

Revision 2

4 February 2014

## Special Category—Amateur-Built Aircraft Airworthiness Certificates

### General

Civil Aviation Authority advisory circulars contain information about standards, practices, and procedures that the Director has found to be an **acceptable means of compliance** with the associated rule.

An acceptable means of compliance is not intended to be the only means of compliance with a rule, and consideration will be given to other methods of compliance that may be presented to the Director. When new standards, practices, or procedures are found to be acceptable they will be added to the appropriate advisory circular.

An advisory circular may also include **guidance material** to facilitate compliance with the rule requirements. Guidance material must not be regarded as an acceptable means of compliance.

### Purpose

This advisory circular provides methods acceptable to the Director for showing compliance with Part 21, Certification of Products and Parts.

### Related Rules

This advisory circular relates specifically to Civil Aviation Rule Part 21, Subpart H – *Airworthiness Certificates*, Rule 21.173(5) *Special category–amateur-built airworthiness certificate*, and Rule 21.197 *Special category–amateur-built certification requirements*.

### Change Notice

Revision 2 makes the following changes:

- amends Annual Review of Airworthiness (ARA) to read Review of Airworthiness (RA)
- updates the CAA point of contact manager title

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- amends the period for Review of Airworthiness (RA) to read 24 month period to align with Part 91
- inserts a new paragraph (l) under “Design and Construction” to clarify some policy issues which could affect eligibility to be classified as an amateur-built aircraft
- amends paragraphs (a) and (c)(vii) under “Amateur Aircraft, Constructed Outside New Zealand”, to align with current policy for imported aircraft
- amends rule reference 21.193(c) under “Issuance of Special Category Airworthiness certificate” to read 21.197(a)(9), to align with the current version of Part 21.

## Table of Contents

<b>Certification, Maintenance and Operation of Amateur-built Aircraft.....</b>	<b>4</b>
Definition .....	4
Purpose .....	4
Background .....	4
Transitional Provisions .....	5
CAA Inspection Criteria .....	5
Design and Construction .....	6
Construction Kits .....	7
Certification Steps .....	8
Aircraft Registration .....	9
Identification and Registration Marks.....	10
Marking and Placards - General.....	11
Issuance of Special Category Airworthiness certificate .....	11
Flight Evaluation Areas.....	12
Safety Precaution Recommendations .....	13
Design Changes after Airworthiness Certificate Issue.....	14
Review of Airworthiness .....	14
Amateur-built Aircraft Constructed Outside New Zealand .....	15
<b>Test Pilot Qualifications .....</b>	<b>16</b>
Guidelines for Test pilot Applicants .....	16
<b>Maintenance Approvals.....</b>	<b>17</b>
Pilot Maintenance .....	17
Maintenance of Amateur-built Aircraft .....	17
<b>Type Ratings.....</b>	<b>18</b>
19.407 First of type authorisation .....	18
<b>Reference Material .....</b>	<b>18</b>

## Certification, Maintenance and Operation of Amateur-built Aircraft.

### Definition

As used in this advisory circular, the term “CAA office” means the CAA office in Level 15, Asteron Centre, 55 Featherston Street, Wellington 6011,. Only this office may perform the airworthiness inspection and certification of an amateur-built aircraft.

As used in this advisory circular the term “vital point inspection” means an inspection carried out to ensure the correct assembly and functioning of a structural item or a component, the failure of which would cause structural collapse or loss of control.

### Purpose

This advisory circular provides guidance concerning the construction, certification, maintenance and operation of amateur built aircraft of all types. It explains how much fabrication and assembly the builder must do for the aircraft to be eligible for amateur built certification, and it describes the Civil Aviation Authority’s (CAA) role in the certification process. It does not replace any manufacturers, or designers, instruction manual or any other technical information supplied by a kit manufacturer or supplier of aircraft plans.

The responsibility for constructing an amateur built aircraft to the designers/manufacturers instructions using best aviation practice remains with the constructor.

### Background

CAA rules provide for the construction and operation of amateur built aircraft in New Zealand. Part 21 contains rules for the issue of special category - experimental airworthiness certificates, Part 47 contains rules for placing aircraft onto the New Zealand register of aircraft, Part 43 contains rules for the maintenance of aircraft, Part 66 provides for licensing and rating aircraft maintenance engineers, Part 39 contains rules regarding airworthiness directives and compliance with airworthiness directives. Some airworthiness directives issued under Part 39 may apply to amateur built aircraft, Part 12 contains rules regarding accident and incident reporting and Part 91 contains general operating and flight rules

Part 1 defines an amateur built aircraft as meaning an aircraft:

- (1) that is eligible for the issue of a special category airworthiness certificate under Part 21 Subpart H; and
- (2) at least 51% of which is fabricated by the aircraft’s amateur constructor.

In the construction of amateur built aircraft, commercially produced components and parts which are normally purchased for use in certified aircraft may be used. This includes engines and engine accessories, propellers, tires, burners, spring steel landing gear, main and tail rotor blades, rotor hubs, wheel and brake assemblies, forgings, castings, extrusions, and standard aircraft hardware such as pulleys, bell cranks, rod ends, bearings, bolts, rivets, and such like.

