AC 21.23-1

DATE 1/12/81

ADVISORY CIRCULAR

DEPARTMENT OF TRANSPORTATION
Federal Aviation Administration
Washington, D.C.

Subject: TYPE CERTIFICATION - FIXED-WING GLIDERS (SAILPLANES)

1. PURPOSE. This advisory circular provides two comprehensive and detailed criteria, but not the only criteria, that may be used by an applicant in showing compliance with Section 21.23(a) of Federal Aviation Regulations, Part 21, (FAR 21.23) for the type certification of fixed-wing gliders (sailplanes), including self-launching (powered) gliders. General guidance relative to glider type certification is also provided.

2. CANCELLATION. Advisory Circular No. 21-3, dated October 18, 1966, is cancelled.

3. RELATED FEDERAL AVIATION REGULATIONS (FARs).

Section 21.5 Airplane or Rotorcraft Flight Manual.

Section 21.23 Issue of type certificate: Gliders (including sailplanes), including fixed-wing, self-launching (powered) gliders.

Part 45, Subpart C—Nationality and Registration Marks.

Section 91.31 Civil aircraft operating limitations and marking requirements.

Section 91.33 Powered civil aircraft with standard category U.S. airworthiness certificates; instruments and equipment requirements.

4. BACKGROUND.

a. FAR 21.23 provides that an applicant is entitled to a type certificate for a fixed-wing glider (sailplane) if it is shown that the glider complies with those airworthiness requirements of FAR 23 or FAR 27 that the FAA considers appropriate and applicable to the specific type design or with such other

airworthiness criteria as the FAA may find provide an equivalent level of safety to those Parts. Reference to FAR 27 in FAR 21.23 is for the type certification of rotary-wing gliders which is outside the scope of this Advisory Circular. The FAA must also find that the glider has no unsafe features or characteristics. The airworthiness standards for the type certification of gliders as defined by FAR 21.23 are very general and objective in nature, making it necessary for the applicant to develop comprehensive and detailed criteria to be used by the FAA in evaluating the glider type design.

b. In 1962, the FAA published a Basic Glider Criteria Handbook. Advisory Circular No. AC 21-3, dated October 18, 1966, advised the public that the Handbook could be used as an acceptable means, but not the only means, of showing compliance with FAR 21.23 for fixed-wing gliders. Except for self-launching (powered) gliders, the FAA still considers the criteria in the Handbook acceptable. Criteria for self-launching sailplanes is addressed in paragraphs 5b, c, and g of this AC. Although AC 21-3 is cancelled by this AC, the Handbook itself is not cancelled.

c. On April 1, 1980, certain European Civil Airworthiness Authorities agreed to Joint Airworthiness Requirements for Sailplanes and Powered Sailplanes (JAR 22). JAR 22 is based on the Federal Republic of Germany national airworthiness code (Luftuchtigkeitsforderungen fur Segelflugzeuge und Motorsegler (LFSM) published by the Luftfahrt Bundesamt), and was developed through joint participation of the Civil Airworthiness Authorities of Belgium, the Federal Republic of Germany, France, Italy, the Netherlands, Sweden, and the United Kingdom. After the original issuance, JAR 22 was amended to add new Subparts H and J which set forth criteria for the type certification of glider engines and propellers, respectively. After reviewing JAR 22, including new Subparts H and J, the FAA determined that a fixed-wing glider design, including a self-launching (powered) glider, that is shown by an applicant to comply with the criteria of JAR 22, plus the additional criteria specified herein, may be found by the FAA to comply with airworthiness criteria that provides an equivalent level of safety to the appropriate and applicable requirements of FAR 23. Moreover, the FAA has in the past, type certificated a number of gliders manufactured in the Federal Republic of Germany that were designed to the LFSM which was used as the basis for JAR 22. The highly satisfactory service experience gained with those gliders further supports the acceptability of JAR 22 as criteria for showing compliance with FAR 21.23(a).

d. As a third alternative, an applicant may wish to study FAR 23, identify those requirements believed to be appropriate and applicable for the type certification of its fixed-wing glider design, and propose alternative criteria for showing compliance with FAR 21.23(a). When approved by the FAA, such independently developed criteria may be used as acceptable means of showing compliance with FAR 21.23(a) for the particular glider under consideration.

e. In addition to the type certification requirements of FAR 21, gliders must also comply with certain operational provisions of FAR 91. Applicants for type certification of gliders, particularly self-launching gliders, should ensure that these requirements are considered in their designs.

