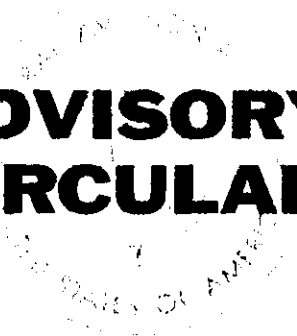


Cancelled See 27A

Federal Aviation Agency

AC NO: 20-27
AIRCRAFT
EFFECTIVE: 7/31/64

ADVISORY CIRCULAR



SUBJECT : CERTIFICATION AND OPERATION OF AMATEUR-BUILT AIRCRAFT

1. PURPOSE. This advisory circular has been prepared to provide information and guidance material for amateur aircraft builders.
2. CANCELLATION. Flight Standards Service Release No. 456, dated January 4, 1962.
3. RELATED PUBLICATIONS. Civil Air Regulations, Part 1; Federal Aviation Regulations, Parts 45, 91, and 101; and Civil Aeronautics Manual, Part 1.
4. BACKGROUND. The Federal Aviation Agency has been receiving requests from various sources for information relative to amateur-built aircraft. The information as outlined in this circular applies to all amateur-built aircraft and specifically to rotorcraft kits. At the present time, there are several sources of rotorcraft kits and detailed plans available to the amateur builder. The advent of the rotorcraft kit has generated considerable publicity, some of which has tended to be misleading. To help correct this situation, and to prevent any unintentional violation of the Civil Air Regulations by amateur builders, the following information is presented.
5. GUIDANCE.

a. CERTIFICATION OF AMATEUR-BUILT AIRCRAFT

(1) An amateur-built aircraft, when constructed under the provisions of Civil Air Regulations 1.73 and 1.74 may qualify for airworthiness certification in the experimental classification provided it is truly built by the amateur. "Amateur-built" is one of the purposes for which an experimental certificate may be issued. An amateur-built aircraft is one which has been fabricated and assembled by an individual or a group of individuals on a nonbusiness,

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nonprofit, nonproduction basis, the construction project having been undertaken for educational and/or recreational purposes.

- (2) As a general rule of thumb, if it can be shown to the satisfaction of the Federal Aviation Agency inspector that the major portion of the aircraft (exclusive of the items listed below) was designed and/or fabricated by an individual or group of individuals for educational or recreational purposes, it will be considered eligible as amateur-built. Certain components and parts need not be manufactured by the applicant, but may be procured on the open market. For example; engine(s), propeller(s), rotor blades and hubs, accessories, wheel and brake assemblies, instruments, appliances, standard aircraft hardware and fasteners, and raw materials, such as tubing, fabric, extruded sections, etc.
- (3) Aircraft completely assembled from prefabricated components or prefabricated kits (i.e., kits which primarily involve assembly operations only) procured commercially or from other persons or sources, are not considered as being within the meaning of amateur-built and, therefore, are not eligible for certification under this purpose.
- (4) Kits, and structural components of other aircraft, may be used provided satisfactory evidence can be shown that the major portion of the aircraft has been fabricated and assembled by an individual or group of individuals for educational or recreational purposes.
- (5) In consideration of the above, the following steps are suggested relative to construction of the aircraft intended for the amateur-built purpose:
 - (a) Familiarization, by the applicant, of the existing regulations and policies governing this category.
 - (b) The applicant should contact the nearest local Flight Standards Service District Office of the FAA, prior to beginning actual fabrication, to discuss his intentions and to generally outline the amateur-built program concerning fabrication and assembly.
 - (c) At the initial building stages, a schedule of inspections should be established with the local FAA inspector, thereby preventing undue hardship on the amateur builder relative to the necessary inspections of closed-in-areas and other details.

- (d) In the latter stages of the building program and following complete inspections of the aircraft, records of which should be kept by the builder, the applications for registration and airworthiness certificates should be considered, consulting the local FAA inspector for advice and information. Guidance in this regard is important since the procedure for issuance of the airworthiness certificate entails the establishment of operating restrictions which are a part of the airworthiness certificate, and the assignment of an approved flight test area. Operation of the aircraft should not be attempted until applicable requirements of CAR 1.73 and 1.74 are met. Otherwise, the operator would be in violation of Section 91.27 of the Federal Aviation Regulations.
 - (e) It is recommended that prior to identification of the aircraft, the applicant familiarize himself with FAR 45 relative to display of identification markings. This section of the regulations provides marking requirements for both fixed-wing aircraft and rotorcraft.
 - (f) Initial flight testing which includes the flight experience and flight test demonstration provisions of Civil Aeronautics Manual 1.74-3 must be performed in an approved flight test area and will be so indicated in the initial operating restrictions. Upon satisfactory completion of the flight testing, the initial restrictions may be modified to authorize operation outside the approved flight test area.
 - (g) In all cases, when the applicant wishes to modify the operating restrictions, a new application should be submitted to the local FAA inspector. Further, in order for the applicant to substantiate test time, a detailed logbook of the aircraft flight history should be maintained.
- (6) The information, as outlined herein, is intended for the guidance of the amateur builder and also to point out the importance of certain airworthiness standards, which are necessary to safeguard the general public.

b. OPERATION OF AMATEUR-BUILT AIRCRAFT

Amateur-built aircraft operations are governed by the provisions of FAR Part 91. Operations of gyrogliders confined to a towline from the surface falls under the provisions of moored balloons and kites as specified in FAR Part 101.