CAA rules allow constructors to build an aircraft with the minimum of CAA involvement and to prove the airworthiness by flight evaluation. The aircraft constructor will be responsible for the quality of workmanship, materials, maintenance, and the ultimate airworthiness of the aircraft: This concept allows the maximum freedom of choice and innovation, balanced with the need for the constructor to act responsibly and seek advice from those with the knowledge and appropriate qualifications before proceeding.

## Transitional Provisions

All amateur-built aircraft projects in existence prior to introduction of the rules come under the guidance of this advisory circular.

Workshops, tooling, and construction conditions are no longer assessed and approved by CAA. The responsibility to maintain high standards of construction in accordance with the designer's plans or construction manual remains with the builder. Placing this responsibility on the builder is consistent with the process followed under the FAA requirements, upon which the New Zealand rules are based.

Existing constructors should continue using the CAA 2170 Amateur-built aircraft Construction Record until completion of the project. All items signed off as completed prior to the introduction of Part 21 will be considered when the aircraft is presented for final Inspection.

It will no longer be mandatory for Stage inspectors to sign this document nor builders to seek approval for design changes during construction. However all design changes must be recorded in the aircraft logbook and be addressed during the flight evaluation phase.

Stage inspections are still highly recommended prior to the closing up of areas that can not be viewed during the CAA inspection. A photographic record of all areas closed up during construction will also be expected.

Vital point inspections should be carried out and a record of these inspections retained. The vital point inspection should cover items of structure, controls and systems components as they are assembled and tested. Vital point inspections should be carried out by an appropriately rated licensed aircraft maintenance engineer, a mentor appointed by the Sport Aircraft Association of New Zealand Inc. (SAANZ), or a person nominated by the constructor who is acceptable to the Director.

The qualification of Stage inspector no longer exists. Builder advice, assistance, and guidance is now provided, often voluntarily, by licensed aircraft maintenance engineers and SAANZ mentors. As the constructor is responsible for the standards of construction no certification can be made, or expected, by these persons. However a record of their inspection including the date completed and their identity should be retained.

Only the final inspection as discussed in this advisory circular will be carried out by CAA.

All owners of amateur-built aircraft initially issued with a Permit-to-Fly should now have returned this document to CAA and had it replaced with an airworthiness certificate in the special category.

## CAA Inspection Criteria

- (a) CAA inspections of amateur-built aircraft are limited to ensuring the use of acceptable workmanship, methods, materials, techniques and practices, and issuing operating limitations necessary to protect persons and property not involved in operating the aircraft.
- (b) Constructors who are not appropriately rated licensed aircraft maintenance engineers, are recommended to seek the advice of those persons having expertise with aircraft construction techniques, such as SAANZ, to inspect and advise on particular components. For example, wing assemblies, fuselages, and so on, prior to covering, and to conduct other inspections as necessary. This practice will provide an additional check on construction integrity and is in addition to the required vital point inspections. Constructors are encouraged to make use of internet user groups and web sites showing photographic progress of construction of aircraft of the same type.

## Design and Construction

- (a) Many individuals who desire to construct their own aircraft have little or no experience with respect to aeronautical practices, workmanship or design. An excellent source for advice in such matters is SAANZ. SAANZ is an organisation established for the purpose of promoting amateur aircraft construction and giving technical advice and assistance to its members. The SAANZ has a technical committee whose aim is to ensure the safety and reliability of amateur-built aircraft. The technical committee may appoint mentors who are willing to assist on amateur-built aircraft projects and offer constructive advice regarding workmanship or design, or both.
- (b) Any choice of engines: propellers; wheels, other components, and any choice of materials may be used in the construction of amateur-built aircraft. It is strongly recommended that materials of aircraft quality and specification be used in primary structure such as wing spars, fuselage structural members and critical attachment fittings. Materials of unknown strength and quality should not be used. Major sections (for example, wings, fuselage, empennage, and so on) from type certificated aircraft may be used in the construction as long as the sections are in a condition for safe operation. These sections are to be considered by the CAA inspector in determining the *major portion* for compliance with the definition in Part 1, Amateur-built Aircraft, but no credit for fabrication and assembly would be given the constructor for these sections. It is recommended that constructors contact the CAA office to co-ordinate the use of such sections.
- (c) The design of the cockpit or cabin of the aircraft should avoid, or provide for padding on, sharp corners or edges, protrusions, knobs and similar objects which may cause injury to the pilot or passengers in the event of an accident. It is strongly recommended that Technical Standard Order (TSO) approved or equivalent seat belts be installed along with approved shoulder harnesses. (Automotive seat belts to NZS 5401:1982 or BS 3254:1988, Part 1, would be acceptable as equivalents)
- (d) Engines installed in multi-seat aircraft should have an independent source of ignition to provide a back up if the primary source fails. An engine installation must ensure that adequate fuel is supplied to the engine in all anticipated flight attitudes. A suitable means, consistent with the size and complexity of the aircraft, should be provided to reduce fire hazard wherever possible. This would include a fireproof firewall between the engine compartment and the cabin. Fuel systems must have a firewall shut-off valve (with positive OFF and ON stops) and be capable of delivering 1.5 times the maximum required fuel flow to the engine. The fuel system must have water drains at the low points of all tanks and at the lowest points of the fuel system and an in-line filter or 'gascolator' in front of the firewall before the carburettor or injector. Fuel tanks should be positively vented and be capable of withstanding 10.3 kPa (1.5 psi). When applicable, a carburettor heat system must also be provided to minimise the possibility of carburettor icing.
- (e) Electrical installations should have individual circuit protection and wiring capable of carrying the anticipated load. A load analysis should be carried out on the planned electrical components against the capacity of the generation and storage system planned. It is recommended that aircraft-grade wiring and fittings should be used and vented cell batteries should be secured in enclosed boxes which are vented overboard.
- (f) Radio communication, navigation, intercommunication, transponder and emergency locator installations, meeting the requirements and specifications of Part 91, should be carried out to the manufacturer's Instructions taking into consideration the recommended aerial positions, ground planes and power requirements. All avionic equipment should be properly earthed and protected by fuses or circuit breakers. All radio equipment should be performance checked on installation by a qualified person using the appropriate test equipment to highlight any installation and performance problems before flight.

