Remotely Piloted Aircraft Systems

An information paper for the Senate Standing Committee on Foreign Affairs and Trade

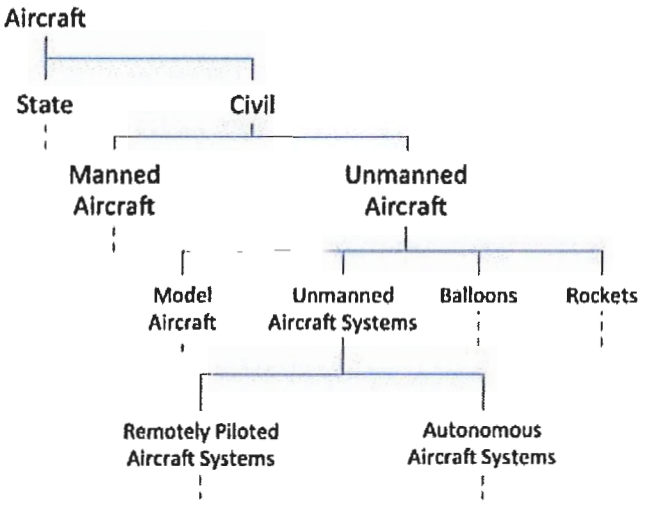
Background

The Civil Aviation Safety Authority (CASA)[1] regulates unmanned aircraft through the Civil Aviation Safety Regulation (CASR) Part 101. An unmanned aircraft is an aircraft, and is generally referred to an Unmanned Aerial Vehicle (UAV), model aircraft, rocket, unmanned free balloon or kite. The term UAV is being replaced with the more correct terms of Unmanned Aircraft System (UAS) or Remotely Piloted Aircraft Systems (RPAS). An RPAS consists of a Remotely Piloted Aircraft (RPA), a Remote Pilot Station (RPS) and the Command and Control data-link that connects them. CASR Part 101 sets out the requirements for the operation of unmanned aircraft (including model aircraft), and (to the extent that the operation of rockets and fireworks affects or may affect the safety of air navigation) the operation of rockets and the use of certain fireworks. RPAs are used in aerial work operations for hire or reward in such activities as aerial agriculture, aerial surveying and aerial photography. Model aircraft are used for sport and recreation use and relate to operations that are performed as a hobby. CASA is clearly focused on its safety related functions and responsibilities under the Civil Aviation Act and on ensuring the aviation industry is fully aware of its own obligations to maintain the highest standards of aviation safety.

An operating certificate and unmanned aircraft controller's certificate are required to be issued by CASA to conduct RPA operations.

It was originally thought that RPAs would be similar to the type used in military systems but that is not proving to be the case. Instead, the technology has advanced so quickly in this area that small, off-the-shelf types are able to provide advanced capability for a range of applications. The regulation of these aircraft is made more difficult for CASA because they are readily obtainable at a low cost, making them appealing to a large number of prospective users.

The safety of other airspace users, as well as the safety of people and property on the ground is CASA's priority in this rapidly growing sector. A key challenge for the organisation will be public education to ensure that operators understand the potential impact of their activities on other airspace users and the general public on the ground.



ICAO Classification Hierarchy

[1] A full list of abbreviations used within this report can be found at Annex A.

Regulatory Aspects

CASR Part 101 was promulgated in 2002 in anticipation of civil operations of unmanned aircraft. At the time there was little civil operational experience to draw on from other States and, as a consequence, there was limited detail included in the regulation. This regulation is now outdated in terms of terminology and operational capabilities due to technological developments.

Under CASA Project OS 11/20, amendments have been drafted to reflect the terminology being used by ICAO, to clarify the requirements for remote pilot training and certification, to remove redundant requirements and to simplify the process for approval. The project also examined the establishment of a risk-based framework for regulating RPA operations by weight.

CASA is developing a suite of Advisory Circulars aimed at providing better guidance to RPAS operators, crew, manufacturers and maintainers, and the means whereby they may safely and legally operate an RPA. A Manual of Standards (MOS) is also under development to assist operators in understanding requirements.

Airspace

The Office of Airspace Regulation (OAR) within CASA has carriage of the regulation of Australian-administered airspace, in accordance with section 11 of the Airspace Act 2007 (Act). Section 12 of the Act requires CASA to foster both the efficient use of Australian-administered airspace and equitable access to that airspace for all users. CASA must also take into account the capacity of Australian-administered airspace to accommodate changes to its use. In exercising its powers and performing its functions, CASA must regard the safety of air navigation as the most important consideration.[2]

Section 3 states that 'the object of this Act is to ensure that Australian-administered airspace is administered and used safely, taking into account the following matters:

a. protection of the environment;

b. efficient use of that airspace;

c. equitable access to that airspace for all users of that airspace; and

d. national security.'

