Australian Government
Civil Aviation Safety Authority

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ADVISORY CIRCULAR

AC 21-42
Light sport aircraft manufacturers' requirements

v2.0 – February 2014
Project Number: CS 11/41

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.

Advisory Circulars should always be read in conjunction with the relevant regulations.

Audience

This Advisory Circular (AC) applies to manufacturers of light sport aircraft (LSA).

Purpose

This AC explains the certification requirements for an LSA manufacturer.

Status

This is the second revision of this AC and it replaces version AC 21-42(1). This revision updates the LSA standards listed in Appendix A and makes various other minor changes. Substantial editorial changes have also been made and therefore change bars have not been used.

For further information

For further information on this AC, contact CASA's Airworthiness and Engineering Standards Branch (Telephone 131 757).

Unless specified otherwise, all subregulations, regulations, Subparts, Parts and Divisions referenced in this AC are references to the *Civil Aviation Safety Regulations 1998 (CASR).*

Contents

1 Reference material

1.1 Acronyms

The acronyms and abbreviations used in this AC are listed in the table below.

Acronym	Description
AC	Advisory Circular
AD	airworthiness directive
ASRA	Australian Sport Rotorcraft Association
ASTM	American Society for Testing and Materials International
CAO	Civil Aviation Order
CAR	*Civil Aviation Regulations 1988*
CASA	Civil Aviation Safety Authority
CASR	*Civil Aviation Safety Regulations 1998*
FAA	Federal Aviation Administration of the USA
FAR	Federal Aviation Regulations (USA)
LSA	light sport aircraft
NAA	National Aviation Authority
SD	safety direction
V_{ne}	maximum never-exceed speed
V_{so}	maximum stall speed in the landing configuration

1.2 Definitions

Terms that have specific meaning within this AC are defined in the table below.

Term	Definition
Contracting State	A foreign country that is a party to the Convention on International Civil Aviation (see Section 3 of the *Civil Aviation Act 1988*).

1.3 References

Regulations

Regulations are available on the ComLaw website http://www.comlaw.gov.au/Home

Civil Aviation Act 1988.

Regulation 262APA of the *Civil Aviation Regulations 1988* (CAR).

Subpart 21.H of CASR.

Subpart 21.M of CASR.

CASR Dictionary.

Federal Aviation Regulations (FAR) 1.1

Advisory material

CASA's advisory material is available at http://www.casa.gov.au/scripts/nc.dll?WCMS:STANDARD::pc=PC_90902

AC 21-10—Experimental Certificates.

AC 21-41—Light Sport Aircraft Certificate of Airworthiness.

LSA standards

The LSA standards issued by the following organisations are available online:

- American Society for Testing and Materials (ASTM) at www.astm.org
- CASA Civil Aviation Order (CAO) 101.54 and CAO 101.55 at http://www.casa.gov.au/scripts/nc.dll?WCMS:STANDARD::pc=PC_91044
- FAA (FAR Part 31) at www.faa.gov/regulations_policies/faa_regulations/
- Civil Aviation Authority of the United Kingdom at:
  - BCAR Section S: http://www.caa.co.uk/docs/33/CAP482.PDF
  - BCAR Section T: http://www.caa.co.uk/docs/33/CAP643.PDF
  - BCAR Section Q: http://www.caa.co.uk/docs/33/CAP471.pdf
  - BCAR Part 31: http://www.caa.co.uk/docs/33/CAP494.PDF
- Australian Sport Rotorcraft Association (ASRA, gyroplane specifications) at http://www.asra.org.au/

1.4 Forms

CASA's forms are available at http://www.casa.gov.au/scripts/nc.dll?WCMS:STANDARD::pc=PC_91308

CASA Form 681—Light Sport Aircraft Statement of Compliance.