Rule 91.529 requires an aircraft (other than a microlight, or balloon) to have an approved, fully operative, automatic emergency locator transmitter installed in aircraft equipped to carry more than one person: Single seat aircraft are exempt providing the pilot is equipped with a portable ELT or personal locator beacon (PLB). Pilots of microlights and gliders are required to carry a PLB if the glider or microlight is operated more than 10 nm from the aerodrome of departure..

- (g) Rule 91.509 lists the minimum instruments and equipment required to be fitted to a New Zealand registered aircraft, while Rule 91.513 and Rule 91.515 covers the requirements for communications equipment. For those constructors wishing to have their aircraft considered for IFR flight, the additional instruments and equipment required by Rule 91.517 and Rule 91.519, Instruments and equipment for IFR flights, and IFR Communications and Navigation equipment must be carried.
- (h) Rule 91.511 lists the instruments and equipment required to be carried on all night VFR flights, in addition to those specified in Rule 91.509.
- (i) Additional information and guidance concerning acceptable fabrication and assembly is provided in - USA DOT FAA AC 43.13-1A, Acceptable Methods, Techniques, and Practices - Aircraft Inspection and Repair, and FAA AC 43.13-2A, Acceptable Methods, Techniques, and Practices — Aircraft Alterations. These publications are available on order from the Superintendent of Documents, US Government Printing Office, Washington, DC 20402, your local book store, or over the internet.
- (j) The constructor should engage the services of a qualified aeronautical engineer when major changes are contemplated or consult with the designer of purchased plans or construction kits, as appropriate, to discuss proposed aircraft design changes during construction.
- (k) For original designs, the constructor is advised to discuss the design with a qualified Aeronautical Engineer before proceeding.
- (l) The constructor is not permitted to modify a type certificated aircraft and then ask for it to be re-classified as an amateur-built aircraft, regardless of how extensive the changes are. The reason for this is because the amateur-built category is not intended to be used as a means to avoid normal modification standards for type certificated aircraft. Some major components of a type certificated aircraft may be used as part of an original design, such as a fuselage or a wing (but not both). However that component will then not be included when reviewing the work performed by the constructor when assessing eligibility under the 51% rule. (If both the wing and the fuselage of an existing aircraft are used, then there would not be enough left that could be considered as part of the amateur-built assessment to qualify as the “majority” (51%) of the aircraft.) The CAA has effectively adopted the FAA amateur-built system and associated definitions, including the FAA’s interpretation of the amateur-built category. The CAA generally approves of and accepts FAA interpretations relating to those particular rules.

## Construction Kits

- (a) An aircraft constructed from a kitset may be eligible for amateur-built certification provided the major portion has been fabricated and assembled by the amateur constructor: The major portion is deemed to be where the constructor carries out at least 51% of the fabrication, assembly and finishing of the aircraft.
- (b) A kitset may consist of raw stock such as lengths of wood, tubing, extrusions and sheet metal, which may have been cut to approximate lengths. A certain quantity of prefabricated parts such as heat treated ribs, bulkheads or complex parts made from sheet metal, fibreglass or polystyrene are also acceptable.

**Note:** Aircraft professionally manufactured outside the guidelines of the FAA Commercial Assistance programme are not eligible for certification in the special category as an amateur-built aircraft.

- (c) Various raw material and pre-formed parts kits are available internationally for use by aircraft constructors. Advertisements tend to be somewhat vague and may be misleading as to whether a kit is eligible for amateur-built certification. Constructors should verify that the aircraft kit they have chosen meets the FAA 51% rule and is eligible for certification as an amateur-built aircraft before ordering.
- (d) The CAA does not certify aircraft kits or approve kit manufacturers but, generally, will accept the FAA 51% ruling made on a particular kit. The FAA does evaluations of kits which have potential for national sales interest, but only for the purpose of determining if an aircraft constructed from the kits will meet the *major portion* criteria.

