Directorate of Airspace Policy

Civil Aviation Authority

# CAP 722

# Unmanned Aerial Vehicle Operations in UK Airspace - Guidance

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# Unmanned Aerial Vehicle Operations in UK Airspace - Guidance

## Important Note

The CAA has made many of the documents that it publishes available electronically (in addition to traditional printed format). Where practical, the opportunity has been taken to incorporate a clearer revised appearance to the documents. Any significant changes to the content of this document will be shown in the Explanatory Note. If no such changes are indicated the material contained in this document, although different in appearance to the previously printed version, is unchanged. Further information about these changes and the latest version of documents can be found at www.caa.co.uk.

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# List of Effective Pages

| Part | Chapter | Page | Date |
|---|---|---|---|
| | | iii | 29 May 2002 |
| | | iv | 29 May 2002 |
| | | v | 29 May 2002 |
| | | vi | 29 May 2002 |
| | | vii | 29 May 2002 |
| | | viii | 29 May 2002 |
| | | ix | 29 May 2002 |
| | | x | 29 May 2002 |
| | Foreword | xi | 29 May 2002 |
| | Abbreviations | xii | 29 May 2002 |
| | Glossary | xiii | 29 May 2002 |
| | Chapter 1 | 1 | 29 May 2002 |
| | Chapter 1 | 2 | 29 May 2002 |
| | Chapter 2 | 1 | 29 May 2002 |
| | Chapter 2 | 2 | 29 May 2002 |
| | Chapter 3 | 1 | 29 May 2002 |
| | Chapter 3 | 2 | 29 May 2002 |
| | Chapter 4 | 1 | 29 May 2002 |
| | Chapter 4 | 2 | 29 May 2002 |
| | Chapter 5 | 1 | 29 May 2002 |
| | Chapter 6 | 1 | 29 May 2002 |
| | Chapter 7 | 1 | 29 May 2002 |
| | Chapter 8 | 1 | 29 May 2002 |
| | Chapter 9 | 1 | 29 May 2002 |
| | Chapter 9 | 2 | 29 May 2002 |
| | Chapter 10 | 1 | 29 May 2002 |
| | Chapter 11 | 1 | 29 May 2002 |
| | Chapter 12 | 1 | 29 May 2002 |
| | Chapter 12 | 2 | 29 May 2002 |
| | Chapter 13 | 1 | 29 May 2002 |
| | Chapter 13 | 2 | 29 May 2002 |
| | Chapter 14 | 1 | 29 May 2002 |
| | Chapter 15 | 1 | 29 May 2002 |
| | Chapter 16 | 1 | 29 May 2002 |
| | Chapter 17 | 1 | 29 May 2002 |
| | Chapter 18 | 1 | 29 May 2002 |
| | Chapter 19 | 1 | 29 May 2002 |
| | Chapter 19 | 2 | 29 May 2002 |
| | Chapter 20 | 1 | 29 May 2002 |
| | Chapter 21 | 1 | 29 May 2002 |
| | Chapter 22 | 1 | 29 May 2002 |
| | Chapter 23 | 1 | 29 May 2002 |
| | Chapter 24 | 1 | 29 May 2002 |
| | Chapter 25 | 1 | 29 May 2002 |
| | Chapter 26 | 1 | 29 May 2002 |
| | Chapter 27 | 1 | 29 May 2002 |
| | Chapter 27 | 2 | 29 May 2002 |
| | Chapter 27 | 3 | 29 May 2002 |
| | Annex A | 1 | 29 May 2002 |
| | Annex B | 1 | 29 May 2002 |

# Contents

# Explanatory Note

## 1 Introduction

1.1 The CAA has made many of the documents that it publishes available electronically. Where practical, the opportunity has been taken to incorporate a clearer revised appearance to the document.

1.2 This is a living document and will be revised at intervals to take account of changes in regulations, feedback from industry, and recognised best practice. Contact addresses, should you have any comments concerning the content of this document or wish to obtain subsequent amendments, are given on the inside cover of this publication.

## 2 Revisions in this Edition

2.1 The major revisions in this document are on Sense and Avoid Criteria and terminology for personnel involved in UAV flying operations.

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# Foreword

This Edition of Guidance for Unmanned Aerial Vehicle (UAV) Operations in UK Airspace is compiled by the Civil Aviation Authority's Directorate of Airspace Policy (DAP) to cater for the burgeoning capabilities and anticipated proliferation of pilotless aerial vehicles. It is a living document and will be updated as necessary. The Guide is intended as a "signpost" for all UAV operators. It does not replace civil or military regulations but is intended to draw together various independent civil and military guidance notes and letters of advice and is wholly dependent on contributions from responsible agencies. Wherever possible consolidated guidance will be simplified and harmonised with other European nations. Additionally, it is acknowledged that not all areas of UAV operations have been addressed, thus additional comment from all industry and government sectors is welcomed and should be addressed to DAP (ORA4).

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# Abbreviations

| | |
|---|---|
| ADRP | Airworthiness, Design Requirements and Procedures |
| ATS | Air Traffic Service |
| ATC | Air Traffic Control |
| CAA | Civil Aviation Authority |
| DAP | Directorate of Airspace Policy |
| D&PSD | Design and Production Standards Division |
| DASC | Defence Aviation Safety Centre |
| D Flying | Director Flying |
| DPA | Defence Procurement Agency |
| DSTL | Defence Science and Technology Laboratories |
| EMC | Electro-Magnetic Compatibility |
| GCS | Ground Control Station |
| HIRF | High Intensity Radio Frequency |
| MoD | Ministry of Defence |
| MUAVC | Master Unmanned Aerial Vehicle Controller (D/Flying) |
| POC | Point of Contact |
| RAC | Range Air Controller (D/Flying) |
| SRG | Safety Regulation Group |
| STC | Strike Command |
| TAC | Target Air Controller (D/Flying) |
| UAV | Unmanned Aerial Vehicle |
| UAV-p | UAV Pilot |
| UAVs | Unmanned Aerial Vehicles |
| UAVS | Unmanned Aerial Vehicle System |
| UAVC | Unmanned Aerial Vehicle Controller (MOD DPA Terminology) |

**NOTE:** It should be noted that the terminology for describing personnel involved in UAV Operations continues to evolve and such evolution could be subject to ICAO or pan-European discussion and agreement in the future. To facilitate current UAV operations in segregated UK airspace, existing abbreviations used by disparate agencies, are accepted by DAP as valid. However, in anticipation of more extensive operations outside danger areas the use of the words "controller" and "operator" to describe those personnel involved in flying a UAV may lead to confusion and have been discouraged. See Chapter 9, Operator Qualifications.

