

Unmanned Aircraft System Operations in UK Airspace – Operating Safety Cases

CAP 722A

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Revision History

First Edition

July 2019

Initial issue. Information has been extracted from Appendices B, C and D of CAP 722 Sixth Edition March 2015, and updated where appropriate to reflect the evolving best practice concerning risk assessment processes, and in order to capture the regulatory changes within ANO 2016 and its subsequent amendments.

Foreword

Aim

CAP 722A, Unmanned Aircraft System Operations in UK Airspace - Operating Safety Cases is intended to assist those involved in the production of an Operating Safety Case (OSC) which will be used as supporting evidence to an application to the CAA for operation of an Unmanned Aircraft System (UAS). The intent is to ensure that the required operational safety requirements have been met and best practice is adopted by all UAS operators before a UAS is authorised to operate in the UK.

The aim of the OSC is to present sufficient evidence that all relevant hazards and resultant safety risks have been identified within an operation and that these safety risks have been reduced to a Tolerable and As Low As Reasonably Practicable (ALARP) level¹.

In advance of further changes to this document, updated information is contained in the unmanned aircraft section of the CAA website www.caa.co.uk/uas

Content

CAP 722A does not replace existing civil aviation regulations but provides requirements and guidance for the preparation of a safety case/risk assessment as part of an application to the CAA for an operational authorisation, permission or exemption.

This document principally consists of 3 sections:

- OSC Volume 1 – Operations Manual Template;
- OSC Volume 2 – Systems Template;
- OSC Volume 3 – Safety Risk Assessment Guidance & Template.

The templates provide section headings detailing the minimum subject areas that need to be addressed when producing an OSC for the purposes of demonstrating that a UAS operation can be conducted safely. The template layouts as presented are not prescriptive, but the subject areas detailed must be included in the OSC documentation as required for the particular operation, in order to provide the minimum required information.

Policy

The UAS Operating Safety Case (UAS OSC) has been devised using the ConOps methodology to give a flexible method by which the applicant can provide the CAA with a safety argument for intended operations. Each application for an operational authorisation,

¹ See CAP 722A Glossary for definitions of relevant Safety Risk Management terms.

exemption or a permission (other than for a 'standard permission' for commercial operations and/or for operations within a congested area) must be accompanied by a UAS OSC.

Applicants wishing to apply to the CAA must produce an OSC, for assessment by the CAA. The individual OSC volumes that will be required is dependent on the relative complexity of the operation, based on the table below:

Further Policy and Guidance is contained in CAP 722.

Mass (kg)	Operating examples	Volume 1	Volume 2	Volume 3
20kg or less	'Standard Permission' (commercial ops and/or <150m of congested areas)	Required	Recommended	Recommended
	<50m from uninvolved people/properties; <150m from 'organised open-air assemblies of more than 1000 persons'; >400ft above the surface EVLOS BVLOS	Required	Required	Required
over 20kg	Low Complexity UAS and/or Rural Environment	Required	Required	Required
	Low Complexity UAS and/or Semi-rural	Required	Required	Required
	High Complexity UAS and/or Complex Airspace/ Congested Area	Required	Required	Required

Availability

The latest versions of CAP 722(Policy and Guidance), 722A(Operating Safety Cases) and 722B(National Qualified Entities) are available from the CAA website Publications section.

The CAA has a system for publishing further information and guidance and this can be found on the CAA website under the Skywise section, which can be filtered for information and subject matter relevant to UAS.

Point of Contact

Unless otherwise stated, all enquiries relating to this CAP should be made to:

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Abbreviations and Glossary of Terms

Terminology relating to UAS and their operation continues to evolve, therefore, this section contains non-exhaustive lists, which are a combination of emerging ICAO definitions and other 'common use' terms which are considered to be acceptable alternatives.

Abbreviations

A

AAIB	Air Accidents Investigation Branch
ACAS	Airborne Collision Avoidance System
ADS-B	Automatic Dependent Surveillance - Broadcast
AIP	Aeronautical Information Publication
AIS	Aeronautical Information Service
ALARP	As Low As Reasonably Practicable
ANO	Air Navigation Order
ANSP	Air Navigation Service Provider
ASTM	American Society for Testing and Materials
ATC	Air Traffic Control
ATM	Air Traffic Management
ATPL	Air Transport Pilot Licence
ATS	Air Traffic Service
ATSM	American Society for Testing and Materials
ATSU	Air Traffic Service (ATS) Unit
ATZ	Aerodrome Traffic Zone

B

BMFA	British Model Flying Association
BRLOS	Beyond Radio Line of Sight
BRS	Ballistic Recovery Systems

BSI British Standards Institute
BVLOS Beyond Visual Line of Sight

C

CAA Civil Aviation Authority
CAP Civil Aviation Publication
ConOps Concept of Operations
CPL Commercial Pilot Licence
CRM Crew Resource Management
C2 Link Command and Control Link
C3 Link Command, Control and Communication Link