**CAUTION: Purchasers of partially completed kits should obtain all fabrication and assembly records from the previous owner(s). This may enable a constructor who completes the aircraft to be eligible for amateur-built certification.**

## Certification Steps

The following procedures are in the general order to be followed in the certification process:

- (a) **Initial Step** The prospective constructor should contact the CAA office (Manager Aircraft Certification ) to inform CAA of the intention to construct an amateur-built aircraft. During this contact, the type of aircraft, its complexity or materials (or both) may be discussed. CAA will forward a form CAA 2188, - Notice of Intention to Construct an Amateur-built Aircraft, to the prospective constructor for completion and return.
- (b) **Registration** The aircraft must be registered before requesting a special category airworthiness certificate. Refer to Part 47 for the registration and marking of aircraft.
- (c) **Marking** The registration marks assigned to the aircraft and an identification plate must be affixed in accordance with Part 47. General placards and markings are to be affixed. Identifiable paint schemes may be an option for replica historic or warbird aircraft.
- (d) **Application** Once the aircraft is completed and registered, the constructor may apply for a special category airworthiness certificate in the experimental subcategory, on Form CAA24021/06. The form and the following documents and data should be forwarded to the CAA office:
  - i. Enough data, such as three-view drawings or three-view dimensional photographs, to identify the aircraft.
  - ii. A notarised form CAA 2115, Eligibility Statement — Amateur-built Aircraft, certifying the major portion was fabricated and assembled by the applicant. Evidence must be provided to the CAA inspector upon request.
  - iii. A letter identifying the aircraft and the area over which it is proposed that the aircraft be tested, and the name of the proposed test pilot who must hold a test pilot approval issued under Part 19.
- (e) **Aircraft Inspection** The constructor should be prepared to furnish the following to the CAA inspector at time of survey:

**Note:** SAANZ can provide its members with a basic Inspection Guide checklist to aid preparation for this inspection.

- (i) An aircraft complete and ready to fly except for cowlings and fairings, and with panels removed or opened for inspection. The aircraft should have completed the weight and balance measurements, rigging checks, aircraft and engine duplicate control checks, fuel flow checks, retraction tests, compass swing, taxi tests and full-power runs. The annual inspection and Review of Airworthiness (RA) should have been completed.

**Note:** *The inspector will wish to observe a landing gear retraction and emergency extension cycle (if applicable) and an engine ground run during this inspection.*

- (ii) A certificate of registration for the aircraft.
- (iii) Logbooks for the aircraft, engine, propeller, and airworthiness directives to allow for review of service records and recording of the inspection and certification by the CAA inspector. The entries also include evidence that the inspections required by Part 91, Subpart G have been certified by appropriately authorised persons.
- (iv) A maintenance programme as required by Rule 91.605(b)(2) for approval in accordance with Rule 91.607. A copy of the programme for CAA records will also be required.
- (v) Evidence of inspections signed by the constructor describing all inspections conducted during construction of the aircraft, including mentor visits and vital point inspections. This is in addition to photographic documentation of construction details.

It is essential that all major structural components, control runs and systems be photographed **before** the final skin or fabric is applied if this will prevent visual inspection when completed.

This will substantiate that the construction has been accomplished in accordance with acceptable workmanship methods, techniques, and practices.

This evidence should be documented in a Construction Record (for example the Service and Maintenance Manual available from the EAA, or Construction Record for amateur-built aircraft) from the SAANZ.

*Note: The Construction Record, photographic record, and logbook entries will be used as the basis for determining whether the major portion of the aircraft was constructed by the constructor(s) and it is therefore eligible to meet the definition of an amateur-built aircraft.*

**It is therefore of prime importance that this documentation be of a high standard.**

## **Aircraft Registration**

Each amateur-built aircraft is required to be registered before a special category airworthiness certificate can be issued. Part 47, Registration and Marking of Aircraft, prescribes the requirements for registering civil aircraft.

**Note:** *Registration applications will only be accepted when the aircraft is substantially finished and it is clear that the project will be completed.*

The basic procedure for registration follows:

- (a) A constructor wishing to register an aircraft must first make application on form CAA 24047/01 Aircraft Registration, together with the correct fee payable by cash, cheque, or money order, made out to the CAA. Current fees are published in the Civil Aviation Charges Regulations at: <http://www.legislation.govt.nz/regulations>. Sections 9 and 10 of the Civil Aviation Act 1990 also require an applicant to complete a Fit and Proper Person Questionnaire Aircraft Registration, form CAA 24047/02. These forms are available from the CAA website.

Once the Director is satisfied that all is in order, a set of registration marks will be allocated. The registration marks are groups of alphabetical letters.

- (b) Under Part 47 the Director allocates registration marks and people can request the reservation of a registration mark. Constructors intending to obtain special marks of their choice may reserve a registration mark for a period not exceeding 24 months on payment of any applicable fees (\$30) or charges made by regulation under the Act. The applicant should submit an application listing up to five (5) possible registration mark combinations desired. Although reservations do not apply to marks allocated at random by the Register of Aircraft, it is recommended that application for registration mark allocation in either case be made 60 to 90 days prior to completion of construction.
- (c) After receipt of the applicant's request for a special or random mark assignment, the Aircraft Registrar will send a form to the applicant giving the marks assigned (this does not constitute registration of the aircraft), and other registration information. All instructions must be carefully followed to prevent return of the application and delay in the registration process.
- (d) Unless the aircraft is substantially altered, aircraft type/model will be taken as specified by the kit manufacturer or the designer of plans built aircraft.

