Australian Government
Civil Aviation Safety Authority

Advisory Circular

AC 21-43(0) JUNE 2006

EXPERIMENTAL CERTIFICATE FOR LARGE UNMANNED AERIAL VEHICLE (UAV)

CONTENTS

1. REFERENCES

- Civil Aviation Safety Regulations (CASR) Part 101 – Unmanned aircraft and rocket operations
- Civil Aviation Safety Regulations (CASR) Part 21 – Certification and airworthiness requirements for aircraft and parts
- Civil Aviation Safety Regulations (CASR) Part 47 – Registration of aircraft and related matters
- AC 21.10(0) - Experimental Certificates
- AC 101-1(0) - Unmanned Aircraft and Rockets
- AC 47-1(1) - Registration of Aircraft and Related Matters

2. PURPOSE

This Advisory Circular (AC) provides guidance to applicants seeking an Experimental Certificate for a large Unmanned Aerial Vehicle (UAV) which is an aeroplane with a launch weight of 150kg or above. While this document provides a means of compliance with the regulations, alternative means of compliance demonstrating an equivalent level of safety will be considered by CASA on a case by case basis.

3. STATUS OF THIS AC

This is the first AC to be published on this subject.

Advisory Circulars are intended to provide advice and guidance to illustrate a means, but not necessarily the only means, of complying with the Regulations, or to explain certain regulatory requirements by providing informative, interpretative and explanatory material.

Where an AC is referred to in a 'Note' below the regulation, the AC remains as guidance material.

ACs should always be read in conjunction with the referenced regulations.

4. BACKGROUND

4.1. CASR Part 101 - "Unmanned aircraft and rocket operations" was introduced to consolidate the rules governing all unmanned aeronautical activities into one body of legislation. These rules require the operation of a large UAV with a launch mass greater than 150 kg to be issued with either an Experimental Certificate or a Certificate of Airworthiness in the restricted category.

4.2. CASR 21.191 - provides for the issue of an Experimental Certificate for specific purposes. Some of these purposes would satisfy the operations of a large UAV which is not type certificated in the restricted category. The Experimental Certificate will contain specific conditions and limitations pertaining to the operations of the UAV. The issue of an Experimental Certificate by CASA will allow the aircraft to operate under specific UAV operational requirements contained in CASR Part 101. However it is also necessary to apply to CASA for approval to operate the UAV under CASR Part 101 (See AC 101-1(0) Unmanned Aircraft and Rockets).

4.3. It should be emphasised that this AC should be read in conjunction with CASRs 21.191, 21.193, 21.195, 21.195A and 21.195B.

4.4. For the purposes of issuing an Experimental Certificate, the UAV includes all system elements consisting of the aircraft, the remote control station, and any other elements necessary to enable flight such as command and control data links, communication systems, launch and recovery elements, and flight systems. It should be noted that other regulatory authorities may refer to a UAV as an Unmanned Aircraft System (UAS).

5. APPLICATION FOR AN EXPERIMENTAL CERTIFICATE

5.1. Who may apply?

5.1.1. The registration holder of a UAV is eligible to apply for an Experimental Certificate. (Refer to CASR 21.192 and Section 6 to this AC).

5.2. Where to apply

5.2.1. The aircraft registration holder can apply to CASA or an authorised person.

5.2.2. If the applicant applies to CASA, he/she should contact the CASA Service Centre to lodge an application

The contact details for the CASA Service Centre are:
Telephone: 136 773 (toll free)
Facsimile: (07) 3842 2580
Email: regservices@casa.gov.au
Postal: PO Box 836, Fortitude Valley, QLD 4006

CASA Service Centre staff are available from 8.00am to 6.30pm EST, Monday to Friday, to answer questions and explain the application process.

5.3. The application form

5.3.1. The application is made on CASA Form No. 718 "Application for Issue of a Special Certificate of Airworthiness" These forms can be obtained from any CASA office or from the CASA website at http://casa.gov.au/manuals/regulate/csofa/form718.pdf.

5.3.2. The CASA Service Centre will review the application for completeness. Should the application be incomplete, you will be contacted and provided with the opportunity to address the shortfall. If you do not provide the information requested by CASA to complete your application, it may be rejected.