D

DA Danger Area
DAA Detect and Avoid

E

EASA European Aviation Safety Agency
EC Electronic Conspicuity
ECCAIRS European Co-ordination Centre for Accident and Incident Reporting Systems
ERF Emergency Restriction of Flying
ERP Emergency Response Plan
EUROCAE European Organisation for Civil Aviation Equipment
EVLOS Extended Visual Line of Sight

F

FIR Flight Information Region
FPV First Person View
FRTOL Flight Radio Telephony Operators' Licence
FRZ Flight Restriction Zone

G

GCS Ground Control Station

H

HMI Human-Machine Interface

I

ICAO International Civil Aviation Organisation

ISO International Standards Organisation

M

MCC Multi Crew Cooperation

MOR Mandatory Occurrence Reporting

MTOM Maximum Take-off Mass

N

NAA National Aviation Authority

NOTAM Notice to Airmen

NQE National Qualified Entity

O

OSC Operating Safety Case

P

PPL Private Pilot Licence

Q

QMS Quality Management System

R

RA (T) Restricted Area (Temporary)

RLOS Radio Line of Sight

RPA Remotely Piloted Aircraft

RPAS Remotely Piloted Aircraft System

RPS Remote Pilot Station

RPZ Runway Protection Zone

RTCA Radio Technical Commission for Aeronautics

RTH Return To Home

S

SMS	Safety Management System
SPOF	Single Point of Failure
SRAP	Safety Risk Assessment Process
STANAG	Standardisation Agreement (NATO)

T

TCAS	Traffic Alert and Collision Avoidance System
TDA	Temporary Danger Area
TMZ	Transponder Mandatory Zone

U

UA	Unmanned Aircraft
UAS	Unmanned Aircraft System(s)
UAS OSC	Unmanned Aircraft System(s) Operating Safety Case

V

VLOS	Visual Line of Sight
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Glossary of Terms

A

Accountable Manager – Somebody who has the authority for ensuring that all activities are carried out in accordance with the applicable requirements and is responsible for establishing and maintaining an effective Management System.

Aircraft - Any machine that can derive support in the atmosphere from the reactions of the air other than the reactions of the air against the Earth's surface.

Air Navigation Order (ANO) - The legal document, established as a UK Statutory Instrument (SI) that is made for the purposes of regulating air navigation within the United Kingdom.

As Low as Reasonably Practicable - Risk management term; see also 'Risk Tolerance'. A risk can be said to be reduced to a level that is ALARP when the sacrifice of further reduction is "grossly disproportionate" to the decrease in risk that would be achieved. An ALARP argument must balance the "sacrifice" (in time, money or trouble) of possible

further risk reduction measures against their expected safety benefit (incremental reduction in risk exposure). Essentially, the '*stopping condition*' for risk reduction due to practical, economic or other such reasons.

B

Beyond visual line-of-sight (BVLOS) operation. A type of UAS operation which is not conducted in visual line of sight of the remote pilot or competent observer. .

C

C2 Link - The data link between the remotely-piloted aircraft and the remote pilot station for the purposes of managing the flight.

Competent Observer – A trained, and competent person designated by the operator who, by visual observation of the remotely-piloted aircraft, assists the remote pilot in the safe conduct of the flight.

Concept of Operations - describes the characteristics of the organisation, system, operations and the objectives of the user.

Congested Area – in relation to a city, town or settlement, means any area which is substantially used for residential, industrial, commercial or recreational purposes.

Controlled airspace – airspace which has been notified as Class A airspace, Class B airspace, Class C airspace, Class D airspace or Class E airspace;

Controlled Ground Area – The ground area where the UAS is operated and within which the UAS operator can ensure that only involved persons are present

D

Detect and Avoid - The capability to sense or detect conflicting traffic or other hazards and take the appropriate action.

E

Electronic Conspicuity - Electronic Conspicuity (EC) is an umbrella term for a range of technologies that can help airspace users to be more aware of other aircraft in the same airspace.

Emergency Response Plan – Plan of actions to be carried out by the operator/ remote pilot in the event of an emergency situation while conducting UAS operations.

Exemption – A document issued by the CAA which is used to allow an exception to the established regulations as listed within the Air Navigation Order.

F

Flight Restriction Zone (FRZ)- Airspace of defined dimensions around a protected aerodrome within which the permission of the relevant ATS unit or aerodrome operator, as appropriate, is required before a small unmanned aircraft flight can take place.

G

Ground Control Station (GCS) - See 'Remote Pilot Station'.

Note: RPS is the preferred term as it enables the consistent use of one term with the same meaning irrespective of its location (e.g. on a ship or in another aircraft).