5. ACCEPTABLE CRITERIA.

a. Applicants may utilize one of the following two sets of criteria for the type certification of fixed-wing gliders, including self-launching (powered) gliders, or develop their own criteria using FAR 23 as a basis for compliance with FAR 21.23(a) -

(1) FAA Basic Glider Criteria Handbook; or

(2) JAR 22, as amended at the date of application for type certification plus the additional criteria specified in paragraph 5.e.(6) of this Advisory Circular.

b. Self-launching (powered), fixed-wing gliders may be type certificated under FAR 21.23 if--

(1) The total occupant capacity does not exceed two persons;

(2) The maximum certificated weight does not exceed 2,000 lbs; and

(3) The minimum descent rates for the glider, power-off, at maximum weight and most unfavorable center of gravity position, does not exceed--

i. 3.3 ft/sec. (1 m/sec) for single-seat gliders; or

ii. 4.0 ft/sec. (1.2 m/sec) for two-seat gliders.

c. Chapter 6 of the FAA Basic Glider Criteria Handbook is no longer considered to adequately address self-launching (powered) gliders. Applicants wishing to type certificate self-launching gliders, that comply with the criteria of paragraph 5.b. of this AC, must either use the criteria of JAR-22 for powered sailplanes or develop criteria for individual FAA approval using FAR 23 as a base. Self-launching gliders that exceed the limitations in 5.b. can only be type certificated as normal, utility, or acrobatic category airplanes under FAR 23.

d. Engines and Propellers intended for use on self-launched (powered) gliders that are not approved as an integral part of the glider per paragraph 5.e.(4) and 5.e.(5) of this Advisory Circular, must meet the requirements of FARs 33 and 35, respectively, to be type certificated.

e. If JAR-22 is selected by the applicant -

(1) Unless otherwise specified in subparagraph (6) below, the national variants identified by individual countries need not be applied.

(2) The "ACJ (interpretive material)" is considered acceptable to the FAA.

(3) The maximum weight limit of JAR 22.1(a)(1) need not be applied for unpowered gliders.

(4) Engines that meet the criteria of JAR 22 Subpart H, may be approved as an integral part of the glider. Engines so approved will be type certificated but the type certificate will be limited for the installation of the engine on specific gliders.

(5) Propellers that meet the criteria of JAR 22; Subpart J, may be approved as an integral part of the glider. Propellers so approved will be type certificated but the type certificate will be limited for the installation of the propeller on specific gliders.

(6) The following additional criteria must be met to satisfy the associated JAR 22 sections -

(a) JAR 22.177(b) -

i. Pitch and roll control may not be adversely affected at maximum rudder deflection in any flap or speed brake configuration.

ii. Any rudder control force reversal must not require immediate corrective action to prevent an unstable or unsafe flight condition.

iii. The temporary control force required to overcome rudder control force reversal and/or rudder lock may not be greater than 15 percent of the maximum unreversed force or 15 pounds force, whichever is greater.

iv. The flight manual must describe the slip characteristics of the glider, the speed range within which slips can be performed, the appropriate pilot action in response to a rudder control force decrease or reversal condition, and the degradation, if any, in the airspeed system accuracy during slip maneuvers.

(b) JAR 22.207(b) - The national variant specified by Belgium, France, and the United Kingdom applies; that is, visual stall warning alone is not acceptable.

(c) JAR 22.1545 - If V_{NE} varies with altitude, there must be a means to indicate to the pilot the appropriate limitations throughout the operating altitude range.

f. The Airplane Flight Manual requirements of FAR 21.5 are applicable to fixed-wing gliders. In addition, all gliders must comply with the civil aircraft operating limitations and marking requirements of FAR 91.31.

g. Self-launching (powered) gliders are considered to be powered aircraft for the purpose of complying with FAR 91.33.

h. Regardless of the criteria selected under paragraph 5.a, wing and tail surface attachments designed for quick removal and installation by the pilot, as is permitted by FAR 43, Appendix A, paragraph (c) (25), must provide a means for direct visual inspection of the connections for placement and security. The lack of a visual inspection means is considered an unsafe feature and is prohibited by FAR 21.23(b).

i. Nationality registration marking requirements for U.S.-registered gliders are provided by FAR 45, Subpart C.

j. The FAA will document FAR 21.23 as the type certification basis for aircraft designs approved as gliders. The type certificate data sheet will explain in summary statement form, the criteria selected by the applicant for showing compliance with FAR 21.23.

k. United States designers and manufacturers of fixed-wing gliders, including self-launching (powered) gliders, should be advised that strict compliance with JAR 22, including adherence to the national variants, probably will be required by participating countries of the JAR group for import airworthiness acceptance. Accordingly, unless specifically notified to the contrary by the authority of the importing country on a particular case basis, the FAA will consider strict compliance with JAR 22 required for issuance of a U.S. Class I Export Certificate of Airworthiness for export to a JAR participating country.

6. AVAILABILITY OF DOCUMENTS.

a. Copies of the FAA Basic Glider Criteria Handbook may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

b. Copies of Joint Airworthiness Requirements (JAR-22) Sailplanes and Powered Sailplanes, may be purchased from the Civil Aviation Authority, Printing and Publication Services, Greville House, 37 Gratton Road, Cheltenham Glos. GL50 2BN, England.

c. Copies of AC 21.23-1 may be obtained from the U.S. Department of Transportation, Publications Section M443.1, Washington, DC 20590.

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