(1) FAR Part 101, Authorizations and Limitations

- (a) Towed flight operations below 150 feet above the surface at locations more than five miles from the boundary of the nearest airport may be conducted without permit from or notice to the Administrator of the FAA.
- (b) In accordance with FAR 101.15, towed flight operation between 150 and 500 feet above the surface may be conducted, provided written notice is submitted to the nearest office of the FAA at least 24 hours prior to the date of operation. This notice shall contain the name and address of the owner and operator, the size and weight of the gyroglider, location of the proposed operation, the height above the surface at which the gyroglider is to be operated, and the date, time, and duration of the operation.
- (c) A certificate of waiver or authorization issued by the Administrator of the FAA is required for all operations which involve the following conditions:

- 1 at altitudes of 500 feet or more above the surface, or
- 2 within five miles of the boundary of the nearest airport, or
- 3 closer than 500 feet to the base of any cloud, or
- 4 during the hours of darkness, or
- 5 when the ground visibility is less than three miles.

(Application forms for the above certificate may be obtained at any FAA Flight Standards Service District Office.)

NOTE: Pilot or aircraft certificates are not required when operating under the provisions of FAR 101.

(2) FAR Part 91

- (a) Operation as an experimental aircraft may be authorized when the aircraft is certificated as amateur-built under the provisions of CAR 1.73 and 1.74. All flight operations must be made in compliance with FAR 91 GENERAL OPERATING AND FLIGHT RULES.

- 1 The operator must hold a valid student pilot certificate endorsed by an appropriately certificated flight instructor for solo flight in the model of aircraft being flown, or
- 2 Be the holder of a private or higher grade of pilot certificate.

NOTE: The holder of an airplane pilot certificate may operate a rotorcraft in solo flight without possessing a rotorcraft category rating; however, he may not carry passengers until a rotorcraft category rating is obtained, and the appropriate modifications have been made to the aircraft restrictions.

c. SAFETY PRECAUTIONS FOR AMATEUR-BUILT ROTORCRAFT OPERATIONS

(1) Rotorcraft-gliders

- (a) A system of signals for communications between the operator and the driver of the tow vehicle is considered necessary.
- (b) A reasonably smooth and level surface at least 1000 feet long is desirable to provide room for takeoff, straight flight, and landing.
- (c) The operator should make ground practice tests to determine the handling characteristics of the aircraft before attempting flight operations.
- (d) The glider should be equipped with a means for quickly detaching the tow cable in case of emergency.
- (e) If flights are made at airports, the operator should coordinate all operations with the appropriate airport officials and be familiar with the airport rules and procedures.
- (f) Towing by aircraft is not permitted under FAR 101, and should not be attempted.
- (g) The operator should not attempt free flight until he is thoroughly familiar with the handling of the aircraft and has made certain that the appropriate aircraft and pilot certificates are held.

(2) Gyroplanes

- (a) Taxi tests should be conducted to determine the handling characteristics of the aircraft prior to attempting flight operations.
- (b) Initial test flights should be made from airports with runways of sufficient length to determine takeoff and landing characteristics of the aircraft without undue risk to the operator.
- (c) Flight tests away from airports must be made within the boundaries of flight test areas approved by the Administrator.

(3) Helicopters

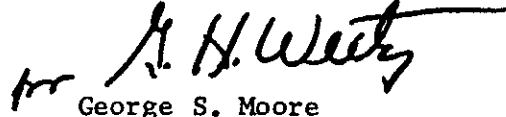
- (a) Stability, vibration, and balance tests should be completed prior to attempting hover or flight operations.
- (b) Hover tests should be completed prior to attempting forward flight.

(4) General Safety Hints for all Rotorcraft Operations

- (a) Airplane pilots should be prepared to cope with a nonconventional aircraft which will not generally possess the stable characteristics of a conventional airplane.
- (b) The effect of collective pitch or cyclic control movements may cause confusion to the airplane pilot and should be thoroughly understood by all operators.
- (c) Operators of rotorcraft having three or more rotorblades should be particularly cautious of "GROUND RESONANCE," a condition of rotor unbalance that if allowed to continue, will usually result in structural failure.

6. The Civil Air Regulations referred to in this advisory circular may be obtained from the Superintendent of Documents, United States Government Printing Office, Washington, D.C. 20402.

	Price
Civil Aeronautics Manual 1 - - - - -	\$2.00
Civil Aeronautics Manual 3 - - - - -	1.50
Civil Aeronautics Manual 18 - - - - -	1.50
Federal Aviation Regulations 91 - - - - -	.30
Federal Aviation Regulations 101 - - - - -	.20
Regulations of the Administrator, Part 501 - - -	.05



George S. Moore
Director
Flight Standards Service

Repl. by 20-27B

AC NO: AC 20-27A

DATE: 8/12/68



ADVISORY CIRCULAR

DEPARTMENT OF TRANSPORTATION FEDERAL AVIATION ADMINISTRATION

SUBJECT: CERTIFICATION AND OPERATION OF AMATEUR-BUILT AIRCRAFT

1. PURPOSE. This advisory circular is to provide information and guidance concerning certification and operation of amateur-built aircraft, including gliders, free balloons, helicopters, and gyroplanes, and to set 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.
 - a. Advisory Circular (AC) No. 20-27, effective 7/31/64.
 - b. Civil Aeronautics Manual (CAM) Part 1, Section 1.74-3 (Ref. AC 20-33).
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

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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

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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 Part 21	- - - - -	\$.60
b. FAR Part 45	- - - - -	.20
c. FAR Part 47	- - - - -	.25

d.	FAR Part 61	- - - - -	\$.70
e.	FAR Part 91	- - - - -	.70
f.	FAR Part 101	- - - - -	.20
* g.	Advisory Circular No. 43.13-1	- - - - -	1.50
* h.	Advisory Circular No. 43.13-2	- - - - -	1.00

* Subscription items.


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