# Glossary of Terms

| | |
|---|---|
| UAVS (Unmanned Aerial Vehicle System) | A UAVS is the UAV and its flight control and operating system. This will include any ground station and data links and any dedicated processes for communication with an Air Traffic Service Unit (ATSU). |

**The following are terms used by D/Flying (see also Chapter 10):**

| | |
|---|---|
| Unmanned Aerial Vehicle Controller | A member of the team responsible for the direct input of flight commands to the UAVS. |
| Master Unmanned Aerial Vehicle Controller | The member in charge of the UAVC team who is, effectively, the commander of the aircraft.<br><br>**NOTE:** The actual individual can change either because of the way the UAVS operates or because he/she is relieved during protracted operations. There will, however, always be one individual who is the MUAVC during any stage of flight and is therefore ultimately responsible for the UAV. |
| Range Air Controller | When operating an UAVS which involves flight within a Danger Area or range, the RAC is to be an appropriately qualified Air Traffic Control Officer. The RAC is responsible for providing appropriate separation between all aircraft (whether manned or unmanned and/or whether known or unknown). Where the UAV is acting as a target, the RAC is to provide vectoring instructions to the UAVS, attack fighters and chase aircraft to achieve the specifications laid down in the trials instructions. |
| Target Air Controller | An appropriately qualified person acting under the authority of the RAC and responsible for issuing instructions to the UAVC team in order to achieve the profile required for the flight. |

# Chapter 1 Introduction

## 1 Policy

1.1 It is CAA policy that UAVs operating in the UK must meet the same or better safety and operational standards as manned aircraft. Thus UAV operations must be as safe as manned aircraft insofar as they must not present or create a hazard to persons or property in the air or on the ground greater than that attributable to the operations of manned aircraft of equivalent class or category.

1.2 In consideration of the limited aviation background of many UAV manufacturers, the guidance is comprehensive and necessarily prescriptive. The CAA will supplement the Guide with further written advice when required. Rules for Avoiding Aerial Collisions are set out in the Rules for the Air Regulations. The term 'See and Avoid' for manned aircraft is referred to as "Sense and Avoid" for the purpose of UAV operations.

1.3 **UAVs may not be flown without the approval of the relevant national aviation authority.** See Chapters 10-12.

## 2 Definition

2.1 For the purposes of this Guide a UAV is defined as:

> "An aircraft which is designed, or modified, to carry no human pilot and is operated under remote control or in some autonomous mode of operation."

Guidance on the use of armed UAVs, Cruise Missiles and Model Aircraft (which are defined under small aircraft in the ANO Art. 129) is not included.

## 3 Classifications

3.1 There are many different classifications of UAV. A commonly accepted classification is by Mission Group or Design Environment but some nations favour classification by weight. Such classifications are recognised as valid but, for the purposes of Airspace Management, the CAA classifications are:

Group 1.

Those intended to be flown in permanent or temporarily segregated airspace (normally a Danger Area) over an unpopulated surface (normally the sea following "clear range" procedure).

Group 2.

Those intended to be flown in permanent or temporarily segregated airspace (normally a Danger Area) over a surface that may be permanently or temporarily inhabited by humans.

Group 3.

Those intended to be flown outside Controlled Airspace (Class F & G) in the United Kingdom Flight Information Region (UK FIR).

Group 4.

Those intended to be flown inside Controlled Airspace (Class A-E) in the United Kingdom Flight Information Region and United Kingdom Upper Information Region (UK FIR and UK UIR).

Group 5.

Those intended to be flown in all airspace classifications.

# Chapter 2 Legal Considerations

## 1 Policy

### 1.1 The Chicago Convention

As a signatory to the Chicago Convention and a member of the International Civil Aviation Organisation, the United Kingdom undertakes to comply with the provisions of the Convention and Standards contained in Annexes to the Convention save where it has filed a Difference to any of those standards.

Article 3 of the Convention provides that the Convention applies only to civil aircraft and not to State aircraft. State aircraft are defined as being aircraft used in military, customs and police services. No State aircraft may fly over the territory of another State without authorisation. 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 8 of the Convention provides that no aircraft capable of being flown without a pilot shall be flown without a pilot over the territory of a Contracting State without special authorisation by that State.

### 1.2 The Air Navigation Order 2000 and the Rules of the Air Regulations 1996

The Air Navigation Order 2000 contains a number of provisions for the regulation of aircraft. The main requirements are that any aircraft must be airworthy, which must in the case of an aircraft registered in the United Kingdom be evidenced by a certificate of airworthiness or a permit to fly issued by CAA. The aircraft must carry an appropriate number of licensed flight crew. In the case of public transport operations, the operator must hold an Air Operator's Certificate. When flying, the aircraft must comply with the Rules of the Air 1996.

The Order includes exceptions for small aircraft. A small aircraft is defined in the Order as any unmanned aircraft weighing not more than 20 kg. None of the above main requirements apply to such small aircraft. Instead, a set of conditions are included at Article 87 of the Order subject to which small aircraft may be flown without complying with airworthiness or flight crew licensing requirements or with the Rules of the Air. These conditions include a prohibition on flight in controlled airspace or within an aerodrome traffic zone unless in either case the permission of the air traffic control unit has been obtained, a normal maximum height of 400 ft above the surface and a prohibition on flight for the purposes of aerial work without the specific permission of CAA.

These rules for "small aircraft" have been principally developed for the purposes of regulating recreational model aircraft flying.

### 1.3 Exemptions

A UAV which weighs more than 20 kg is not a "small aircraft" for the purposes of the ANO so that all the requirements referred to above (certificate of airworthiness or permit to fly, licensed flight crew, Rules of the Air) must be complied with. In practice of course a UAV cannot yet comply with all of these requirements so that the only way such a large UAV may fly is if CAA is prepared to issue an Exemption under Article 127 of the ANO. To operate a UAV which weighs less than 20 kg outside the restrictions contained in Article 87, an Exemption is also required.

### 1.4 Insurance

With the exception of aircraft operated by commercial air carriers based in the United Kingdom (which hold an operating licence issued under EC Regulation 2407/92), there is no legal requirement for an aircraft in the United Kingdom to be insured.

It is important to note that insurance is not a safety issue. The role of the CAA as a safety regulator is to be satisfied as to the safety of aircraft. It does not concern itself with whether or not people may be adequately compensated in the event of an accident. That is a matter for Government and in particular the Department of Transport, Local Government and the Regions and the aircraft operator.

## 2 Lead Agency

### 2.1 CAA Legal Department.

Insurance – Department of Transport, Local Government and the Regions

## 3 POC

3.1 R J Allan
CAA Legal Department
CAA House
45-59 Kingsway
London
WC2B 6TE

Tel: 020 7453 6161

E-mail to: **robin.allan@caa.co.uk**

# Chapter 3 Certification - Military

## 1 Scope

1.1 This guidance relates to the certification process for all military UAVS, including trials and experimental UAVs and includes:

- Establishment of Airworthiness Requirements
- Approval of Navigation System/Function
- Approval of other equipment
- EMC/HIRF clearance
- Response/Reaction times
- Security of Control/Payload links
- Ground Station
- Recycling of components
- Emergency Procedures
- Failure/Termination Modes
- Black Box (Retrievable/Downlink)
- ATC Communication system and functions
- Redundancy

## 2 Lead Agency

2.1 DASC - AD/ADRP

## 3 Policy

3.1 Initial Military Certification is called "Military Aircraft Release' (MA Release) and is issued under the authority of the Chief of Defence Procurement. It is only issued once sufficient evidence is available to establish the airworthiness and safety of the UAV and the UAV system. This evidence will include a Certificate of Design and supporting documentation, which will include information on construction of the aircraft and equipment, any risk mitigations, also handling, role and system limitations. Information on how this is achieved is contained in the following documents: JSP 318, JSP 318B, Def Stan 00-970, Def Stan 05-123, Def Stan 05-57 and any other documents identified within them.

