CIVIL AIR REGULATIONS

PART 14

AIRCRAFT PROPELLER AIRWORTHINESS

Effective March 5, 1952

CIVIL AERONAUTICS BOARD

WASHINGTON, D. C.

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PART 14—AIRCRAFT PROPELLER AIRWORTHINESS

REVISION

Adopted by the Civil Aeronautics Board at its office in Washington, D. C., on the 28th day of January 1952.

The previously effective Part 14 was issued on May 31, 1938, and to date has been amended only in minor details. The present revision of this part is for the purpose of making it consistent in form and language with other airworthiness parts of the Civil Air Regulations and to bring up to date certain technical provisions. The administrative rules of Subpart A have been completely rewritten for consistency with corresponding rules in other airworthiness parts. In amending these administrative rules it is not the intent of the Board to alter any of the procedures which have been consistent with the previously effective regulations. Although the present provisions with respect to eligibility for type certification under Part 14 do not make direct reference to the acceptance by the Administrator of military specifications, nevertheless such acceptance is implicit within the provisions of § 14.10 and, therefore, the revised Part 14 is not intended to imply any general change in policy in this regard.

The provisions of revised Part 14 reflect the discussions at the annual airworthiness meeting and the subsequent comments on the notice of proposed rule making.

Interested persons have been afforded an opportunity to participate in the making of this amendment, and due consideration has been given to all relevant matter presented.

In consideration of the foregoing the Civil Aeronautics Board hereby makes and promulgates a revision of Part 14 of the Civil Air Regulations (14 CFR Part 14, as amended) effective March 5, 1952, to read as follows:

SUBPART A—GENERAL

APPLICABILITY AND DEFINITIONS

AUTHORITY: §§ 14.0 to 14.157 issued under sec. 205, 52 Stat. 984; 49 U. S. C. 425. Interpret or apply secs. 601, 603, 52 Stat. 1007, 1009; 49 U. S. C. 551, 553.

SUBPART A—GENERAL

APPLICABILITY AND DEFINITIONS

§ 14.0 *Applicability of this part.* This part establishes standards with which compliance shall be demonstrated for the issuance of type certificates for propellers [1] used on aircraft. This part, until superseded or rescinded, shall apply to all propellers for which applications for type certification are made after the effective date of this part.

§ 14.1 *Definitions.* As used in this part terms are defined as follows:

(a) *Administration*—(1) *Administrator.* The Administrator is the Administrator of Civil Aeronautics.

(2) *Applicant.* An applicant is a person or persons applying for approval of a propeller or any part thereof.

(3) *Approved.* Approved, when used alone or as modifying terms such as means, devices, specifications, etc., shall mean approved by the Administrator.

(b) *General design*—(1) *Propeller.* A propeller includes all parts, appurtenances, and accessories thereof.[2]

(2) *Propeller accessories.* Propeller accessories are those necessary for the control and operation of the propeller.

(3) *Pitch setting.* Pitch setting is the propeller blade setting determined by the blade angle measured in a manner, and at a radius, specified in the instruction manual for the propeller.

(4) *Fixed-pitch propeller.* A fixed-pitch propeller is a propeller the pitch setting of which cannot be changed except by processes constituting a workshop operation.

(5) *Adjustable-pitch propeller.* An adjustable-pitch propeller is a propeller the pitch setting of which can be conveniently changed in the course of ordinary field maintenance but which cannot be changed when the propeller is rotating.

(6) *Variable-pitch propeller.* A variable-pitch propeller is a propeller the pitch setting of which can be changed by the flight crew or by automatic means while the propeller is rotating.

(7) *Feathered pitch.* Feathered pitch is the propeller pitch setting which in flight, with the engines stopped, gives approximately the minimum drag and corresponds with a wind-milling torque of approximately zero.

(8) *Reverse pitch.* Reverse pitch is the propeller pitch setting for any blade angle used beyond zero pitch (e. g. the negative angle used for reverse thrust).