2 Manufacturers' requirements

2.1 Background

2.1.1 The Civil Aviation Safety Authority (CASA) introduced new standards for the manufacture, certification, operation and maintenance of LSA in 2005. The standards were implemented as a result of other National Aviation Authorities (NAAs) adopting similar standards to address advances in sport and recreational aviation technology. The intended effect of the regulations covering these standards is to allow the manufacture of safe and economical aircraft, to be operated for the purpose of sport and recreation, to carry a passenger and to conduct flight training and glider towing.

2.2 What is a light sport aircraft?

An LSA is a small, simple-to-operate, low-performance aircraft. In relation to the requirements of the regulations, an LSA is defined[1] as an aircraft other than a helicopter that:

a. has
   i. if the aircraft is not intended for operation on water, a maximum take-off weight of 600 kg or less; or
   ii. if the aircraft is intended for operation on water, a maximum take-off weight of 650 kg or less; or
   iii. if the aircraft is a lighter-than-air aircraft, a maximum gross weight of 560 kg or less
b. if the aircraft is a powered aircraft, has a single, non-turbine engine fitted with a propeller
c. has a maximum stall speed in the landing configuration (V_{so}) of 45 knots calibrated air speed
d. if the aircraft is a glider, has a maximum never-exceed speed (V_{ne}) of 135 knots calibrated air speed
e. if the aircraft has a cabin, has an un-pressurised cabin
f. if the aircraft is designed to be equipped with seating — has a maximum seating capacity of 2 persons, including the pilot
g. if the aircraft is a manned free balloon that is not designed to be equipped with seating, can carry no more than 2 persons
h. has
   i. in the case of an amphibian, repositionable landing gear; or
   ii. in the case of a glider, fixed landing gear or retractable landing gear; or
   iii. in any other case, fixed landing gear.

2.2.1 The classes of aircraft that may satisfy these criteria are:

[1] See Part 1 of the CASR Dictionary

a. fixed wing aircraft
b. powered parachutes
c. weight shift aircraft
d. gliders
e. balloons
f. airships
g. gyroplanes.

2.3 Manufacturing light sport aircraft

2.3.1 The certification and continuing airworthiness of LSA is the responsibility of the manufacturer. The manufacturer must ensure that LSA are designed and manufactured to meet the LSA standards.

2.3.2 Manufacturers' qualifications

2.3.2.1 Manufacturers must demonstrate that they are suitably qualified to manufacture an LSA[2] by:

a. holding a current production certificate. CASA expects that:
   i. manufacturers will hold a production certificate for a similar aircraft to the manufactured LSA
   ii. the production certificate is in force and not under an enforcement action that would preclude the manufacturer from manufacturing an LSA to the applicable standards

   or
b. making a declaration in writing, if they do not hold a production certificate, indicating that they have:
   i. contracted engineering personnel with experience in ultralight or light aircraft design, to ensure compliance with LSA standards
   ii. facilities and tools suitable for the production of the aircraft in accordance with the applicable LSA standards
   iii. competent personnel, with appropriate training, skills and experience, to perform work that affects product quality.

[2] See regulation 21.172.

2.3.3 Overseas manufacturers

2.3.3.1 For LSA to be certified and operated in Australia, overseas LSA manufacturers are required[3] to be from a Contracting State.[4] To ensure compliance with the Australian LSA standards, overseas manufacturers will be required to show evidence that they meet similar requirements to local manufacturers. An overseas manufacturer who holds a production approval (however described) for a similar aircraft issued by their NAA or approved organisation delegated by their NAA, would satisfy these requirements.

2.3.4 LSA standards

2.3.4.1 Appendix A to this AC lists the LSA standards applicable to each class of LSA. These standards include the ASTM International (ASTM) standards and alternative standards that CASA has approved as acceptable for this category of aircraft.

Note: The manufacturer must be aware that the Federal Aviation Administration of the USA (FAA) accepts only the ASTM standards for certification as an LSA under the FAR.

