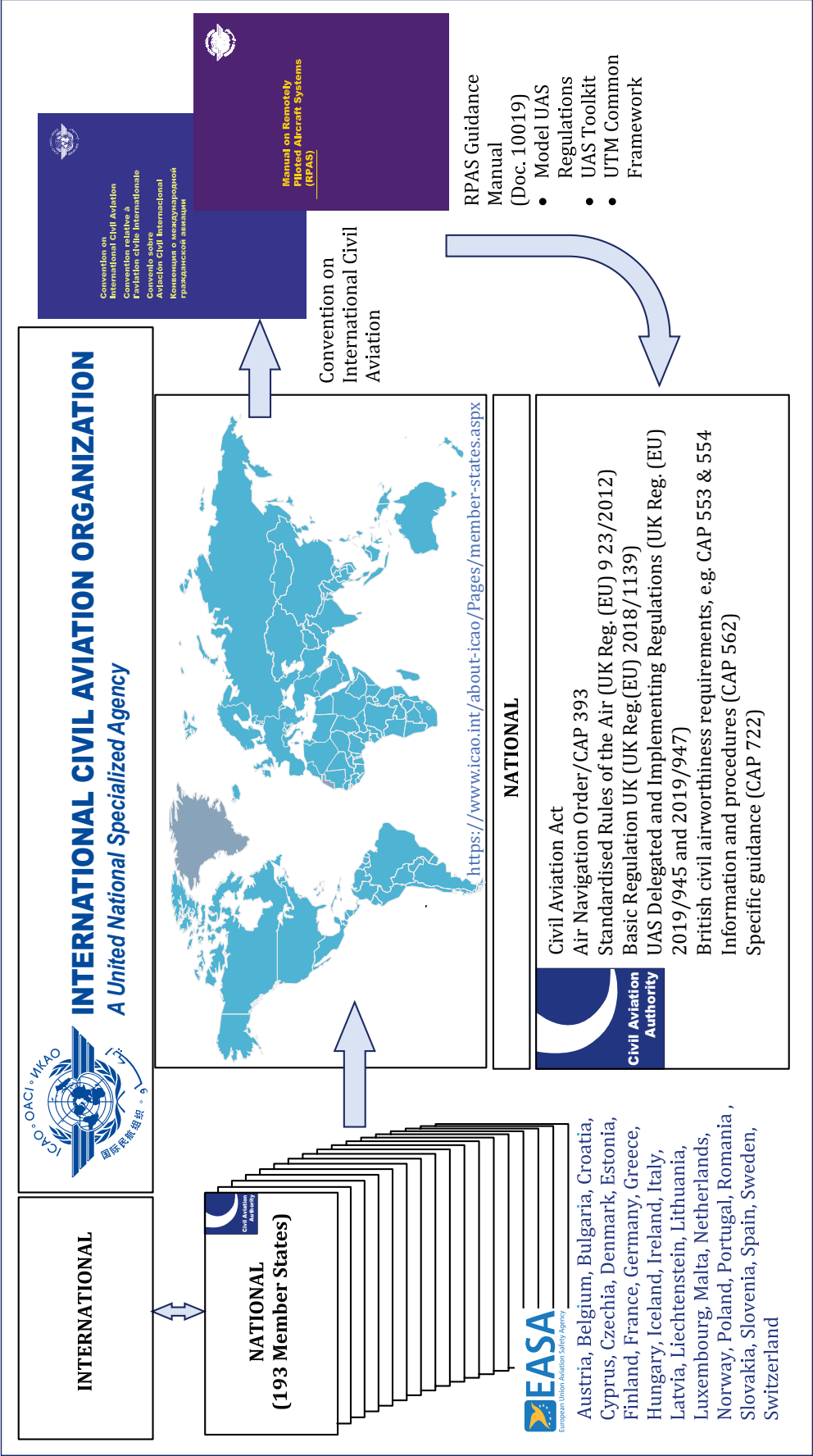
4.2 Regulatory framework overview

4.2.1 General

Aviation is a global business in which common high safety standards are a prerequisite foundation to enable all participating countries to have confidence in the aircraft that could fly within their territorial airspace. This is facilitated by the Convention on International Civil Aviation [1], developed, managed and maintained by the International Civil Aviation Organization (ICAO).

An overview of the relationship between the ICAO, and UK and wider member states, including EASA member states, and the CAA is given in Figure 2.

Figure 2 – Relationship overview



4.2.2 International overview

The Convention on International Civil Aviation [1] defines the aviation framework that facilitates cross-border operations, including operations within another country's sovereign territory. It recognizes the principle that each sovereign state/country retains the right to manage and govern its territorial areas and communities as it deems appropriate, but also recognizes that a viable aviation system needs to operate across many countries and thus requires a consistent approach.

The convention [1] currently has 19 annexes [referred to as standards and recommended practices (SARPs)] that cover the principal elements of the aviation system, supported by a range of other manuals, GM and supportive documents that together describe the globally agreed aviation systems, processes and methods.

Each member state concurs with the described systems (unless formally defining a difference), and implements them into its national legislative and procedural frameworks, thus enabling a globally harmonized regulatory approach for international aviation.

This harmonized approach provides the mechanisms for mutual recognition of each member state's safety assurance and operating practices, and enables the benefits of operations between, and within, the airspace of each country with a minimum of process friction.

Under this framework and the associated governing assessment/audit processes, each state is responsible for aircraft on its state registry, such that they conform to the defined standards, and are sufficiently airworthy, maintained and operated by appropriately competent persons in accordance with applicable standards and practices. In meeting these obligations, the flight operation is eligible to make use of the benefits of the convention [1], including flying over and within another country's airspace without prior checks, investigation or specific permission.

NOTE 1 *Aircraft registration provides individual aircraft with a unique reference that includes the identification of the country (state) that is responsible for its regulatory oversight.*

NOTE 2 *Applicable national standards and practices might not always address compliance with international regulations, limiting operations to within that country.*

The regulations pertinent to AAM aircraft, typically intended to carry passengers or cargo, such as electric vertical take-off and landing (eVTOL) aircraft, are under review and development internationally and by national aviation authorities (NAAs). Principally, these aircraft are perceived to be similar in intent to current transport aircraft, which means the current initial airworthiness approval (type certification/validation) requirements and processes are applicable. These processes and procedures³⁾ fully enable innovation of new technologies and different approaches, and include the definition of new or revised requirements. Such new or amended requirements might be project specific, e.g. documented within Certification Review Items, or be more generic in nature and published as initial new requirements, e.g. EASA Special Conditions, such as SC-VTOL or SC E-19 – Electric/Hybrid Propulsion System. UK CAA certification of eVTOL aircraft is described in CAP 2537 [19].

The initial regulations for international RPAS operations under the benefits of the convention [1] have been revised and published within Annex 1, Annex 6 (Part 4) and Annex 8. Other regulations, such as air traffic services considerations, are in development. Other annexes and documents are able to be used as is, e.g. Annex 7 (Aircraft nationality and registration marks) and Annex 13 (Aircraft accident and incident investigation), or will be amended as further insight is gained from operating experience.

³⁾ Type certification and validation processes and procedures are the responsibility of each aviation authority. Those published by EASA, for airworthiness of type design, might be a useful reference – see <https://www.easa.europa.eu/en/document-library/certification-procedures/airworthiness-type-design>.