## 4 Source Documents

4.1 JSP 318 Military Flying Regulations.

JSP 318B Regulation of the Airworthiness of Ministry of Defence Aircraft.

Defence Standard 00-970 Design and Airworthiness Requirements for Military Aircraft.

Defence Standard 05-57 Configuration Management of Defence Material.

Defence Standard 05-123 Technical Procedures for the Procurement of Aircraft, Weapons and Electronic System.

## 5 POC

5.1 ADRP2
AIR/LAND TECHNOLOGY GROUP
Ash 3b #3312
DPA
MOD Abbey Wood
Bristol
BS34 8JH

Tel: 0117 91 35332

Fax: 0117 91 35910

E-mail to: **altg_adrp2@dpa.mod.uk**

# Chapter 4 Certification - Civil

## 1 Scope

1.1 Design and production standards applicable to the civil certification of the whole UAVS, including components of UAVs, which support or can affect the airworthiness of the UAV.

## 2 Lead Agency

2.1 CAA SRG, Design & Production Standards Division.

## 3 Policy

3.1 UAVs on the UK Civil Register will be required to hold valid certificates of airworthiness issued by the CAA. (Some limited exceptions will be made; for example, to continue to allow flights without certificates of airworthiness by "model aircraft").

3.2 Airworthiness design requirements appropriate to each type of UAVS seeking certification will be derived from the existing codes of requirements as currently applied to manned aircraft. Certificates of airworthiness will be issued following acceptable demonstration of compliance with the applicable requirements.

3.3 Where any function of a UAV System is essential to, or can prejudice, continued safe flight and landing of the UAV, that function, and the equipment performing the function, (including equipment remote from the UAV), shall be considered as part of the aircraft for the purposes of the validity of the certificate of airworthiness of the UAV as such. It will have to comply with the applicable airworthiness requirements.

3.4 Organisations undertaking design and/or manufacture of civil UAVs will be required to hold appropriate approvals under JAR 21 or similar requirements acceptable to the CAA.

## 4 Source Documents

4.1 CAA Airworthiness Notice No. 6 - Airworthiness Publications.

(This Notice details CAA airworthiness publications and how to obtain copies of them).

4.2 CAA Airworthiness Information Leaflet AIL/0165 - Applications for the approval of aircraft and modifications to aircraft.

# 5 POC

5.1 For enquiries relating to UAV design standards:

Head of Aircraft Certification Section
Aircraft Projects Department
Design & Production Standards Division
Safety Regulation Group
Civil Aviation Authority
Aviation House
Gatwick Airport South
West Sussex
RH6 0YR

Tel: 01293 573284

Fax: 01293 573976

E-mail to: **derek.blackall@srg.caa.co.uk**

5.2 For enquiries relating to CAA approval of design and production organisations:

Head of Approvals & Quality Assurance Section
Aircraft Projects Department
Design & Production Standards Division
Safety Regulation Group
Civil Aviation Authority
Aviation House
Gatwick Airport South
West Sussex
RH6 0YR

Tel: 01293 573120

Fax: 01293 573976

E-mail to: **john.marshall@srg.caa.co.uk.**

# Chapter 5 Registration - Military

## 1 Scope

1.1 The regulations governing the registration of military aircraft are contained in JSP318B. The regulation applies to all aircraft required to be registered within the UK as a military aircraft.

## 2 Lead Agency

2.1 DASC - AD/ADRP

## 3 Policy

3.1 It is MoD policy that all military UAVs are to be registered as military aircraft in accordance with JSP 318B.

## 4 Source Documents

4.1 JSP318B Regulation of the Airworthiness of Ministry of Defence Aircraft.

## 5 POC

5.1 ADRP1c
AIR/LAND TECHNOLOGY GROUP
Ash 3b #3312
DPA
MOD Abbey Wood
Bristol
BS34 8JH

Tel: 0117 91 35207

Fax: 0117 91 35910

E-mail to: **altg_adrp1c@dpa.mod.uk**

# Chapter 6 Registration - Civil

Guidance on the Registration of civil UAVs should be sought from CAA Aircraft Registration.

Head of Aircraft Registration
CAA House
45-59 Kingsway
London
WC2B 6TE

Tel: 020 7453 6660

E-mail to: **robert.ferris@caa.co.uk**

# Chapter 7 Maintenance and Inspection - Military

## 1 Scope

1.1 General information on maintenance policy and procedures for military aircraft is contained in the AP 100 series of publications. Regulations within the AP 100 series of publications apply to all those concerned with the maintenance of military registered aircraft and are applied on either a single service or joint service basis.

## 2 Lead Agency

2.1 Equipment Support (Air) Engineering Policy Branch.

## 3 Policy

3.1 It is MoD policy that military UAVs are maintained in accordance with the same policy and procedures requirements applicable to manned aircraft, although within the AP 100 series of publications no distinction is made between manned aircraft and UAVs. Subject to the provisions of the appropriate aircraft design and airworthiness requirements, Integrated Project Team Leaders are therefore responsible for the development and publication of specific procedures to effectively support and maintain the airworthiness of their aircraft.

## 4 Source Documents

4.1 General information on maintenance policy and procedures for military aircraft is contained in the AP 100 series of publications although there are no specific maintenance policy or procedure documents relating to UAVs.

## 5 POC

5.1 Engineering Policy Regulation (EPR)
Room F156
Building 351
RAF Brampton
Huntingdon
Cambridgeshire
PE28 2EA

Tel: 01480 52151 x 6161

E-mail to: **engpolreg@logistics.co.uk**

# Chapter 8 Maintenance and Inspection - Civil

Guidance on the Maintenance and Inspection of civil UAVs should be sought from CAA SRG Air Maintenance Standards Department.

Air Maintenance Standards Department
Safety Regulation Group
Civil Aviation Authority
Aviation House
Gatwick Airport South
West Sussex
RH6 0YR

Tel: 01293 573362

Fax: 01293 573984

E-mail to: **jim.done@srg.caa.co.uk**

# Chapter 9 Operator Qualifications

## 1 Scope

1.1 There are currently no regulations governing the qualifications required to operate a UAV in UK airspace. For operations in Danger Areas, under the auspices of D/Flying, specific requirements are set out in Director Flying Instructions and, for contractors, AvP67. 729 NAS (Previously the Royal Navy's Fleet Target Group) also follows strict operating guidelines. Individual UAV manufacturers have their own company requirements.

## 2 Lead Agency

2.1 CAA DAP

## 3 Policy

3.1 In anticipation of wider operations of UAVs in Groups 3-5 (see Chapter 1), DAP is considering using the word "crew" to mean flight crew, that is, the UAV Commander and the UAV-p, each of whom is a crew member.

**UAV Commander.** Every flight of a UAV must be under the command of a UAV Commander. The UAV Commander is a qualified person who is in overall charge of, and responsible for, a particular UAV flight or flights. The UAV Commander can either; be in direct control of the vehicle by remote controls; or co-located with the UAV-p; or monitoring the state and progress of the vehicle at the flight deck location in the GCS.