2.3.4.2 Although there is a range of different design standards, it is not acceptable to 'cherry pick' selected paragraphs out of these standards when signing a statement of compliance—when a manufacturer selects a design standard, compliance should be shown with the entire standard. However, if the standard does not cover certain systems or products (e.g. kind of engine or variable pitch propeller) then the manufacturer may select a different LSA standard for that system or product. The manufacturer is responsible for identifying any potential issues associated with their selection of LSA standards for the aircraft, such as interface issues and other consequential design considerations (e.g. if the aircraft is designed with a variable pitch propeller then the manufacturer must consider the various configurations and show compliance with an LSA standard).

2.3.4.3 If a manufacturer is in any doubt about their selection of LSA standards or their capability and compatibility analyses, they should contact CASA's Airworthiness and Engineering Standards Branch before moving into a certification process.

2.3.5 LSA statement of compliance

2.3.5.1 For an LSA to be issued[5] with a special certificate of airworthiness, or an experimental certificate for a kit-built LSA[6], the manufacturer is required to sign a statement of compliance, using CASA Form 681, for each aircraft and kit that is produced. This statement of compliance will indicate that the aircraft complies with all applicable LSA standards (see Appendix A to this AC).

[3] See subparagraph 21.186 (1) (b) (iii).

[4] Contracting State is defined in Section 1.2 of this AC.

[5] Issued under regulation 21.186.

[6] Issued under paragraph 21.191 (j).

2.3.6 Exporting LSA overseas

2.3.6.1 Before designing and manufacturing aircraft for an overseas market, it is crucial that the manufacturer considers the applicable NAA requirements for LSA certification and operation in that particular country as other NAAs may have different requirements for LSA. For instance, the FAA definition of LSA has some differences that the manufacturer should consider if they want to export aircraft to the USA—the definition provides different stall and never-exceed speeds, and only accepts the ASTM standards.[7]

2.3.7 Manufacturing production aircraft[4]

2.3.7.1 To produce an LSA, the manufacturer must consider the design and quality assurance of the product, and continuing airworthiness requirements. These requirements are contained in the standards listed in Appendix A to this AC. For a particular market, the manufacturer should choose the most applicable design standard prior to manufacturing the aircraft. The proposed market will influence the choice of standard. For example, if the manufacturer wants to export its aircraft to the USA then the only reasonable choice is to ensure the aircraft complies with the ASTM standards and meets the FAA's definition of LSA.[8]

2.3.7.2 A manufacturer does not require a CASA production certificate to manufacture an LSA. However, the manufacturer must be suitably qualified (see subsection 2.3.2 of this AC) and should comply with the quality assurance and production test acceptance standards listed in Appendix A of this AC.

2.3.7.3 As CASA is not responsible for the continuing airworthiness of LSA, the manufacturer will be required to continually monitor the airworthiness of these aircraft in accordance with the ASTM standard for Continued Operational Safety Monitoring of Light Sport Aircraft. To comply with this requirement, the manufacturer should maintain a database of all owners of aircraft in Australia and overseas, investigate service defects and address safety critical defects with corrective action by issuing safety directions (SD) to all affected owners/registered operators (see paragraph 2.4.2.1 for more information on SDs).

2.3.7.4 The manufacturer will also need to provide product information in accordance with the regulations and LSA standards. This will include the conformity details of the aircraft, aircraft operating instructions, the aircraft flight training supplement, and maintenance and inspection procedures.

2.3.7.5 Once aircraft manufacture is complete, the manufacturer must sign a statement of compliance, using CASA Form 681, to indicate that the aircraft conforms with the specified LSA standards (see Appendix A to this AC). If the manufacturer resides/operates overseas, they will need to provide evidence that the aircraft was manufactured in a Contracting State and is eligible for a certificate of airworthiness, or another document of similar effect, in the country of manufacture.[9]

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[7] See FAR 1.1.

[8] As defined in in FAR 1.1.