### **Identification and Registration Marks**

When applying for a special category airworthiness certificate for an amateur-built aircraft, the builder must show, in accordance with Part 47, that the aircraft displays the nationality and registration markings required. The following is a summary of the requirements:

- (a) The aircraft must be identified by an identification plate made of a fireproof metal, or other fireproof material with suitable physical properties, that is stamped, engraved, or etched with the allocated nationality and registration marks, as required by Rule 47.119.
- (b) The identification plate should be secured in such a manner that it will not likely be defaced or removed during normal service, or lost or destroyed in an accident. The identification plate must be affixed to the aircraft in a prominent position near the main point of entrance to the aircraft.
- (c) An optional addition, to the identification plate, may be the names of the aircraft design, the amateur constructor, plans producer, or kit manufacturer and the aircraft serial number. The serial number can be whatever the constructor wishes to assign, provided it is unique. Normally, the plans or kitset serial number is used.
- (d) The constructor should refer to Rules 47.109, 47.111, 47.113, 47.115, and 47.117, which define specific requirements for the affixing, location and measurement of registration marks. These registration marks must be painted on or affixed by any means ensuring a similar degree of permanence. Decals are also acceptable. The use of tape which can be peeled off, or water soluble paint, such as poster paint, is not considered acceptable.

- (e) Amateur-built aircraft are required to display registration marks with a minimum height of 250 mm. However, where the design limits the display of the normal 250 mm marks, they may be reduced in size to no smaller than 150 mm with the Director's written permission. If in doubt whether the standard size will fit due to space limitations, ask CAA for guidance before applying any marks.
- (f) The registration marks displayed on the aircraft must consist of capital letters in Roman characters without ornamentation and must conform to the specifications in 47.115. In addition, the word EXPERIMENTAL should also be displayed on the aircraft near each entrance (interior or exterior) to the cabin or cockpit in letters not less than 50 mm nor more than 150 mm in height while the aircraft is being operated under phase 1 Flight Limitations.

### Marking and Placards - General

In the interests of flight safety and rescue, the following markings and placards must be applied to amateur-built aircraft in permanent materials where applicable to the aircraft type:

- (a) Flight and engine limitations are to be marked on the appropriate instruments in the standard colour code, RED -  $V_{ne}$  or Max, YELLOW - Caution, GREEN - Normal, WHITE - Flap operating range. Altimeters are to have their subscale calibrated in hectoPascals (Millibars). Where it is not possible to colour code instruments, placards showing the limitations must be affixed adjacent to the instrument.
- (b) Fuel and oil tanks are required to have the capacity and specification and/or grade marked on, in the vicinity of, each filler cap as appropriate. Rule 91 Appendix A2(b) refers.
- (c) The main fuel tank(s) are required to have fuel contents gauge(s) and the fuel selector valves should clearly indicate, and have positive stops in the OFF and ON positions. If the fuel gauges are calibrated in US gallons they are required be clearly marked showing they are calibrated in US Gallons. Rule 91 Appendix A.2(a) refers.
- (d) All exits are required to be marked inside and outside showing the method of operation. Rule 26 Appendix B.1 refers.
- (e) When a first aid kit, (91 App. A.12), or ELT (91 App A.15) are fitted, a placard is required to be affixed to the exterior of the aircraft adjacent to the location of these items.
- (f) A compass deviation card is required to be fitted adjacent to the compass. AC 43-7 Part 1 refers.
- (g) Baggage areas are required to show placards with the maximum allowable baggage weights as advised in the related flight manual. Rule 91 Appendix A.1 refers.

### Issuance of Special Category Airworthiness certificate

The procedure for issuing an airworthiness certificate reflects the need to first prove that the aircraft is safe to fly before allowing the carriage of passengers. The flight evaluation phase is controlled by CAA issuing phase 1 Operating Limitations. Once the flight evaluation has been satisfactorily completed CAA then issues phase 2 Operating limitations which will remain in force until, or if, the aircraft is required to enter a further flight evaluation regime due to modification or major alteration of the aircraft. This system mirrors the well tested procedures developed by the FAA.

- (a) Upon a determination that the aircraft has been properly constructed, the CAA inspector may issue a special category airworthiness certificate in the experimental subcategory, together with appropriate phase 1 Operating Limitations. The CAA inspector will verify

that all required markings are properly applied, including the following placard which is displayed in the cabin or the cockpit at a location in full view of all passengers.

**WARNING - EXPERIMENTAL THIS AIRCRAFT DOES NOT MEET THE NEW ZEALAND AIRWORTHINESS REQUIREMENTS FOR STANDARD**

**OR**

**SPECIAL CATEGORY AIRCRAFT. PASSENGERS FLY IN THIS AIRCRAFT AT THEIR OWN RISK.”**

*Note: The maintenance programme will be assessed at this time. If the maintenance programme is not available and acceptable, the airworthiness certificate will **not** be issued.*

- (b) Phase 1 Operating Limitations (for showing compliance with the rules), are a part of the special category airworthiness certificate and restrict the operation of the aircraft whilst it is undergoing the evaluation flight test programme. It is the responsibility of the test pilot to conduct all flights in accordance with the phase 1 Operating Limitations, as well as the General Operating and Flight rules in Part 91.

Only approved test pilots may act as pilot-in-command of an aircraft operating under phase 1 Operating Limitations.

- (c) Upon satisfactory completion of operations in accordance with the phase 1 Operating Limitations in the assigned evaluation area, the operator of the aircraft is required to submit evidence to the Director that a period of flight evaluation has been completed as required by Rule 21.197(a)(9).