**UAV-p.** The UAV-p is a qualified person who is actively exercising remote control of a non-autonomous UAV flight, or monitoring an autonomous UAV flight. The UAV-p may or may not be the UAV Commander. The UAV-p must meet the training, qualifications, proficiency and currency requirements stated in the approved Flight Operations Manual of the operating organisation.

The UAV Commander is tasked with overall responsibility for the operation and safety of the vehicle in flight and must be fully trained and qualified to assume these responsibilities. The UAV Commander therefore assumes the same operational and safety responsibilities as those of the captain or pilot-in-command of a piloted aircraft performing a similar mission in similar airspace. A UAV Commander may simultaneously assume the prescribed responsibilities for more than one UAV when this can be accomplished safely by directing activities of one or more UAV-p.

For all flights in Groups 3-5, the UAV Commander must be licensed and appropriately rated according to airspace classification and meteorological conditions/flight rules. This may mean an instrument rating appropriately endorsed "UAV".

3.2 The Flight Operations Manual of the UAV Operating Organisation must specify the required qualifications and levels of training and proficiency for flight crew members, that is, for the UAV Commander and UAV-p. The following aspects shall be addressed:

- Aeronautical knowledge.
- Knowledge of flight critical systems of the relevant UAV.

- Manned aircraft pilot qualifications.
- Communications procedures.
- UAV flight training levels.
- Flight proficiency and currency with the relevant UAV.
- Meteorology.

## 4 Source Documents

4.1 Nil.

## 5 POC

5.1 ORA 4
K6 G3
CAA House
45-59 Kingsway
London
WC2B 6TE

Tel: 020 7453 6544

Fax: 020 7453 6565

E-mail to: **matt.lee@dap.caa.co.uk**

# Chapter 10 Approval to Operate - Military

## 1 Policy

1.1 Guidance on the approval to operate military UAVs should be sought in the first instance from AD/ADRP who will advise on any further points of contact if necessary.

## 2 POC

2.1 AD/ADRP
Defence Aviation Safety Centre
Ash 3b#3312
DPA
MOD Abbey Wood
Bristol
BS34 8JH

Tel: 0117 91 34655

Fax: 0117 91 35910

E-mail to: **altg_adrp@dpa.mod.uk**

# Chapter 11 Approval to Operate - Military Trials (Under D/Flying Jurisdiction)

## 1 Scope

1.1 All UAVs Flying under D/Flying jurisdiction must comply with any approvals/ restrictions issued by the D/Flying before they are permitted to fly. See Annex C.

## 2 Lead Agency

2.1 MOD DPA D/Flying.

## 3 Policy

3.1 All operations will be subject to a full approvals process as for equivalent manned flights.

This will include approvals for, as appropriate, the company, designated head of flying, operating airfield(s), UAV controlling staff and sight of specific UAV types.

Under normal circumstances and until appropriate national airspace procedures have been promulgated, flights will only be permitted within D/Flying- approved Danger Areas. These Danger Areas must provide adequate radar services (or such processes that are agreed to be considered equivalent) such that the ANO requirement for the 'Commander' of the aircraft (i.e. the master UAV Controller), to avoid aerial collisions, can be fully acquitted.

## 4 Source Documents

4.1 AvP 67, DFIs, DFATCIs, Mil AIP.

## 5 POC

5.1 Wg Cdr R D Jenkins
AD Flying
Directorate of Flying (DPA)
Building 419
MoD Boscombe Down
Salisbury
Wiltshire
SP4 0JE

Tel: 01980 663017

Fax: 01980 663027

E-mail to: **D-FlyingDPAAD@dpa.mod.uk**

# Chapter 12 Approval to Operate - Civil

## 1 Lead Agency

1.1 CAA SRG, General Aviation Department

## 2 Policy

2.1 An aircraft that weighs more than 20 kg is not a 'small aircraft' for the purposes of the ANO and is subject to all the Rules of the Air and Articles of the Air Navigation Order. UAVs on the UK Civil Register weighing more than this limit will generally be required to hold valid Certificates of Airworthiness issued by the CAA (see Chapter 4).

However, Article 127 of the ANO gives the CAA powers to exempt any person or aircraft from most Articles of the ANO. Some limited exceptions will be made; for example to continue to allow recreational flying without Certificates of Airworthiness by 'model aircraft'.

Additionally, a small number of UAVS above 20 kg have been allowed conduct aerial work under such Exemptions, which permitted flight without a valid Certificate of Airworthiness, subject to a number of conditions. However, the power to exempt from regulations does not release the CAA from its statutory duties. Before granting such Exemptions the CAA must be satisfied that the risks to persons and property are acceptable and are properly controlled, and in the absence of a conventional airworthiness approval, the CAA will normally stipulate operational constraints such as limiting the operating height and range and the area to be overflown. The granting of Exemptions to allow flight without Certificates of Airworthiness is a short-term measure, which will be used on a small scale until the scheme of regulation for civil UAVS airworthiness matures. Even when such regulation is in place there may continue to be occasions when the CAA will permit a UAVS to operate for commercial purposes without a Certificate of Airworthiness, but it is expected that such permissions will be very few; every application will be subject to assessment in detail and the operation of the aircraft is likely to be severely restricted.

2.2 Application for an Exemption should be made to the CAA General Aviation Department. It is vital to be clear who is the operator (defined in ANO Article 129(3)). The operator, i.e. the person having management of the aircraft, and not another person who may, for example, have contracted with the operator to have work done, should apply for an Exemption. In order to satisfy the CAA that a UAVS has been designed and built to a satisfactory standard, it may be possible to achieve satisfactory verification from an independent centre of expert opinion. For large recreational models the assistance of the Large Model Association has proved satisfactory. For UAVS intended for research or commercial purposes the involvement of an established aeronautical engineering design organisation may be considered. Such an organisation undertaking design or manufacturing activities should have appropriate approvals under JAR 21 or similar requirements acceptable to the CAA.

2.3 Security of radio control links and provision for flight termination in the event of a malfunction should be considered from the outset, and construction of the UAVS should be monitored and recorded on an appropriate build inspection schedule. It is particularly important to build to such a schedule if the construction does not allow access to all parts of the aircraft for a final inspection.

2.4 Compliance with Rule 17 of the Rules of the Air Regulations 1996 (Rules for avoiding aerial collisions) means that flight beyond line of sight and under visual control by UAVs, other than balloons, will not be possible unless a technological solution to collision avoidance can be provided. For practical purposes, it is considered that the maximum range over which effective visual control can be exercised should not normally exceed 500 metres. Note that the collision avoidance rules apply to flights conducted under the instrument flight rules (IFR) and to flights made with an air traffic control clearance, as well as to flights under the visual flight rules (VFR).

## 3 Source Documents

3.1 Air Navigation Order 2000, Rules of the Air Regulations 1996, Aeronautical Information Publication and CAP 32 UK Aeronautical Information Publication.

