

TAD-4944

AC NO: AC 20-27B

DATE: 20 Apr 72



# ADVISORY CIRCULAR

## DEPARTMENT OF TRANSPORTATION FEDERAL AVIATION ADMINISTRATION

**SUBJECT:** CERTIFICATION AND OPERATION OF AMATEUR-BUILT AIRCRAFT

1. PURPOSE. This advisory circular provides information and guidance concerning certification and operation of amateur-built aircraft, including gliders, free balloons, helicopters, and gyroplanes, and sets forth an acceptable means, not the sole means, of compliance with Federal Aviation Regulations (FAR) Part 21, Sections 21.191 and 21.193, and FAR Part 91, Section 91.42.
2. CANCELLATION. Advisory Circular No. 20-27A, "Certification and Operation of Amateur-built Aircraft" dated 8/12/68 is cancelled.
3. RELATED PUBLICATIONS.
  - a. FAR Parts 21, 45, 47, 61, 91, and 101.
  - b. Advisory Circulars Nos. 43.13-1 and 43.13-2.
4. BACKGROUND. The Federal Aviation Administration has received many requests from amateur-builders for information concerning building, certification, operation, and pilot requirements for amateur-built aircraft of all types. Advisory Circular No. 20-27 was originally prepared to provide information and guidance based on Civil Air Regulations (CAR) Part 1, Section 1.74, which has since been recodified into FAR Part 21, Section 21.191. This advisory circular has been prepared to update the information formerly in AC No. 20-27, incorporate information formerly in CAM Part 1, Section 1.74-3, and to set forth an acceptable means of compliance with FAR Part 21, Sections 21.191 and 21.193, and FAR Part 91, Section 91.42.
5. ELIGIBILITY. Under FAR Part 21, Section 21.191, an experimental certificate for an amateur-built aircraft may be issued if the major

portion of the aircraft has been fabricated and assembled by persons who undertook the construction project solely for their own education or recreation. In meeting the requirements of this section:

- a. Many components, parts, and materials need not be fabricated by the applicant but may be procured through normal trade channels. (For example: engines, propellers, rotor blades and hubs, wheel and brake assemblies, "standard" aircraft hardware such as pulleys and fasteners, and materials such as tubing, fabric, and extrusions). In addition, raw material construction kits and structural components of other aircraft may be used provided the builder has fabricated and assembled the major portion of the aircraft for education or recreation.
- b. Aircraft which are merely assembled from kits composed completely of prefabricated components and parts, and pre-cut, pre-drilled materials, are not considered to be eligible for certification as amateur-built aircraft, since the major portion of the aircraft would not have been fabricated and assembled by the builder.

6. DESIGN AND CONSTRUCTION. The following is intended to provide guidance and information in the interest of safety for the design and construction of amateur-built aircraft.

- a. The design 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 a minor accident.
- b. Any kind of engines, propellers, wheels, and similar components, and any kind of materials may be used in the construction of an amateur-built aircraft; however, it is suggested that FAA approved components and established aircraft quality material be used wherever possible, and especially in fabricating parts such as wing spars, critical attachment fittings, and fuselage structural members.
- c. It is suggested that the instruments and equipment specified in the applicable paragraphs of FAR Part 91, Section 91.33 be installed in amateur-built aircraft.
- d. Prior to first flight of the aircraft, the powerplant installation should undergo at least one hour of ground operation at various speeds from idle to full power, to determine and ensure that all systems are operating properly. The grade of fuel recommended by the engine manufacturer should be used for all operations, and a fuel flow check should be accomplished to ensure that adequate fuel is supplied to the engine in all anticipated flight attitudes.
- e. Suitable means, consistent with the size and complexity of the aircraft, should be provided to reduce fire hazard wherever possible, including a fire wall between the engine compartment and the

fuselage. A system for providing carburetor heat should also be provided to minimize the possibility of carburetor icing.

f. Additional information and guidance of value to an amateur-builder is provided in FAA Advisory Circulars No. 43.13-1 and 43.13-2.

7. APPLICATION FOR EXPERIMENTAL CERTIFICATE. The following regulations are applicable to an applicant for an experimental certificate.

a. The appropriate sections of FAR Part 47, Aircraft Registration, which prescribe the requirements for:

(1) Obtaining an identification number (nationality and registration marks) and,

(2) Registering the aircraft. (NOTE: In addition to general provisions, FAR Part 47, Section 47.33(c) applies specifically to applicants for registration of amateur-built aircraft.)

b. FAR Part 21, Section 21.182, which prescribes aircraft identification requirements.

c. FAR Part 45, which establishes requirements for:

(1) Data and location for identification plates;

(2) Display of airworthiness classification marks; and,

(3) Display of the identification number.

d. FAR Part 21, Sections 21.173 and 21.193, which prescribe the requirements for submittal of an application for airworthiness certificate. An application form may be obtained from the nearest office of the FAA Flight Standards Service.