**“I certify that the prescribed flight evaluation period has been completed and the aircraft is controllable throughout its normal range of speeds and throughout all manoeuvres to be executed and has no hazardous operating characteristics or design features. The manoeuvres executed were: (list all manoeuvres executed)”.**

This statement should be entered in the aircraft logbook, signed and dated by the test pilot carrying out the flight evaluation

- (d) Phase 2 Operating Limitations are issued on the successful completion of the flight evaluation under phase 1. The geographical flight limits will be removed and, if the aircraft is a multi-seater, passengers may be carried.
- (e) Prior to issuance of phase 2 Operating Limitations, the constructor should expect the CAA inspector to review the technical log to determine whether corrective actions have been taken on any problems encountered during the testing and that the aircraft's condition for safe operation has been established.

At this stage authorisation for flight over congested areas may be requested. Aircraft of one-off design or those fitted with non-certified engines with unknown operating history will not be authorised for flight over congested areas.

### **Flight Evaluation Areas**

- (a) Amateur-built aeroplanes and rotorcraft will initially be limited to operating within an assigned flight evaluation area for at least 25 hours if a type certificated engine and propeller combination is installed, and 40 hours if a non-certificated (that is modified type certificated or automobile) engine and propeller combination is installed. Amateur-built gliders, balloons and airships built from kits will be limited to operating within an

assigned flight evaluation area for at least 10 hours of satisfactory operation, including at least five take-offs and landings.

- (b) The desired flight evaluation area should be requested by the constructor and, if found acceptable by the CAA inspector, will be specified in the phase 1 Operating Limitations. It will usually encompass the area within a 35 nautical mile radius (or larger depending on the type and performance of the aircraft) from the aircraft's base of operation or in a designated test area established by the CAA office. The area selected by the constructor and submitted to the CAA for approval should not be over congested areas, so that the flight testing would not be likely to impose any hazard to persons or property on the ground.

**FAA advisory circular 90-89A, 'Amateur-built & Ultralight Aircraft Flight Testing Handbook', contains recommended procedures for the flight evaluation of amateur-built & ultralight aircraft. FAA AC90-89A contains the minimum standards acceptable to CAA for test pilots and flight evaluation procedures.**

The test pilot is required to record the handling and parameters of the aircraft during the flight evaluation period. This can be done on a test flight record which is available from SAANZ for both aeroplanes and helicopters. The amateur-builder may also create their own record from data in the FAA advisory circular mentioned above.

- (c) The aircraft will be restricted to solo flight while the aircraft is restricted to the flight evaluation area under phase 1 Operating Limitations. It is suggested that a voice recorder, for example, be used by the test pilot for recording readings and such like. CAA may authorise the carriage of an engineering observer once the initial flight testing has established reliability. This authorisation must be added to the phase 1 Operating Limitations by the CAA. Flight instruction will not be permitted in the aircraft while it is operated under phase 1 Operating Limitations.

## Safety Precaution Recommendations

(a) All Aircraft

- (i) The test pilot should become thoroughly familiar with the effectiveness of the brakes, with engine operation, and the ground handling characteristics of the aircraft by conducting taxi tests before attempting flight operations. Lift-off is not permitted during taxi tests without a Special Category airworthiness certificate.

**Note:** *Pilots not rated on tailwheel aircraft must undergo conversion training in an aircraft of similar performance to the amateur-built before ground-handling or flight-testing single seat tailwheel aircraft. (Refer to FAA AC90-89A).*

- (ii) Before the first flight of an amateur-built aircraft, the pilot should take precautions to ensure that emergency equipment and personnel are readily available in the event of an accident.
- (iii) Violent or acrobatic manoeuvres should not be attempted until sufficient flight experience has been gained to establish that the aircraft is satisfactorily controllable throughout its normal range of speeds and manoeuvres.
- (iv) Where it is proposed to carry out aerobatics, in aerobatic capable aircraft, spin entry and recovery should be included in the evaluation unless prohibited by design. It is recommended that a parachute be worn and that the canopy or

door can be jettisoned when carrying out aerobatic manoeuvres and exploring the outer limits of the flight envelope.

- (v) Those manoeuvres successfully demonstrated while in the test area may continue to be permitted by the CAA when the phase 2 Operating Limitations are issued. All manoeuvres conducted satisfactorily are to be documented in the aircraft logbook by the test pilot.
- (vi) The Operating Limitations issued by the CAA inspector will require the aircraft to be operated in accordance with applicable air traffic control and general operating rules of Civil Aviation Rule Part 91. Those operators who plan to operate under Instrument Flight Rules (IFR) or night VFR must ensure that the aircraft is equipped in accordance with the instrument and equipment requirements prescribed in Part 91. The operator must then make written application to CAA so that the airworthiness and operational requirements can be considered for the particular aircraft.
- (vii) Any aircraft equipped with a transponder must be equipped in accordance with the requirements prescribed in Rule 91.541

(b) Rotorcraft

The appropriately rated rotorcraft flight-test pilot should be aware of the following operating characteristics:

- (i) Operators of rotorcraft having fully articulated rotor systems should be particularly cautious of ground resonance. This condition of rotor unbalance, if maintained or allowed to progress, can be extremely dangerous and usually results in structural failure.
- (ii) Tests showing that stability, vibration, and balance are satisfactory should normally be completed with the rotorcraft tied down, before beginning hover or horizontal flight operations.