## 4 POC

4.1 Gill Galway
General Aviation Department
Safety Regulation Group
Civil Aviation Authority
Aviation House
Gatwick Airport South
West Sussex
RH6 0YR

Tel: 01293 573226

Fax: 01293 573973

E-mail to: **gill.galway@srg.caa.co.uk**

# Chapter 13 Flying Operations

## 1 Scope

1.1 This guidance relates to civil and military UAV operations outside Danger Areas (Groups 3-5 see Chapter 1). Information on airspace regulation within Danger Areas should be sought from the relevant Danger Area authority. DAP will assist in identifying the appropriate authority if required.

## 2 Lead Agency

2.1 CAA DAP

## 3 Policy

### 3.1 Airspace Principles for UAV Operations in the UK

a) UK aviation legislation is designed to enable manned aircraft to fly safely in various classes of airspace, UAV operators should seek to operate within existing arrangements.

b) UAVs will not have an automatic right to airspace use if safety provision cannot be made.

c) In order to integrate with other airspace users, UAV operators must ensure that their aircraft show an **equivalent level of compliance** with the rules and procedures that apply to manned aircraft.

d) UAV operators should recognise the expectations of other airspace users, which are that the routine flight of any UAV outside a UK danger area **will not increase the risk to existing users** and will not deny airspace to them.

e) In the near-term, one-off or occasional UAV flights outside Danger Areas may be accommodated. However, this will involve long lead-times and thorough consultation in the flight planning stage, and during the early flights, will almost certainly involve the **exclusive** use of temporary segregated airspace.

f) The provision of an Air Traffic Service (ATS) to a UAV must be **transparent to the ATC controller.** In other words, the controller must not have to do anything different using RT or landlines than he would with other aircraft under his control. Nor should he have to apply different rules or work to different criteria. UAVs must be able to comply with ATC instructions and with equipment requirements applicable to the class of airspace within which they intend to operate. To ensure that air traffic controllers are aware that a flight is a UAV flight, all UAV callsigns shall include the word "UNMANNED".

### 3.2 General Principles for UAV Operations in the UK

a) For all flights outside Danger Areas or reserved (exclusive use) airspace, the vehicle performance and all communications with ATC must be continuously monitored by the UAV-p. The UAV-p must be capable of taking immediate active control of the UAV at all times, and of complying with ATC instructions.

b) Special equipment (e.g. SSR, TCAS or equivalent system etc.) mandated for manned aircraft in certain classifications of airspace shall also be fitted to UAVs

intended for use in such airspace. Such equipment should be regarded as a minimum.

c) An approved method of aerial collision avoidance is required. This might be a combination of radar coverage and a chase aircraft or an approved onboard system.

d) For all flights outside Danger Areas an approved method of assuring terrain clearance is required.

e) Standard Operating Procedures are required and will include:

- Take-off and landing procedure.
- Loss of control data link.
- Abort procedures following critical system failure.

f) UAVS must comply with the IFR or VFR as they affect manned aircraft. Thus UAVs fitted with non-visual collision avoidance systems must still comply with the IFR when IMC (i.e. they may not fly VFR in IMC just because they can "sense" and avoid; quadrantal/semi-circular rules will continue to apply).

g) Details on how sense and avoid criteria should be arrived at can be found at Chapter 27.

## 4 Source Documents

4.1

| | |
|---|---|
| CAP 393 | Air Navigation: the Order and the Regulations |
| JSP 318 | Military Flying Regulations |
| JSP 318A | Military Air Traffic Services |
| UK AIP | Integrated Aeronautical Information Publication |

## 5 POC

5.1 ORA 4
K6 G3
CAA House
45-59 Kingsway
London
WC2B 6TE

Tel: 020 7453 6544

Fax: 020 7453 6565

E-mail to: **matt.lee@dap.caa.co.uk**

# Chapter 14 Cross Border Operations

## 1 Scope

1.1 For the purposes of this guide, international boundaries are considered coincident with FIR/UIR divisions.

## 2 Lead Agency

CAA DAP

## 3 Policy

3.1 DAP will provide guidance on cross border ATC procedures. Guidance on foreign national procedures should be sought from the appropriate State CAA/MoD.

## 4 Source Documents

4.1 Nil.

## 5 POC

5.1 ORA4
K6 G3
CAA House
45-59 Kingsway
London
WC2B 6TE

Tel: 020 7453 6544

Fax: 020 7453 6565

E-mail to: **matt.lee@dap.caa.co.uk**

# Chapter 15 Flying Regulations - Military

## 1 Scope

1.1 Military Flying Regulations are contained in JSP318. The regulations apply to all those concerned in the operation of British Service aircraft and non-Service aircraft contracted to support military tasks.

## 2 Lead Agency

2.1 MoD Directorate of Air Staff (DAS), MANP.

## 3 Policy

3.1 It is MoD policy that UAVs must show an equivalent level of compliance with the regulations for manned aircraft. Military aircraft are not subject to the ANO but it is MoD policy that they should comply with the "spirit" of the order.

3.2 During operations involving the use of a chase aircraft, the flight shall be classified as a formation flight and shall have the same right of way status as aircraft engaged in airborne refuelling or towing. A chase aircraft shall not be used in conjunction with a UAV IFR flight when VMC cannot be maintained.

## 4 Source Documents

4.1 The operation of UAVs is covered in JSP318, regulation 02008.

## 5 POC

5.1 MOD (DAS) MANP
6/24A
Metropole Building
Northumberland Avenue
London
WC2N 5BP

Tel: 020 7218 7241

Fax: 020 7218 7701

E-mail to: **reg.das@pipex.com**

# Chapter 16 Flying Regulations - Military Trials (Under D/Flying Jurisdiction)

## 1 Scope

1.1 D/Flying provides the Regulatory authority, operational and flight safety arrangements for UK military registered aircraft involved in R&D, Clearance and Production flying, and in-Service Return-to-Works (RTW) activities. D/Flying also regulates Civil Owned Military Type Aircraft (COMA) and this extends to Civil Owned Military Registered (COMR) aircraft when they are allotted to a contractor for RTW activities. In addition D/Flying regulates test pilot training, non-Service UAV Systems and QinetiQ parachuting/aerial delivery activity.

D/Flying (ATC) is responsible for the regulation and approval of ATC/Range Air Control staff (and associated equipment) providing services within air Danger Areas operated by QinetiQ.

From a MoD perspective, all Integrated Project Team Leaders (IPTLs) **must inform** Directorate of Flying before any new contract involving **any** flying operation is let.

## 2 Lead Agency

2.1 DASC - D/Flying.

## 3 Policy

3.1 The MoD require, in JSP 318B, that internal regulatory arrangements for military aircraft should be at least as effective as those which follow from the ANO for civilian aircraft, this includes UAVs.

## 4 Source Documents

4.1 AvP 67, DFIs DFATCIs

## 5 POC

5.1 C Smith
D Flying ATC
Directorate of Flying (DPA)
Building 419
MoD Boscombe Down
Salisbury
Wiltshire SP4 0JE

Tel: 01980 663028

Fax: 01980 663027

E-mail to: **D-FlyingDPAATC@dpa.mod.uk**

# Chapter 17 Flying Regulations - Civil

## 1 Scope

1.1 All civil aircraft fly subject to the legislation of the Air Navigation Order 2000 and the Rules of the Air Regulations 1996.