The Act does not provide for CASA to consider privacy as a reason to administer the airspace and there is no legislative basis on which CASA may consider privacy.

In line with the International Civil Aviation Organization (ICAO) Annex 11 and as described in the Australian Airspace Policy Statement (AAPS), Australian airspace is classified as Class A, C, D, E and G depending on the level of air traffic services required to manage traffic safely and effectively. Class B and F are not currently used in Australia. The classification determines the category of flights permitted and the level of Air Traffic Services (ATS) provided. Annex B provides details of the classes of airspace used in Australia. Within this classification system aerodromes are either controlled (i.e. Class C or Class D) or non-controlled (Class G).

Large RPA such as the Global Hawk[3] typically operate at high altitude (60,000 feet above mean sea level (AMSL)) which is within Class A airspace. These aircraft are

[2] Civil Aviation Act 1988, Section 9A – Performance of Functions

[3] Refer to Annex C for examples of RPAs used in Australian airspace.

fitted with Transponders and Automatic Dependant Surveillance– Broadcast (ADS-B) avionics which allows them to be identified by Air Traffic Control (ATC). These RPAs are managed as a manned aircraft operating under the instrument flight rules (IFR) and are positively separated from other aircraft.

Medium sized RPA such as the ScanEagle generally operate at low levels, within Class G airspace. Some of the aircraft are fitted with transponders, however the majority of the smaller RPAs are not transponder equipped and therefore are not known to air traffic controllers (ATC). Positive separation and a Directed Traffic Information service (DTI) are not able to be provided by ATC as the RPAs are not visible to the air traffic management system.

Operational Context

Military RPAs, known as drones, can operate at high altitude (above 40,000 feet AMSL) whereas small civil RPAs generally operate at low altitude (less than 400 feet above ground level (AGL)). However, CASA is receiving requests from operators of larger RPAs to operate at higher levels (such as 7,500 feet AMSL), which brings them into conflict with Visual Flight Rules (VFR) general aviation and recreational aircraft and smaller IFR aircraft.

To reduce the risk of conflicts between RPAs and manned aircraft, CASA has declared Temporary Restricted Areas (TRAs) or Temporary Danger Areas (TDAs) for RPAS operations near or within busy airspace. In conjunction with the declaration of a TRA or TDA, a Notice to Airmen (NOTAM) is issued to alert airspace users to RPAS operations. Warning NOTAMs may be issued to alert airspace users to RPAS operations without the associated declaration of a TRA or TDA.

As additional experience has been captured about operating methods and processes, CASA has adjusted the limitations placed on UOCs to ease (not remove) restrictions to enable wider safe operation of RPAS.

	TRA and NOTAM	TDA and NOTAM	NOTAM only	AREA APPROVALS
2011	2	3	2	RO
2012	1	2	1	RO
2013	-	2	-	28

Table 1: Summary of TRA, TDA, NOTAMs and Area Approvals.
(RO = Regional office. Prior to April 2013, Area Approvals were granted by the CASA Regional offices. Data not available at time of this report.)

As At	RPAS Certificates
January 2012	15
February 2013	34
10 February 2014	72 (35 being assessed)
30 April 2015	226 (131 being assessed)

Table 2: Summary of RPAS Operator certificates issued.

Operational Issues

Aircraft operating under the VFR use "see-and-avoid" as a method for preventing mid-air conflicts. RPAs do not have the ability to "see-and-avoid" other aircraft, therefore the majority of Area Approvals have been granted to RPAs operating within Visual Line of Sight (VLOS). The operator must be able to see and control the aircraft at all times. VLOS operations limits the operational area of the RPA.

Advances in technology permit large RPAs to operate Beyond Visual Line of Sight (BVLOS). CASA expects an increase in applications for BVLOS operations to conduct activities such as bushfire-spotting, shark spotting, search and rescue, police surveillance and geological surveys. CASA has provided segregated airspace for BVLOS operations due to the unmitigated risks of conflicts with other aircraft. This policy will need to be reviewed as technology advances permit "detect and avoid" operations by RPA.

The poor altitude holding ability of some of these aircraft increases the difficulty of maintaining separation between RPAs and manned aircraft. The potential for conflicts has been a primary consideration as to whether segregated airspace has been declared for an RPAS operation.