5.4. Costs

5.4.1. CASA charges a fee to process an application for the issue of an Experimental Certificate. An hourly fee is charged, as specified in 'Schedule 1 - Fees for aviation regulatory services' to the Civil Aviation (Fees) Regulations 1995. It should be noted that in accordance with Section 97 of the Civil Aviation Act 1988, the Experimental Certificate may not be processed until CASA receives full payment of the fee.

5.5. CASA Authorised Person

5.5.1. An applicant may wish the processing of an application for an Experimental Certificate to be undertaken, from the outset, by a person who is authorised by CASA to process and issue an Experimental Certificate on CASA's behalf.

5.5.2. In this case, the CASA authorised person will undertake the necessary initial coordination with CASA. A different fee structure would usually apply in the case of an application through a CASA authorised person. This is a matter for the applicant and authorised person to negotiate, which in turn is outside CASA control.

6. REGISTRATION AND MARKING

6.1. Prior to the application for the issue of the Experimental Certificate, the UAV must be registered (Refer CASR 47.015). Therefore the first step in the process is to apply to CASA for registration. Refer to AC 47-1(1) – Registration of aircraft and related matters.

6.2. In addition to the nationality and aircraft registration marks, the following markings and identifications (Refer to CASR Part 45 and CASR 101.255) are also required:

- an aircraft registration identification plate must be attached to an accessible location.
- an aircraft data plate with specific information imprinted on it must be fixed to the aircraft.
- the word "EXPERIMENTAL" must be displayed on the aircraft in letters not less than 5 cm nor more than 15 cm in height. The letters should be in block capitals of a style that is conspicuous and legible, and easily read.

7. PRESCRIBED PURPOSES FOR UAV OPERATIONS

7.1. In accordance with CASR 21.191, one or more of the following purposes may be considered for the issue of an Experimental Certificate for a large UAV:

- research and development (R&D);
- showing compliance with regulations;
- training the applicant's UAV Controller;
- exhibition of the UAV.

7.2. The UAV will require a suitable maintenance program prior to the issue of the Experimental Certificate. A maintenance release does not have to be issued prior to the issue of an Experimental Certificate. However, a UAV operating on an Experimental Certificate cannot fly legally until a maintenance release has been issued and is in force.

8. RESEARCH AND DEVELOPMENT PURPOSES

8.1. An Experimental Certificate issued for research and development purposes, allows operation of the UAV for testing new UAV design concepts, researching UAV operations, testing equipment and installations specific to UAVs or developing UAV operating techniques. It is primarily intended for Research and Development operations which lead to the issue of a type certificate or proof of concept for a special operation. Such examples could be coast watch trials or pipeline inspections, etc.

8.2. A UAV issued with an Experimental Certificate for Research and Development purposes will be permitted to operate in a designated unpopulated area (refer to CASR 101.025 for meaning of populous area) during daylight hours using the Visual Flight Rules (VFR). To operate under Instrument Flight Rules (IFR) and night flying will require further approval from CASA. It should be capable of aborting a mission and returning the aircraft to base or demonstrating flight termination if communication is lost or the aircraft approaches the boundaries of the designated area. (Refer CASR 101.275 and 101.280).

8.3. To demonstrate flight termination, the aircraft must be capable of landing in an area that would not result in damage to property or injury to persons on the ground. The probability for exiting the designated operational area should not be greater than 10^{-5}. The applicant would need to undertake a risk assessment of all possibilities and address each possibility separately and have a mitigating plan of action to minimise the risk in case the UAV leaves the designated area.

9. SHOWING COMPLIANCE WITH REGULATIONS

9.1. After completion of testing under the R&D purpose, the UAV can be issued with an Experimental Certificate to show compliance with the regulations and standards. This could be for the issue of a type certificate or a supplementary type certificate, demonstrating a major design change or demonstrating a safe flight history by showing compliance with the function and reliability requirements of the regulations.

9.2. The UAV may be issued with an Experimental Certificate to show compliance with a range of standards that may include:

- structural, avionics, and mechanical systems;
- propulsion;
- launch;
- ground control (including communications and links with the UAV);
- flight testing.

9.3. The UAV operational limitations would be confined to a designated unpopulated area and approval to operate at night or in conditions other than VMC would be required by CASA.

9.4. The UAV issued with an Experimental Certificate under this purpose is to be capable of aborting a mission and returning the aircraft to base or demonstrating flight termination, if communication is lost or prior to UAV breaching the boundaries of the designated area. (Refer to paragraph 8.3).