## 2 Lead Agency

2.1 CAA SRG, General Aviation Department

## 3 Policy

3.1 The Air Navigation Order 2000 contains a number of provisions for the regulation of aircraft. When flying, aircraft must comply with the Rules of the Air Regulations 1996. In particular, UAVs will require an approved method of aerial collision avoidance, which ensures compliance with Rule 17 (Rules for avoiding aerial collision). For further information see Chapter 27.

## 4 Source Documents

4.1 ANO, Rules of the Air

## 5 POC

5.1 Gill Galway
General Aviation Department
Safety Regulation Group
Civil Aviation Authority
Aviation House
Gatwick Airport South
West Sussex
RH6 0YR

Tel: 01293 573226

Fax: 01293 573973

E-mail to: **gill.galway@srg.caa.co.uk**

# Chapter 18 ATM Procedures - Military

## 1 Scope

1.1 The regulations concerning military air traffic services are contained within JSP 318A. These regulations apply to all those concerned with the operation of British Service aircraft, but they do not absolve any person from using best judgement to ensure the safety of aircraft and personnel.

## 2 Lead Agency

2.1 MOD HQ STC OPERATIONS SUPPORT (ATC)

## 3 Policy

3.1 It is MoD policy that UAVs must show an equivalent level of compliance with regulations for manned aircraft. Routine operations of any UAV outside a UK Danger Area must not increase the risk to other airspace users and should not deny the airspace to them. Any one-off unusual air activity[1], that requires de-confliction with, coordination with and notification to other airspace users should be notified through the DAP Airspace Utilisation Section (AUS) in the same way as for manned aircraft. From the air traffic controller's perspective, the provision of an ATS to a UAV must be transparent. This includes all stages of the flight from pre-notification to landing; there should be no difference in RT, landline communications or transponder data procedures nor should the controller have to apply different rules or different criteria.

## 4 Source Documents

4.1 JSP318A
UK Military AIP

## 5 POC

5.1 SO1 ATC (AREA)
Room 134 B Block
HQ Strike Command
RAF High Wycombe
Buckinghamshire
HP14 4UE

Tel: BT: 01494 495703 RAFTN: 95221 5703

Fax: BT 01494 495716 RAFTN: 95221 5716

CHOtS: STC-OPSSPT-ATC-AREA/SO1

E-mail to: **milopsarea@nats.co.uk** - E-mails should be marked for the attention of SO1 ATC (AREA)

1. Unusual Air Activity: an event such as an air exercise, trial, display, formation, balloon or kite flight which could adversely affect the operations of other airspace users.

# Chapter 19 ATM Procedures - Civil

## 1 General Guidance

1.1 The Air Traffic Service (ATS) system in the UK comprises three levels of service, Air Traffic Control, Flight Information Service and the Air/Ground Communication service.

1.2 Individual ATS units may provide services within clearly defined geographic boundaries (such as a specific portion of airspace) or may provide services within a general area (for example, in the vicinity of an aerodrome).

1.3 The rules pertaining to aircraft flight and to the air traffic service provided will be determined by a number of factors (including airspace categorisation, weather conditions, aircraft flight rules and type of air traffic service unit).

1.4 Not all aircraft within the same geographic area will necessarily be in communication with the same ATS unit or operating under the same rules.

1.5 It is important that those managing UAV operations are familiar with the relevant rules and procedures applicable within any airspace through which the aircraft will be flown. Should a UAV wish to fly through Controlled Airspace which is the subject of Air Traffic Flow Management procedures, then it must obtain and comply with an AFTM slot time.

1.6 UAV operation is expected to be transparent to ATS providers. The UAV-p will be required to comply with any air traffic control instruction or a request for information made by an ATS unit in the same way and within the same timeframe that the pilot of a manned aircraft would. These instructions may take a variety of forms and, for example, may be to follow another aircraft or to confirm than another aircraft is in sight.

1.7 It is not possible to anticipate all of the issues and queries relating to ATS integration that will inevitably arise during the future development of UAVs and their operational procedures. Any enquiries for further guidance or to establish the UK policy on a particular issue should be made to the address below.

## 2 Further Information

2.1 Further information about the various levels of ATS and the services available from ATS units can be found in the following documents:

- Air Traffic Control - CAP 493 Manual of Air Traffic Services Part 1
- Flight Information Service - CAP 427 Flight Information Service and the FISO Licence
- Air/Ground Communication Service - CAP 452 Aeronautical Radio Station Operator's Guide

2.2 Further information about the classification of airspace and flight rules can be found in CAP 32 UK Aeronautical Information Publication.

Further information about radiotelephony procedures can be found in CAP 413 Radiotelephony Manual.

## 3 Enquiries

3.1 Guidance on civil ATM procedures for UAVs should be sought from CAA SRG ATS Standards Department.

Head of ATS Standards Department
Safety Regulation Group
Civil Aviation Authority
Aviation House
Gatwick Airport South
West Sussex
RH6 0YR

Tel: 01293 573423

Fax: 01293 573974

E-mail to: **john.dancer@srg.caa.co.uk**

# Chapter 20 Emergency ATM Procedures - Military

## 1 Scope

1.1 Regulations and information relating to the UK emergency organisations are contained within JSP 318A. For UK airspace, assistance on the VHF (121.500 MHz) and UHF (243.00 MHz) International Aeronautical Emergency Frequencies is provided by the RAF from 2 Distress and Diversion (D & D) sections at LATCC (Mil) and ScATCC (Mil) equipped with extensive radar coverage, communications and specialist facilities.

## 2 Lead Agency

2.1 MOD HQ STC OPERATIONS SUPPORT (ATC)

## 3 Policy

3.1 It is MOD policy that UAVs must show an equivalent level of compliance with regulations for manned aircraft. The provision of emergency aid and position fixing services to UAVs should be transparent to the D & D controller.

## 4 Source Documents

4.1 JSP318A (Section 701)

## 5 POC

5.1 SO1 ATC (AREA)
Rm 134 B Block
HQ Strike Command
RAF High Wycombe
Buckinghamshire
HP14 4UE

Tel: BT: 01494 495703 RAFTN: 95221 5703

Fax: BT 01494 495716 RAFTN: 95221 5716

CHOtS: STC-OPSSPT-ATC-AREA/SO1

E-mail to: **milopsarea@nats.co.uk** - E-mails should be marked for the attention of SO1 ATC (AREA)

# Chapter 21 Emergency ATM Procedures - Civil

Guidance on Emergency ATM procedures for civil UAVs should be sought from CAA SRG ATSSD.

Head of ATS Standards Department
Safety Regulation Group
Civil Aviation Authority
Aviation House
Gatwick Airport South
West Sussex
RH6 0YR

Tel: 01293 573423

Fax: 01293 573974

E-mail to: **john.dancer@srg.caa.co.uk**

# Chapter 22 Breaches of ATC Regulations - Military

## 1 Scope

1.1 Regulations relating to the reporting and investigation of breaches of ATC regulations are contained in JSP 318A Chapter 69.