CASA is anticipating an increase in operators applying to use RPAs in Controlled Airspace (CTA). Large RPAs such as the Global Hawk already operate in CTA, however, applications from operators of small to medium sized RPAs are anticipated as new uses for RPAS are developed.

Large RPAs are being developed to operate for longer periods of time and at higher altitudes. Operating at higher altitudes brings the RPAs into conflict with manned aircraft. CASA has utilised TRAs and TDAs as a method to segregate and alert other airspace users to RPAS operations. The development of "detect and avoid" technology for RPAS will reduce the need to segregate RPAS operations from other airspace users.

International Practices

The International Civil Aviation Organisation (ICAO) is committed to the development of Standards and Recommended Practices (SARPs), Procedures and Guidance Material for the civil use of RPAS. ICAO supports the safe, secure and efficient integration of RPA into non-segregated airspace and aerodromes.

This work is being done through the ICAO Unmanned Aircraft System Study Group (UASSG) and CASA currently holds the Chair of this Group.

The ICAO UASSG published UAS Circular 328 in March 2011 which appraised States of the emerging ICAO perspective on the integration of RPAS. The current body of work is the development of an RPAS Guidance Manual which will provide guidance to States as they establish their own regulatory framework for RPAS. This is expected to be published in 2014.

ICAO is also contributing to the development of technical specifications for detect and avoid and command and control data-links for RPAS.

An ICAO roadmap for the integration of RPAS is under development and is expected to be released in 2014.

Canada, Singapore and some European nations allow only VLOS operations in segregated airspace. The United States of America (USA) provides segregated

airspace to RPAS operations or imposes restrictions on the operator. The USA policy states that:

> *Those RPAS issued with a Federal Aviation Administration (FAA) Special Airworthiness Certificate have specific airspace and operational limitations that address the operators' specific needs, which are also intended to assure an equivalent level of safety.*
>
> *All other RPAS operations are pending regulatory approval.*[4]

In Norway, current RPAS operations can broadly be divided into two groups:

a) Rotorcraft of various sizes, for local commercial visual line of sight operations, e.g. photography of buildings;

b) Fixed-wing aircraft up to 50 kilograms, for research operations beyond line of sight in remote/arctic areas.

An article on RPAS in Norway states that *"The VLOS operational concept may not be sufficient to provide adequate safety for operation of all types or sizes of unmanned aircraft in non-segregated airspace."*

Annexes:

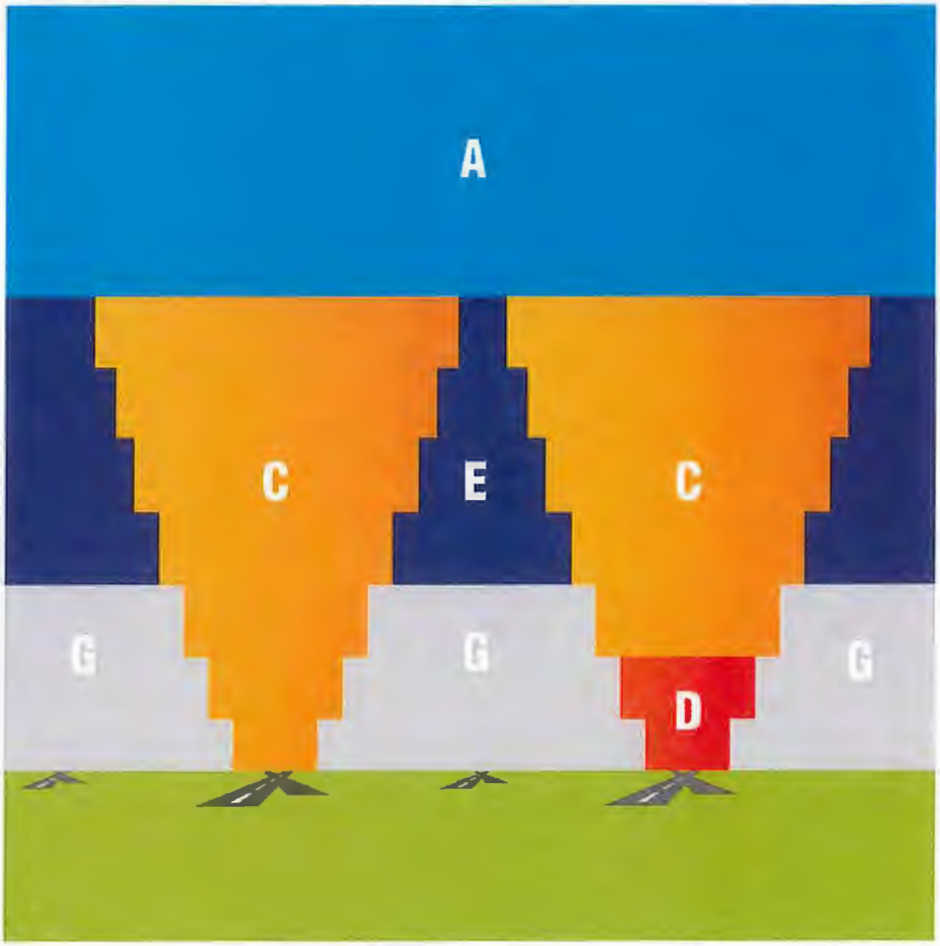
A. Abbreviations
B. Australian Airspace Structure
C. Examples of Available RPAS