CERTIFICATION

§ 14.10 *Eligibility for type certificates.* A propeller shall be eligible for type certification under the provisions of this part if it complies with the airworthiness provisions hereinafter established or if the Administrator finds that the provision or provisions not complied with are compensated for by factors which provide an equivalent level of safety: *Provided,* That the Administrator finds no feature or characteristic of the propeller which renders it unsafe for use on aircraft.

§ 14.11 *Designation of applicable regulations.* (a) The provisions of this part, together with all amendments thereto effective on the date of application for type certificate, shall be considered as incorporated in the type certificate as though set forth in full.

(b) Except as otherwise provided by the Board, or pursuant to § 1.24 of this chapter by the Administrator, any change to the type design may be ac-

[1] Applicable to both reciprocating and turbine engines, unless otherwise stated.

[2] As defined in Section 1 of the Civil Aeronautics Act of 1938, as amended.

complished, at the option of the holder of the type certificate, either in accordance with the provisions incorporated by reference in the certificate pursuant to paragraph (a) of this section, or in accordance with the provisions in effect at the time the application for change is filed.

(c) The Administrator, upon approval of a change to a type design, shall designate and keep a record of the provisions of the Civil Air Regulations with which compliance was demonstrated.

§ 14.12 *Amendment of part.* Unless otherwise established by the Board, an amendment of this part shall be effective with respect to propellers for which applications for type certificates are filed after the effective date of the amendment.

§ 14.13 *Type certificate.* (a) An applicant shall be issued a type certificate when he demonstrates the eligibility of the propeller by complying with the requirements of this part in addition to the applicable requirements in Part 1 of this chapter.[1]

(b) The type certificate shall be deemed to include the type design (see § 14.14 (b)), the operating limitations for the propeller (see § 14.16), and any other conditions or limitations prescribed by the Civil Air Regulations (See also § 14.11 (a).)

§ 14.14 *Data required.* (a) The applicant for a type certificate shall submit to the Administrator such descriptive data, test reports, and computations as are necessary to demonstrate that the propeller complies with the requirements of this part.

(b) The descriptive data required in paragraph (a) of this section shall be known as the type design and shall consist of such drawings and specifications as are necessary to disclose the configuration of the propeller and all the design features covered in the requirements of this part, such information on dimensions, materials, and processes as is necessary to define the structural strength of the propeller, and such other data as are necessary to permit by comparison the determination of the airworthiness of subsequent propellers of the same type.

§ 14.15 *Inspections and tests.* Inspections and tests shall include all those found necessary by the Administrator to insure that the propeller complies with the applicable airworthiness requirements and conforms to the following:

(a) All materials and products are in accordance with the specifications in the type design.

(b) All parts of the propeller are constructed in accordance with the drawings in the type design.

(c) All manufacturing processes, construction, and assembly are such that the design strength and safety contemplated by the type design will be realized in service.

§ 14.16 *Required tests.* The tests prescribed in this part shall be conducted to establish the propeller operating limitations, as chosen by the applicant, and the reliability of the propeller to operate within those limitations. The provisions of paragraphs (a) through (c) of this section shall be applicable.

(a) The applicant shall furnish all testing facilities, including equipment and competent personnel, to conduct the prescribed tests.

(b) An authorized representative of the Administrator shall witness such of the tests as are necessary to verify the test report.

(c) The Administrator shall establish propeller operating limitations determined on the basis of the propeller operating conditions demonstrated during the tests.

§ 14.17 *Production certificates.* (For requirements with regard to production certificates see Part 1 of this chapter.)

§ 14.18 *Approval of materials, parts, processes, and appliances.* (a) Materials, parts, processes, and appliances shall be approved upon a basis and in a manner found necessary by the Administrator to implement the pertinent provisions of the Civil Air Regulations. The Administrator may adopt and publish such specifications as he finds necessary to administer this regulation, and shall incorporate therein such portions of the aviation industry, Federal, and military specifications respecting such materials, parts, processes, and appliances as he finds appropriate.