## 2 Lead Agency

2.1 MOD STC Operations Support (ATC)

## 3 Policy

3.1 The reporting and investigation of incidents of any sort is essential to the safe management of the air traffic services provided by military units. Additionally, dissemination of the knowledge gained from each incident will enable an assessment to be made of any safety implications so that appropriate follow-up action can be taken. It is therefore, MOD policy that operators of UAVs should comply fully with the incident reporting and investigation system as detailed in JSP 318A in the same way as operators of manned vehicles.

## 4 Source Documents

4.1 JSP 318A (Section 805)

## 5 POC

5.1 SO2 ATC (SM&I) 2
Room 141 B Block
HQ Strike Command
RAF High Wycombe
Buckinghamshire
HP14 4UE

Tel: BT: 01494 495709 RAFTN: 95221 5709

Fax: BT 01494 495716 RAFTN: 95221 5716

CHOtS: STC-OPSSPT-ATC-SM+I2-SO2

E-mail to: **stc-atc@hwstc.raf.mod.uk** - E-mails should be marked for the attention of SO2 ATC (SM&I) 2a.

# Chapter 23 Breaches of ATC Regulations - Civil

Guidance on breaches of civil ATC regulations should be sought from CAA SRG SIDD SDU3.

SIDD (SDU 3)
Safety Regulation Group
Civil Aviation Authority
Aviation House
Gatwick Airport South
West Sussex
RH6 0YR

Tel: 01293 573220

Fax: 01293 573972

E-mail to: **sdd@srg.caa.co.uk**

# Chapter 24 Incident/Accident Procedures - Military

Guidance on Incident/Accident procedures for Military UAVs should be sought from MOD Defence Aviation Safety Centre (DASC) SO1 Occurences.

MOD DASC
PO Box 333
RAF Bentley Priory
Stanmore
HA7 3YN

Tel: 0208 838 7631

Fax: 0208 838 7638

# Chapter 25 Incident/Accident Procedures - Military Trials (Under D/Flying Jurisdiction)

## 1 Scope

1.1 Incidents/Accidents involving UAVs operating under D/Flying's jurisdiction.

## 2 Lead Agency

2.1 DASC - D/Flying.

## 3 Source Documents

3.1 DFIs, DFATCIs AvP67.

## 4 POC

4.1 Tug Wilson
D/Flying Flight Safety
Directorate of Flying (DPA)
Building 419
MoD Boscombe Down
Salisbury
Wiltshire SP4 0JE

Tel: 01980 662106

Fax: 01980 663027

E-mail to: **D-FlyingDPASafety@dpa.mod.uk**

# Chapter 26 Incident/Accident Procedures - Civil

## 1 Scope

1.1 Any Accident/Serious Incident/Incident involving UK aviation facilities, including aircraft operators, ATC providers, aerodrome operators. Also includes third parties within the UK.

## 2 Lead Agency

2.1 CAA SRG AAIB

- Accident / Serious Incident - AAIB.
- Incident - CAA SRG - SIDD.

## 3 Policy

3.1 Accident/Serious Incident - to be reported to the AAIB.
Incident - to be reported to the CAA.

## 4 Source Documents

4.1 The Civil Aviation (Investigation of Air Accidents and Incidents) Regulations 1996. Air Navigation Order 2000 - Article 117 & CAP 382 (The Mandatory Occurrence Reporting Scheme).

## 5 POC

5.1 Accident / Serious Incident -

DETR AAIB
Berkshire Copse Road
Aldershot
Hants.
GU11 2HH

Tel: 01252 510300

Fax: 01252 376999

Incident -

SDU2
Safety Regulation Group
Civil Aviation Authority
Aviation House
Gatwick Airport South
West Sussex RH6 0YR

Tel: 01293 573220

Fax: 01293 573972

E-mail to: **sdd@srg.caa.co.uk**

# Chapter 27 CAA Policy on Unmanned Aerial Vehicle Sense and Avoid Criteria

## 1 Scope

1.1 Guidance to industry on how to progress Sense and Avoid criteria.

## 2 Lead Agency

2.1 CAA DAP

## 3 Introduction

3.1 At present, Unmanned Aerial Vehicle Systems (UAVS) that operate within the UK are almost entirely those flying under the auspices of the MoD Flying Regulations. These seek to ensure at least an equally effective level of regulation to the regulations contained within the ANO. Currently an equivalent level of safety to that required for 'manned flying' is achieved by both appropriate regulation and restricting peace-time military UAV operations to segregated airspace (i.e. Danger Areas). Further, there are currently no national procedures which permit either civil or military UAVS to routinely fly in non-segregated airspace.

3.2 A significant increase in both civil and military UAVS flying is anticipated, most of which will require access to all classes of airspace if it is to be both operationally effective and/or commercially viable. To achieve this, UAVS will have to be able to meet all existing safety standards, applicable to equivalent manned aircraft types, appropriate to the class (or classes) of airspace within which they are intended to be operated.

## 4 Aim

4.1 The aim of this policy statement is to clarify the position of the CAA in respect of its role in assisting the UAV industry to find a solution to achieving a capability and level of safety which is equivalent to the existing 'see and avoid' concept. It is also recognised that 'see and avoid' is only one of a number of requirements that will need to be addressed for safe operation of UAVs.

## 5 Policy

5.1 The CAA policy on UAV Sense and Avoid Criteria is as follows:

a) The overriding principle when assessing if a proposed UAV sense and avoid criteria is acceptable is that it should not introduce a greater hazard than currently exists. Any proposed criteria must demonstrate equivalence with manned aircraft safety standards, and the capability of any UAV to comply with the rules and obligations that apply to manned aircraft in relation to collision avoidance.

b) There has already been considerable discussion between the CAA and industry representatives on matters such as specific distances, or time factors by which a UAV must avoid other airborne objects. From these discussions and its own

deliberations the CAA has concluded that the full range of parameters which may have to be taken into account in any solution of the sense and avoid problem has yet to be established. Consequently it is considered premature at this stage to try to reach agreement on any specific criteria while their significance for any final solution remains unclear. The CAA considers that, until such time as research and development work has been carried out to define potential system concepts and architectures, the parameters that will govern the performance characteristics of a sense and avoid system cannot be identified with any certainty, (and so cannot be agreed).

c) It is not the role of the CAA to carry out such research and development; this must be performed by the UAV industry. However, it is considered advisable that the CAA has a defined role in the regular review of any such activity in order that the CAA can provide guidance to the UAV industry on the appropriate interpretation of the applicable rules and regulations.

d) Any agreed Sense and Avoid Criteria must be acceptable to other existing airspace users.

e) The CAA therefore strongly recommends that any parties developing sense and avoid technology for the use of UAVs in non-segregated airspace should set up a programme of regular discussion and review of their research and development activity with the CAA by making contact at an early stage with the Design and Production Standards Division (D&PSD), Operating Standards Division (OSD) and the Aerodrome, Air Traffic and Licensing Standards Division (AALSD) of the CAA Safety Regulation Group. This will ensure that system developers will have access to the best advice on the applicable regulations, thereby increasing the likelihood of the ultimate acceptance of any sense and avoid system by the civil authorities.