H

Handover - The act of passing piloting control from one remote pilot station to another.

Hazard - A condition or object with the potential of causing injuries to personnel, damage to equipment or structures, loss of material, or reduction of ability to perform a prescribed function (*ICAO Doc 9859, Safety Management Manual (SMM)*)

High Authority - those systems that can evaluate data, select a course of action and implement that action without the need for human input.

Highly Automated - those systems that still require inputs from a human operator (e.g. confirmation of a proposed action) but which can implement the action without further human interaction once the initial input has been provided.

L

Lost C2 Link - The loss of C2 Link with the unmanned aircraft such that the remote pilot can no longer manage the aircraft's flight.

N

National Qualified Entity – A person or organisation approved by the CAA to submit reports relating to pilot competence in operating a small unmanned aircraft.

O

Operating Safety Case – Methodology used to apply to the CAA for a Permission or Exemption to operate a UAS within the UK.

Operational Authorisation – A document issued by the CAA that authorises the operation of an unmanned aircraft system, subject to the conditions outlined within the authorisation, having taken into account the operational risks involved.

P

Permission – Authorisation issued by the CAA to allow flights within the UK subject to the conditions and limitations specified.

R

Radio Line-Of-Sight (RLOS) - A direct radio link point-to-point contact between a transmitter and a receiver.

Redundancy - The presence of more than one independent means for accomplishing a given function or flight operation.

Remote Pilot - 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. Regulation (EU) 2018/1139

Note: Within ANO 2016, article 94G the “remote pilot”, in relation to a small unmanned aircraft, is an individual who—

- (i) operates the flight controls of the small unmanned aircraft by manual use of remote controls, or*
- (ii) when the small unmanned aircraft is flying automatically, monitors its course and is able to intervene and change its course by operating its flight controls*

In this document, the term ‘remote pilot’ is used for all sizes of unmanned aircraft, hence the first definition is applicable.

Remote Pilot Station (RPS) - The component of the remotely-piloted aircraft system containing the equipment used to pilot the remotely-piloted aircraft.

Remotely-Piloted Aircraft (RPA) - An unmanned aircraft which is piloted from a remote pilot station.

Runway Protection Zone – Airspace of defined dimensions, which comprises part of the UAS Flight Restriction Zone, which is established for the protection of aircraft operating along the extended runway centreline.

S

Safety - The state in which the possibility of harm to persons or of property damage is reduced to, and maintained at or below, an acceptable level through a continuing process of hazard identification and safety risk management. (ICAO Doc 9859, *Safety Management Manual (SMM)*)

Safety Management System (SMS) - A systematic approach to managing safety, including the necessary organizational structures, accountabilities, policies and procedures.

Safety Risk Level – The combined estimation of likelihood and severity of harm to people when they encounter aviation.

Small Unmanned Aircraft - Any unmanned aircraft, other than a balloon or a kite, having a mass of not more than 20 kg without its fuel but including any articles or equipment installed in or attached to the aircraft at the commencement of its flight.

Small Unmanned Surveillance Aircraft - A small unmanned aircraft which is equipped to undertake any form of surveillance or data acquisition.

SUA Operator – In relation to a small unmanned aircraft, the SUA operator is the person who has the management of the small unmanned aircraft.

Swarming – Operation of more than one UAS, which are controlled collectively rather than individually.

T

Temporary Danger Area – A Danger Area that has been established on a short term (temporary) basis.

Tethered Unmanned Aircraft - An unmanned aircraft that remains securely attached (tethered) via a physical link to a person, the ground or an object all the time it is flying. The tether normally takes the form of a flexible wire or a cable and may also include the power supply to the aircraft as well.

Tolerable – Risk management term; see also ALARP. The threshold levels of risk appetite that can be accepted. The Health and Safety Executive defines Tolerable as a “willingness by society as a whole to live with a risk so as to secure certain benefits and in the confidence that the risk is one that is worth taking and that it is being properly controlled”

Transponder Mandatory Zone - Airspace of defined dimensions wherein the carriage and operation of pressure-altitude reporting transponders is mandatory

U

Unmanned Aircraft (UA) - Any aircraft operating or designed to operate autonomously or to be piloted remotely without a pilot on board.

Note: RPA is considered a subset of UA.

Unmanned Aircraft System (UAS) – An unmanned aircraft and the equipment to control it remotely.

Note: The UAS comprises individual 'System Elements' consisting of the Unmanned Aircraft (UA) and any other System Elements necessary to enable flight, such as a Remote Pilot Station, Communication Link and Launch and Recovery Element. There may be multiple UAs, RPS or Launch and Recovery Elements within a UAS.

Unmanned Aircraft System operator – Any legal or natural person operating or intending to operate one or more UAS.

V

Variation – A request to change the conditions within an already granted Permission, Exemption or other operational authorisation