[9] See subparagraph 21.186 (1) (b) (iii).

2.3.8 Manufacturing kit-built LSA

2.3.8.1 Before a kit-built LSA can be issued with an experimental certificate, the manufacturer will need to produce a production aircraft issued with a special certificate of airworthiness in the LSA category of the same make and model. [10]

Note: To indicate that the aircraft is kit-built, the model number may have a different prefix or suffix to the production aircraft model number.

2.3.8.2 A kit-built LSA must be manufactured to the same applicable LSA standards as the production aircraft of the same make and model, except that the standards relating to production testing are not required. Instead of complying with the production aircraft test standards, the manufacturer must identify the assembly instructions for the aircraft as meeting the applicable LSA standard for kit assembly.

2.3.8.3 For the kit-built aircraft to be eligible for an experimental certificate, satisfactory evidence needs to be presented to show that the aircraft was manufactured and assembled to the applicable LSA standards. Therefore, the manufacturer will need to:

a. provide the aircraft owner with a statement of compliance, using CASA Form 681, indicating that the aircraft kit complies with the applicable LSA standards for a kit aircraft
b. provide information that shows a special certificate of airworthiness has been issued for a production aircraft of the same make and model
c. provide aircraft assembly instructions, operating instructions, aircraft maintenance and inspection procedures and an aircraft flight training supplement.

2.3.8.4 It is the owner's responsibility, not the manufacturer's, to assemble and acceptance test a kit-built aircraft.

2.4 Continued operational safety monitoring of light sport aircraft

2.4.1 CASA requires the manufacturer to use a system to monitor and correct safety-of-flight issues in accordance with an approved LSA standard. For as long as an LSA is registered in Australia, it remains the manufacturer's responsibility to monitor for unsafe conditions in aircraft and notify owners/registered operators of corrective actions. It is incumbent on the manufacturer to evaluate all significant defects and correct any unsafe condition that may exist in the remaining fleet. To achieve this, the manufacturer should provide a method for the aircraft owner/registered operator to report any in-service difficulty.

[10] See paragraph 21.191 (j).

2.4.2 Safety directions

2.4.2.1 The manufacturer may decide that an SD is required to correct an unsafe condition. In such a circumstance, the manufacturer should issue a notice to all the known owners/registered operators of the affected aircraft. It is therefore very important, and is a requirement of the LSA standards, that the manufacturer has current contact information for all owners/registered operators of their aircraft, irrespective of whether they are located in Australia or overseas. CASA recommends that the manufacturer include a statement in the documents provided with the aircraft to the effect that the manufacturer must be notified of the new owner/registered operator's name and address when the aircraft changes ownership.

2.4.2.2 The operating rules require the owner/registered operator to comply with the requirements of the SD.[11] The owner/registered operator may apply to the manufacturer for a variation of, or exemption from, the SD, if they have a suitable safety justification to substantiate their request. The manufacturer should assess the application and, if the justification satisfactorily addresses the safety issue, approve an alternative means of compliance against the SD. However, if the manufacturer does not approve an application, the owner/registered operator must comply with the requirements of the manufacturer's SD. Failure to comply with an SD is a breach of the regulations and would result in regulatory action against the owner/registered operator.

2.4.3 Modifications

2.4.3.1 For production LSA issued with a special certificate of airworthiness under regulation 21.186, the aircraft may only be modified if the manufacturer authorises the modification. All modifications should be made in accordance with the LSA standards applicable to the aircraft. A modification approval under Subpart 21.M must also be authorised by the manufacturer. Modifications that are not authorised by the manufacturer will result in the revocation of a special certificate of airworthiness issued under regulation 21.186.[12]

Note: An LSA that has been modified without approval by the manufacturer may be eligible for an experimental certificate under regulation 21.191.

[11] See paragraph 262APA (3) (b) of CAR.

[12] See paragraph 21.181 (4) (c).