## 6 Summary

6.1 If the UAV industry is to produce UAVs capable of operating in unsegregated airspace, it is essential that 'sense and avoid' issues be addressed. Without a means of ensuring equivalence with manned aircraft, UAV operations will be severely limited and subject to the restrictions of segregated airspace. If every intended UAV flight needs to rely on using segregated airspace then it is highly unlikely the UK UAV industry will progress and grow at the rate it desires. Furthermore, it is doubtful whether sufficient segregated airspace could be made available to meet UAV demand. The CAA considers that the way forward is for the UAV industry to investigate potential solutions and for the research and development process to include full and open consultation with the CAA at appropriate stages.

## 7 Factors for Consideration when Developing Sense and Avoid Criteria for Unmanned Aerial Vehicles

7.1 The CAA Safety Regulation Group does not define the matters to be taken into account for the design of aircraft or their systems. However, for the guidance of those engaged in the development of Sense and Avoid systems, some of the factors that the CAA believes may need to be considered are listed below:

a) Description of the operation and classification of the airspace in which it is planned to be flown.

b) UAV physical characteristics.

c) Flight performance.

d) Airworthiness.

e) Control method, controllability and manoeuvrability.

f) Method of sensing other airborne objects.

g) Ability to comply with the Rules of the Air.

h) Communications procedures and associated links.

i) Security.

j) Emergency actions, reversionary or failure modes in the event of degradation of any part of the UAV and its associated Control and/or Relay Stations.

k) Actions in the event of lost communications and/or failure of onboard sense and avoid equipment.

l) Ability to determine real-time meteorological conditions and type of terrain being overflown.

m) Nature of task and/or payload.

n) Autonomy of operation and control.

o) UAV-p level of competence.

p) ATC communications, procedures and links with control station.

q) Means of launch/take-off and recovery/landing.

r) Reaction logic to other airspace objects.

s) Flight termination.

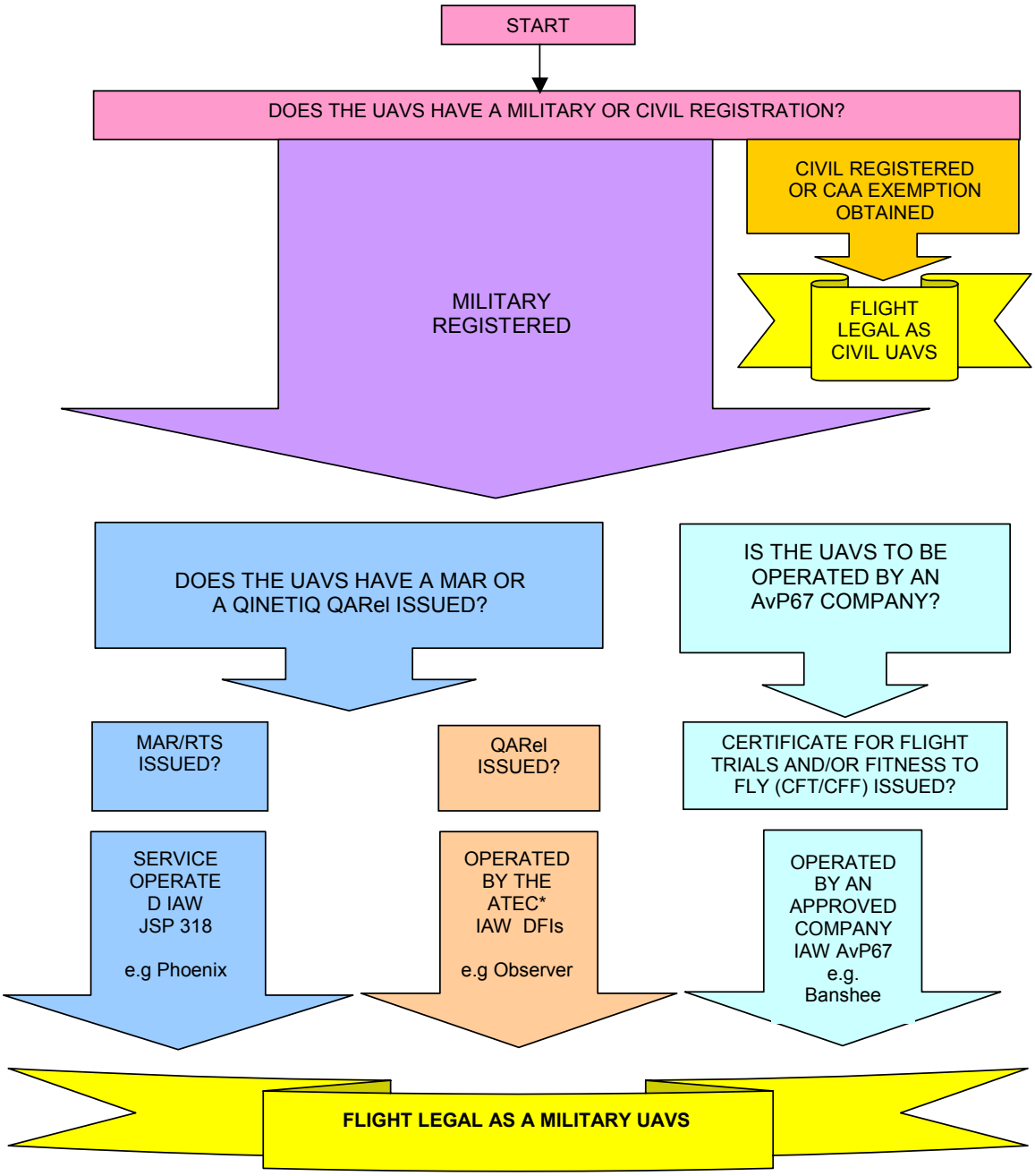
This list is not exhaustive.

# Annex A Document List

Documents, or extracts thereof, are available from:

| | |
|---|---|
| Military AIP | No 1 AIDU<br>RAF Northolt<br>West End Road<br>Ruislip<br>Middlesex<br>HA4 6NG |
| JSP 318 Military Flying Regulations | DAS<br>MoD MB<br>Whitehall<br>London SW1A 2HA |
| JSP 318A Military Air Traffic Service | MoD STC ACOA (Ops Supt)<br>SO3 ATC (Area 3a)<br>B Block<br>HQ Strike Command<br>RAF High Wycombe<br>Buckinghamshire<br>HP14 4UE |
| JSP318B Regulation of the Airworthiness of Ministry of Defence Aircraft & AP 100 Series | MoD DPA ADRP<br>Abbey Wood<br>Bristol<br>BS34 8JH |
| JSP318, JSP318A JSP318B and the AP 100 series are available from: | DSDC(L)<br>Defence Storage and Distribution Centre<br>Mwrwg Road<br>Llangennech<br>Llanelli<br>Carms<br>South Wales SA14 8YP<br>Tel: 01554 822347 |
| Civil CAP, AIP & ANO | Documedia Solutions Ltd<br>37 Windsor Street<br>Cheltenham<br>Gloucestershire<br>GL52 2DG |

# Annex B Military UAV Approval Process Flow Diagram




* Aircraft Test & Evaluation Centre