10. TRAINING UAV CONTROLLERS

10.1. An Experimental Certificate can be issued for the purpose of training UAV controllers. This purpose is limited to UAV controllers who require training for subsequent operations of the UAV in type certification programs or for production flight testing. At this stage, the UAV should have demonstrated compliance with the agreed standards.

10.2. The UAV operational limitations would be confined to a designated unpopulated area and approval to operate at night or in conditions other than VMC would be required by CASA. The person responsible for conducting the training (the trainer) should be qualified and approved as a UAV controller and operator instructor.

10.3. The UAV should be capable of aborting a mission and returning the aircraft to base or demonstrating flight termination if communication links have been severed or the aircraft has experienced during flight uncontrolled commands. Flight termination would be required prior to breaching the boundaries of the designated area. (Refer to paragraph 8.3).

11. EXHIBITION

11.1. An Experimental Certificate can be issued for the purpose of exhibiting the flight capabilities, performance or unusual characteristics of a UAV. This can also include flying to and from the venue or training for an exhibition or maintaining proficiency. The Experimental Certificate for this purpose is normally valid for an unlimited period of time.

11.2. The UAV operations under this purpose are limited to a specific area in the vicinity of the airport or at the venue of the intended exhibition. This may also include flying to and from the venue. The UAV should have demonstrated compliance with agreed standards.

11.3. The UAV should be capable of aborting a mission and returning the aircraft to base or demonstrating flight termination if communication is lost (Refer to paragraph 8.3).

12. ISSUE OF THE EXPERIMENTAL CERTIFICATE

12.1. Prior to issue of the Experimental Certificate, CASA or the authorised person will require an inspection of the aircraft and all associated support systems. (Refer to CASR 21.193). The applicant should facilitate this and understand that this should resolve issues associated with the imposition of conditions or operational limitations deemed necessary in the interests of safety.

12.2. Subsequent to the inspection, CASA or the authorised person will decide on the conditions, limitations and directions applicable to the application. This will be documented in the Annex to the Experimental Certificate.

12.3. Duration

12.3.1. The Experimental Certificate is in force for a specified period, until it is cancelled or until the aircraft registration is ceased. For the purposes of research and development, showing compliance with the regulations, or UAV operator training, the duration of the Experimental Certificate is limited to a maximum period of one year. (Refer to CASR 21.195B). However it is possible to renew the experimental certificate but a new application would need to be lodged.

12.4. Cancellation/Suspension

12.4.1. If the holder of the Experimental Certificate does not comply with the conditions, limitations or the regulations, CASA or the authorised person can suspend or cancel the Experimental Certificate. For example, such action could occur if maintenance on the aircraft is not carried out in accordance with the regulations or if operation of the aircraft is deemed unsafe and is a hazard to other airspace users and persons on the ground.

12.4.2. The holder of the Experimental Certificate is required to surrender the certificate, at the written request of CASA or an authorised person, to CASA or an authorised person if it is expired, suspended or cancelled. (Refer to CASR 21.195B(8)).

13. CONDITIONS AND LIMITATIONS

13.1. Conditions, limitations and directions for the operation of the UAV are entered in the Annex to the Experimental Certificate. These will be specific to the purpose of the certificate and the operation of the UAV.

13.2. CASA or the authorised person may impose any additional conditions or limitations deemed necessary in the interests of safety to other airspace users or persons on the ground. (Refer CASR 21.95). The conditions and limitations will be explained to the applicant to ensure the requirements are fully understood.

14. OTHER APPROVALS REQUIRED FOR UAV

(Refer to CASR Part 101 and AC 101-1(0))

14.1. To operate a UAV under CASR Part 101 with an Experimental Certificate, the person who controls the UAV must be a certified UAV controller. These UAV controllers should be required to demonstrate satisfactory knowledge of ground and flight operations via examination flight checks. Also the maintenance on a UAV must be carried out by a person who holds a maintenance authority or, under the supervision of a person who holds the maintenance authority.

14.2. Also, under CASR Part 101, CASA requires an operating approval for all UAVs with an Experimental Certificate. CASA can impose additional conditions on the approval in the interests of air safety. The approval may cover the following:

- Who may operate the UAV;
- The operating area, altitudes and times;
- Notification requirements for Aeronautical Information Publication (AIP) and Notice To Airmen (NOTAM); or
- Communication requirements, limitations, restrictions and safety requirements.

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