2.5 Placards and warnings

2.5.1 For production LSA, CASA requires that an information placard be displayed in the cabin or cockpit at a location in full view of the passenger and the pilot[13] with the wording:

> THIS AIRCRAFT WAS MANUFACTURED
> IN ACCORDANCE WITH THE LIGHT SPORT AIRCRAFT AIRWORTHINESS STANDARDS
> AND DOES NOT CONFORM TO STANDARD CATEGORY AIRWORTHINESS
> REQUIREMENTS.

2.5.2 If an LSA with an experimental certificate is to be used for passenger-carrying operations then an information placard is required to be displayed inside the aircraft in a way that is conspicuous to, and can be easily read by, each person in the aircraft.[14] The placard must be worded as follows:

> WARNING
>
> PERSONS FLY IN THIS AIRCRAFT AT THEIR OWN RISK
> THIS AIRCRAFT IS NOT OPERATED TO THE SAME SAFETY
> STANDARDS AS A NORMAL COMMERCIAL
> PASSENGER FLIGHT
> CASA DOES NOT SET AIRWORTHINESS STANDARDS FOR
> EXPERIMENTAL AIRCRAFT

[13] See paragraph 262APA (1) (f) of CAR.

[14] See paragraph 262AP (8) (c) of CAR.

3 What happens if a manufacturer no longer exists?

3.1.1 In the event that a manufacturer no longer exists or can no longer provide continuing airworthiness support to owners/registered operators of their aircraft, a 'competent person' (see paragraph 3.1.2 below) may be appointed by CASA to carry out the manufacturer's continuing airworthiness function.[15] If no person satisfies CASA's eligibility criteria or applies to CASA for appointment, all affected LSA's will have to cease operation under their special certificate of airworthiness issued under regulation 21.186. In such situations, these aircraft may be entitled to an experimental certificate for LSA, issued under paragraph 21.191 (k).

3.1.2 A 'competent person' should have:

a. a system to monitor and correct safety-of-flight issues in accordance with the ASTM standard for Continued Operational Safety Monitoring of Light Sport Aircraft
b. access to the manufacturer's data for aircraft configuration and registered aircraft operators
c. contracted engineering personnel with experience in ultralight/light aircraft design and repair and knowledge of the LSA standards
d. facilities, tools, and trained or appropriately experienced staff that are suitable to provide continuing airworthiness support affected LSAs
e. an audit system (internal or external) that complies with the LSA quality standards.

Executive Manager
Standards Division

February 2014

[15] See subregulation 262APA (7) of CAR.

Appendix A

Light sport aircraft (LSA) standards

A.1 General

A.1.1 This Appendix lists the LSA standards as defined in regulation 21.172.

A.1.2 The LSA standards for a particular class of LSA are the ASTM standards (see Section A.2) or alternative standards (see Section 0).

Note: The standards listed in the following paragraphs are subject to amendment by the holder of the standard. In all cases, the user should determine the latest revision of the particular standard issued by the holder and/or the revision approved or accepted by CASA (as applicable).

A.2 ASTM standards

A.2.1 The following table sets out the ASTM standard for each subject and class of LSA.

	CLASS OF LSA					
SUBJECT	**Fixed Wing**	**Gliders**	**Gyroplanes**	**Lighter-Than-Air**	**Powered Parachutes**	**Weight Shift Control**
Design and Performance	F2245	F2564	F2352	F2355	F2244	F2317 / F2317M
Required Equipment	F2245	F2564	F2352	F2355	F2244	F2317 / F2317M
Quality Assurance	F2279	F2279	F2449	F2353	F2240	F2448
Production Acceptance Tests	F2279	F2279	F2449	F2356	F2242	F2447
Aircraft Operating Instructions	F2245	F2564	F2352	F2427	F2243	F2457
Maintenance and Inspection Procedures	F2483	F2483	F2483	F2483	F2483	F2483
Identification and Recording of Major Repairs and Major Alterations	F2483	F2483	F2483	F2483	F2483	F2483
Continued Airworthiness	F2295	F2295	F2415	F2354	F2241	F2425
Manufacturers' Assembly Instructions [Kit builders only]	F2563	F2563	F2563	F2563	F2563	F2563
Wing Interface	N/A	N/A	N/A	N/A	F2426	N/A