8. INSPECTION.

a. The airworthiness certification procedure includes inspection of the aircraft by an authorized FAA representative to determine that the aircraft is in condition for safe operation.

b. In order that the inspection can be conducted with the least burden to all concerned, it is recommended that the amateur-builder contact the nearest office of the FAA Flight Standards Service prior to starting his project, to discuss his intentions and to generally outline his proposed program for fabrication and assembly of his aircraft. The FAA representative will establish a tentative plan for inspection of the aircraft at stages in its construction which will permit inspection

of structures, such as wings or fuselage, before external covering is applied or before an area is permanently closed.

- c. To preclude any problems or questions concerning source or specifications of materials, parts, appliances, etc. used in fabricating the aircraft, it would be helpful if the builder kept copies of all invoices or other shipping documents.
- d. The final inspection of the aircraft will include a determination by the FAA representative that:
  - (1) The aircraft is properly registered;
  - (2) The aircraft identification requirements of FAR Part 45 have been complied with; and,
  - (3) FAR 91.31 has been complied with, as applicable.

#### 9. OPERATING LIMITATIONS.

- a. With the issuance of an experimental certificate, conditions and limitations are prescribed by the FAA. The operating limitations are generally considered in two phases; (1) those prescribed with the original issuance of the certificate, and, (2) those prescribed following satisfactory operation in an assigned flight test area. FAR Part 91, Section 91.42 prescribes general operating limitations for all experimental aircraft; however, the FAA inspector will also normally issue additional limitations specifically applicable to amateur-built aircraft.
- b. After completion of the appropriate period of operation in an assigned flight test area, application may be made to the FAA for amendment of the operating limitations to permit flight outside of the area. An application for airworthiness certificate is the form used to apply for amendment of operating limitations and may be obtained from the nearest FAA Flight Standards Service Office.

10. OPERATION OF AMATEUR-BUILT AIRCRAFT. An amateur-built aircraft is governed by the operating rules contained in FAR Part 91, "General Operating and Flight Rules," except that, a "gyroglider" flown while attached to a ground or water towing vehicle is considered a kite and subject to FAR Part 101, "Moored Balloons, Kites, Unmanned Rockets, and Unmanned Free Balloons." The pilot in command of an amateur-built aircraft being operated under FAR Part 91 is subject to FAR Part 61, "Certification: Pilots and Flight Instructors."

#### 11. SAFETY PRECAUTIONS.

- a. Before first flight of an amateur-built aircraft, the operator should take precautions to ensure that adequate emergency equipment and

service is readily available in the event of an accident during initial takeoffs and landings. If the aircraft is a seaplane operated from a body of water, it is recommended that a boat with appropriate rescue equipment and personnel be stationed near the takeoff and landing area.

- b. The operator should thoroughly familiarize himself with the ground handling characteristics of his aircraft by conducting taxi tests, before attempting flight operations.
- c. Acrobatics or violent maneuvers should not be attempted on the first flight of an amateur-built aircraft, nor until sufficient flight experience in gentle maneuvers has been gained to establish that the aircraft is satisfactorily controllable.
- d. If the aircraft is built from purchased plans or raw material kits, with which the seller provides a flight manual, the flight manual instructions should be followed.
- e. The following precautions are specifically applicable to amateur-built helicopters or gyroplanes.
  - (1) The pilot should be prepared to cope with a nonconventional aircraft which has flight characteristics unlike that of an airplane.
  - (2) The effect of collective pitch and cyclic pitch control movements should be thoroughly understood by the operator.
  - (3) Operators of rotorcraft having three-bladed, fully articulated rotor systems should be particularly cautious of "ground resonance." This condition of rotor unbalance, if allowed to progress, can be extremely dangerous and usually results in structural failure.
  - (4) Tests showing that stability, vibration, and balance are satisfactory should be completed with the rotorcraft tied down, before beginning hover or horizontal flight operations.

12. HOW TO GET PUBLICATIONS. The following Federal Aviation Regulations and Advisory Circulars are pertinent to the construction and operation of amateur-built aircraft and may be obtained from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402, at the price indicated:

- |   |   |         |
|---|---|---------|
| * | a. FAR, Volume II - contains Parts 11, 13, 15, <u>21</u> , 37, 39, <u>45</u> , <u>47</u> , 49, 183, 185, 187, and 189 | \$ 6.00 |
|   | b. FAR, Volume VI - contains Parts <u>91</u> , 93, 99, <u>101</u> , 103, and 105                                      | 5.00    |

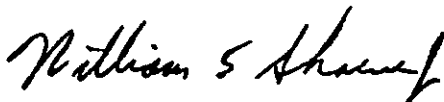
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- \* c. FAR, Volume IX - contains 61, 63, 65, 67, 141, 143, \$ 6.00  
and 147  
d. Advisory Circular No. 43.13-1 3.00  
e. Advisory Circular No. 43.13-2 2.00

The above includes amendment transmittal service

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