[4] The FAA is not able to provide any information regarding specific pending regulatory action.

ANNEX A – ABBREVIATIONS

Abbreviation	Explanation
AAPS	Australian Airspace Policy Statement
AARD	Airspace and Aerodrome Regulation Division
Act	*Airspace Act 2007*
ADS-B	Automatic Dependant Surveillance Broadcast system
AGL	Above Ground Level
Airservices	Airservices Australia
AMSL	Above Mean Sea Level
ATC	Air Traffic Control
ATS	Air Traffic Service
ATSB	Australian Transport Safety Bureau
BVLOS	Beyond Visual Line of Sight
CASA	Civil Aviation Safety Authority
CASR	Civil Aviation Safety Regulation 1998
CTAF	Common Traffic Advisory Frequency
Department	Department of Infrastructure and Regional Development
DTI	Directed Traffic Information
FAA	Federal Aviation Administration
FL	Flight Level
ft	feet
ICAO	International Civil Aviation Organization
IFR	Instrument Flight Rules
IMC	Instrument Meteorological Conditions
kg	kilograms
kt(s)	knot(s)
m	metre(s)
MTOW	Maximum Take Off Weight
NM	Nautical Miles
NOTAM	Notice to Airmen
OAR	Office of Airspace Regulation
OCTA	Outside of Controlled Airspace
RA	Restricted Area
RAAF	Royal Australian Air Force
RPAS	Remotely Piloted Aircraft Systems
TDA	Temporary Danger Area
TRA	Temporary Restricted Area
UAV	Unmanned Aerial Vehicle (Obsolete term)
USA	United States of America
VFR	Visual Flight Rules
VLOS	Visual Line of Sight

ANNEX B – AUSTRALIAN AIRSPACE STRUCTURE



Class A:
IFR flights only are permitted. All flights are provided with an air traffic control service and are positively separated from each other.

Class C:
All aircraft must get an airways clearance and communicate with air traffic control. IFR aircraft are positively separated from both IFR and VFR aircraft. VFR aircraft are provided traffic information on other VFR aircraft.

Class D:
All aircraft must get an airways clearance and communicate with air traffic control. IFR aircraft are positively separated from other IFR aircraft and are provided with traffic information on all VFR aircraft. VFR aircraft are provided traffic information on all other aircraft.

Class E:
IFR aircraft require an airways clearance and must communicate with air traffic control. IFR aircraft are positively separated from other IFR aircraft and given traffic information on known VFR aircraft. VFR aircraft do not require an airways clearance and are not required to communicate with air traffic control.

Class G:
IFR and VFR flights are permitted and do not require an airways clearance. IFR flights must communicate with air traffic control and receive traffic information on other IFR flights and a flight information service. VFR flights receive a flight information service if requested.

ANNEX C – EXAMPLES OF AVAILABLE RPAS

Global Hawk

Length: 14.5 metres
Wingspan: 39.9 metres
Max Take-off Weight: 14,628 kilograms
Endurance: 32+ hours
Maximum Altitude: 60,000 feet
Cruise speed: 310 knots

Heron

Length: 8.5 metres
Wingspan: 16.6 metres
Max Take-off Weight: 1,100 kilograms
Endurance: Up to 24 hours
Maximum Altitude: 30,000 feet
Cruise speed: 100 knots

ScanEagle

Length: 1.71 metres
Wingspan: 3.11 metres
Max takeoff weight: 22 kilograms
Endurance: 24+ hours
Maximum Altitude : 19,500 feet
Cruise speed: 50-60 knots

DraganFlyer

Length: 87 centimetres
Width: 87 centimetres
Operational weight: 2.5 kilograms