	CLASS OF LSA					
SUBJECT	**Fixed Wing**	**Gliders**	**Gyroplanes**	**Lighter-Than-Air**	**Powered Parachutes**	**Weight Shift Control**
Required Product Information	F2745	N/A	N/A	F2427	F2243	F2457

A.2.2 ASTM standards to be used when required by the aircraft design standard:

Subject	**Fixed Wing**	**Gliders**	**Gyroplanes**	**Lighter-Than-Air**	**Powered Parachutes**	**Weight Shift Control**
Design & Manufacture of Reciprocating Spark Ignition Engines	F2339	F2339	F2339	F2339	F2339	F2339
Design and Testing of Fixed-Pitch or Ground Adjustable Propellers	F2506	F2506	F2506	F2506	F2506	F2506
Design & Manufacture of Reciprocating Compression Ignition Engines	F2538	F2538	F2538	F2538	F2538	F2538
Pilot's Operating Handbook (POH)	F2746	N/A	N/A	N/A	N/A	N/A
Design and Manufacture of Electric Propulsion Units	F2840	F2840	F2840	F2840	F2840	F2840

A.2.3 ASTM standards optional for all aircraft:

Subject	**Fixed Wing**	**Gliders**	**Gyroplanes**	**Lighter-Than-Air**	**Powered Parachutes**	**Weight Shift Control**
Airframe Emergency Parachutes	F2316	F2316	F2316	F2316	F2316	F2316
Compliance Audits to ASTM Standards	F2839	F2839	F2839	F2839	F2839	F2839

A.2.4 ASTM standards for reference only:

Subject	Fixed Wing	Gliders	Gyroplanes	Lighter-Than-Air	Powered Parachutes	Weight Shift Control
Standard Terminology for Light Sport Aircraft	F2626	F2626	F2626	F2626	F2626	F2626
Guide for Compliance with Light Sport Aircraft Standards	F2930	F2930	F2930	F2930	F2930	F2930

A.3 Alternative LSA standards acceptable to CASA

A.3.1 The following table sets out alternative Design and Performance standards for each class of LSA.

Class of LSA	Alternative Design and Performance standards
Fixed Wing (ASTM Standard F2245)	• BCAR Section S (Britain) • CS-VLA (EASA) • CS-LSA (EASA) • CAO 101.55 (Australia) • LTF-UL (Germany) • UL/2 PT2 (Czech Republic) • DS 10141E (Canada)
Fixed Wing (ASTM Standard F2245)	**HISTORICAL** • BFU-95 (Germany) • PICA26 (Australia)
Gliders	Nil at the time of publication.
Gyroplanes (ASTM Standard F2352)	• BCAR Section T (Britain) • Australian Sport Rotorcraft Association (ASRA) Gyroplane Specifications (Australia)
Lighter-Than-Air (ASTM Standard F2355)	• BCAR Part 31 – balloons (Britain) • FAR Part 31 – balloons (USA) • CAO 101.54 – balloons (Australia) • BCAR Q – airships (Britain)

Class of LSA	Alternative Design and Performance standards
	• FAA AC 21.17-1A – airships (USA)
Powered Parachutes (ASTM Standard F2244)	• BCAR Section S (Britain) • DS 10141E (Canada)
Weight Shift Control (ASTM Standard F2317/F2317M)	• BCAR Section S (Britain) • DS 10141E (Canada)

A.4 Where to access LSA standards

A.4.1 Section 1.3 of this AC provides references to online LSA standards.