### **Design Changes after Airworthiness Certificate Issue**

If an owner wishes to make a design change that may affect the airworthiness of the aircraft, after the airworthiness certificate and phase 2 Operating Limitations have been issued, the CAA office must be advised of the extent and nature of the change before the aircraft is flown.

Should the design change be significant such as an engine type, propeller, structural change or one that has the potential to change the aerodynamics or flight characteristics of the aircraft, the aircraft may be required to be re-inspected by CAA, and further flight evaluation may be required under new phase 1 Operating Limitations.

On satisfactory completion of this evaluation, CAA will re-issue the phase 2 Operating Limitations to allow the aircraft to be returned to normal operations.

The maintenance aspects of a design change must also be considered and the aircraft's maintenance programme reviewed by the CAA to ensure that it remains relevant.

### **Review of Airworthiness**

- (a) An airworthiness certificate is issued for a non-terminating period, and therefore rule 91.615 requires a Review of Airworthiness (RA) to be carried out at 24 monthly periods to provide assurance that the aircraft has been maintained to the rules and is in an airworthy condition. This inspection cannot be extended but may be anticipated so that the inspection may fall in the months where good flying weather is limited. The RA may only be carried out by a person holding a certificate of inspection authority (IA certificate) issued under

Part 66. The RA will confirm that all mandatory inspections have been completed, all defects have been rectified and that the aircraft is in a safe condition for flight. Information on the RA can be found in Part 43 Subpart D.

- (b) Make an appointment with your IA holder before your RA is due. As the RA is not a maintenance operation it may be carried out separately.
- (c) The RA will remain valid for a 24 month period from the day it is signed off.
- (d) If discrepancies are found, the IA will enter these in the aircraft logbook and inform you in writing. Discrepancies must be cleared before further flight.
- (e) Rectification of discrepancies is the responsibility of the owner or operator.

### **Amateur-built Aircraft Constructed Outside New Zealand**

- (a) If an amateur built aircraft has been constructed outside of New Zealand to foreign standards, the person intending to apply for an airworthiness certificate for the aircraft should make contact with the CAA Manager Aircraft Certification to determine whether the aircraft is eligible for certification as an amateur-built aircraft. (The aircraft logbooks, construction records, previous certification history and other data should be made available if required to assist with this determination. As a general rule if the aircraft has been accepted as amateur-built by the foreign Civil Aviation Authority of the previous State of Registry, then that determination would be accepted here. It depends on what that country's rule are. (The FAA and Australian rules for amateur-built aircraft are the same as New Zealand. The UK eligibility requirements may be different.)
- (b) If it is determined that the aircraft is eligible for certification as an amateur-built aircraft, the owner of the aircraft must present the following documentation to CAA:
  - (i) A completed CAA 24047/01, application for registration, a completed CAA 24047/02 Fit & Proper Person questionnaire, a completed CAA 24021/06 application for issue of an experimental airworthiness certificate together with the fees;
  - (ii) The aircraft logbooks, construction records and any other data pertaining to the construction, maintenance and operation of the aircraft;
  - (iii) All letters and records of inspections;
  - (iv) A maintenance programme for approval prior to certificate of airworthiness issue as required by rule 91.621(a)(4).
- (c) The applicant should expect the CAA inspector to:
  - (i) confirm that the aircraft is registered;
  - (ii) conduct a thorough review of all documentation;
  - (iii) inspect the aircraft as if it is any other new amateur-built aircraft, since the aircraft will be considered as an original;
  - (iv) witness an undercarriage retraction, emergency extension (if applicable), and engine ground run;
  - (v) check that a RA has been completed by a person holding a certificate of inspection authorisation (IA Certificate);

(vi) check that a 100-hour/annual maintenance inspection has been carried out to the approved aircraft maintenance programme and certified by an appropriately rated licensed aircraft maintenance engineer, and a Technical Log issued.

(vii) issue the airworthiness certificate and phase 1 Operating Limitations. The aircraft will always be required to complete the minimal flight time needed to complete the standard flight test schedule, and for the Test Pilot to make the logbook certification that the aircraft has no hazardous operating characteristics. However the CAA will recognise flight time accrued overseas, and will not require this to be repeated, unless there was some doubt as to its validity, or the aircraft had been modified since import. (Some flight testing is required because the CAA cannot be sure of the conditions under which the previous foreign flight testing was performed, or the exact configuration of the aircraft.)

## Test Pilot Qualifications

Rule 19.405 requires a person to be approved by the Director and to hold a valid pilot licence issued under Part 61.

### Guidelines for Test pilot Applicants

Pilots considering flight-testing amateur-built aircraft for the purpose of showing compliance with the rules should have the following qualifications and experience to back up their application to CAA:

- hold at least a current private pilots licence and instructors rating or have considerable flight experience in a similar type, and
- be in current flying practice in aircraft of the same configuration (nose-wheel, tailwheel, canard, retractable, constant-speed, amphibian, float plane, piston, gas turbine, helicopter) and performance as the aircraft being flight-tested; and
- have a thorough knowledge of FAA advisory circular AC90-89A Amateur-built & Ultralight Flight-Testing handbook, including the test pilot experience recommendations in section 3.
- Certified true copies of logbooks showing the experience meeting the above.

**Note:** *Where a glider or powered glider is to be tested, a New Zealand Gliding Test Pilot Approval should be applied for under their Part 149 approval.*

## Maintenance Approvals

The aircraft constructor may be issued a CAA maintenance approval if he/she is the primary constructor of the aircraft and can satisfactorily prove the required skill to determine whether the aircraft is in condition for safe operation.

This approval can be obtained by making application to the CAA office for issue of a maintenance approval. Approvals are normally issued for a particular aircraft identified by registration letters. An examination will then be arranged with Aviation Services Limited (ASL).

It is strongly recommended that the constructor obtains practical experience in the maintenance of their aircraft/engine/components under the guidance of a licensed aircraft maintenance engineer prior to applying for a maintenance approval examination.

Persons holding Maintenance Approvals will be expected to hold, or have ready access to Civil Aviation rules and associated advisory circulars. They need to be familiar, with Part 91 Subpart G-Operator maintenance requirements, Part 43 general maintenance rules, and Part 39 airworthiness directives and any airworthiness directives pertaining to amateur-built aircraft.

Persons purchasing second hand amateur-built aircraft may qualify for a Maintenance Approval providing they pass certain papers of the licensed aircraft engineer examinations and an oral examination relating to the aircraft. For more information, interested persons should contact the Manager Aircraft Certification at the CAA office.

### Pilot Maintenance

Rule 43.51(b) provides for a pilot to perform various maintenance activities that are detailed in Appendix A to Part 43.

Unlike the maintenance approval, a person who holds a pilot licence with an appropriate type rating for the aircraft type issued under Part 61 may perform the maintenance listed in Appendix A to Part 43 if the holder is:

- appropriately trained; and
- authorised by the owner or operator of the aircraft.

Persons certifying pilot maintenance items must still comply with 43.105 by entering in the logbook or other record required by 43.69(b), a statement of release to service.

### Maintenance of Amateur-built Aircraft

Rule 91.621 requires aircraft issued with a special category airworthiness certificate to be maintained to a maintenance programme approved by the Director. Accordingly, a maintenance programme must be approved by the Director prior to the issue of the certificate of airworthiness in accordance with Part 21.

Rule 91.623 prescribes the approval process and content for maintenance programmes. A maintenance programme consists of a series of approved schedules and instructions which will enable the aircraft to be maintained to the required airworthiness standards in Part 91 Subpart G and Part 43. The programme and schedules will be approved at the time of aircraft inspection. Schedules may be developed from manufacturer's information or from generic sources based on the annual/100 hour inspection content in Part 43 Appendix C. Assistance in creating a suitable maintenance programme can be obtained from SAANZ.

Owners may elect to carry out routine maintenance at periods less than the annual or 100-hour period on the aircraft/engine/component manufacturer's advice. These inspections should be detailed in the approved aircraft maintenance programme. Following the satisfactory completion of the annual or 100-hour inspection the aircraft may be released to service for a 12 month or 100

hour maximum period. Routine maintenance and replacements, within the annual period, may be carried out and certified by persons approved or licensed in accordance with Part 66. The Release to Service statement can be found in 43.105.

With the exception of Pilot maintenance, all maintenance must be carried out and certified by persons approved or licensed under Part 66. The aircraft will not be released to service until the certifying person is satisfied that all required maintenance has been carried out and that the aircraft is in a condition for safe operation.

The operator is responsible for providing a technical log which will be kept in the aircraft and used on a daily basis until filled and replaced. This log records daily flight hours, defects and rectification of defects. It also shows when the next RA is due.

**Note:** *The technical log is an extension of the aircraft logbook and must be retained as such in accordance with Part 91 (AC91-6 refers)*

## Type Ratings

Test pilots approved under 19.405 need not be rated on the aircraft type to carry out evaluation flights however, Part 61 Subpart B requires all pilots (other than those conducting the test flying evaluation) to be rated. Rule 19.407 enables the Director may authorise a Part 61 instructor, to act as a pilot or pilot-in-command if the pilot does not hold an appropriate type rating (Shown in full below). Once flight testing has been completed an unrated pilot may obtain a rating from this instructor.

### 19.407 First of type authorisation

- (a) The Director may authorise, subject to such conditions as the Director considers necessary in the interests of safety, the holder of an instructor rating issued under Part 61 to act as pilot, or pilot-in-command of an aircraft for which the instructor does not hold an appropriate aircraft type rating if a holder of such an aircraft type rating is not available in New Zealand.
- (b) Notwithstanding 61.5(d) and 61.305, an instructor authorised under paragraph (a) may act as pilot, or pilot-in-command of an aircraft without the required aircraft type rating.

## Reference Material

Civil Aviation rules, advisory circulars and airworthiness directives may be obtained from the CAA web site [www.caa.govt.nz](http://www.caa.govt.nz)

Sport Aircraft Association of New Zealand (SAANZ) web Site [www.saa.org.nz](http://www.saa.org.nz)

Federal Aviation Administration (FAA) for advisory circulars, etc. web site <http://faa.gov>

Experimental Aircraft Association (EAA) web site [www.eaa.org](http://www.eaa.org)

Civil Aviation Charges Regulations web site: <http://www.legislation.govt.nz/regulation>