NOTE: The provisions of this paragraph are intended to allow approval of materials, parts, processes, and appliances under the system of Technical Standard Orders, or in conjunction with type certification procedures for a propeller, or by any other form of approval by the Administrator.

(b) Any material, part, process, or appliance shall be deemed to have met the requirements for approval when it meets the pertinent specifications adopted by the Administrator, and the manufacturer so certifies in a manner prescribed by the Administrator.

§ 14.19 *Changes in type design.* (For requirements with regard to changes in type design see Part 1 of this chapter.)

IDENTIFICATION AND INSTRUCTION MANUAL

§ 14.20 *Propeller identification data.* A certificated propeller, propeller blade, or propeller hub shall have displayed upon it conspicuously the identification data required by § 1.50 of this chapter. The identification data shall be permanently attached upon a noncritical surface of the propeller, blade, or hub by means of a plate, stamping, engraving, etching, or other approved method. When such data are not visible when the propeller is assembled or installed on an aircraft, they shall also be painted or printed on the propeller, blade, or hub.

§ 14.21 *Instruction manual.* The applicant shall prepare and make available an approved manual containing instructions for the installation, operation, servicing, maintenance, repair, and overhaul of the propeller.

NOTE: It is not intended to limit the form of the manual to a single document.

SUBPART B—AIRWORTHINESS

DESIGN AND CONSTRUCTION

§ 14.100 *Scope.* (a) The propeller shall not incorporate design features or details which experience has shown to be hazardous or unreliable. The suitability of all questionable design details or parts shall be established by tests.

(b) The design and construction provisions of this part shall be applicable to the propeller when it is installed, operated, and maintained in accordance with the instruction manual prescribed in § 14.21.

§ 14.101 *Materials.* The suitability and durability of all materials used in the propeller shall be established on a basis of experience or tests. All materials used in the propeller shall conform to approved specifications which will insure their having the strength and other properties assumed in the design data.

§ 14.102 *Durability.* All parts of the propeller shall be designed and constructed to minimize the development of an unsafe condition of the propeller between overhaul periods.

TESTS

§ 14.150 *General.* The tests and inspections prescribed in §§ 14.151 through 14.157 shall be applicable to propellers, including all essential accessories. The propeller shall complete the prescribed tests without evidence of failure or malfunctioning.

§ 14.151 *Centrifugal load test.* The hub and blade retention arrangement of propellers with detachable blades shall be subjected to a centrifugal load equal to twice the centrifugal force to which the propeller is to be subjected in normal operation. Either one of the following two test methods shall be acceptable.

(a) A one-hour whirl test.

(b) A static pull test.

§ 14.152 *Vibration test.* Propellers with metal blades and/or metal hubs shall be subjected to a vibration test under sufficient conditions to establish the level of vibratory stresses in the blade and/or hub when the propeller is operated under all conditions of rotational speed and engine power which are to be established for the propeller. The test shall be conducted on the same or equivalent engine and the test stand configuration on which the endurance tests are conducted.

§ 14.153 *Endurance test*—(a) *Fixed-pitch wood propellers.* Fixed-pitch wood propellers shall be subjected to one of the following endurance tests.

(1) A 10-hour endurance block test on an engine shall be conducted with a propeller of the greatest pitch and diameter for which certification is sought at the rated rotational speed.

(2) A 50-hour flight test shall be conducted in level flight or in climb. At

[1] Prior to approval for use of a type certificated propeller on a certificated aircraft, the propeller will be required to comply with pertinent provisions of the applicable aircraft airworthiness parts of the Civil Air Regulations.

least 5 hours of this flight test shall be conducted with the propeller operated at the rated rotational speed, and the remainder of the 50 hours shall be conducted with the propeller operated at not less than 90 percent of the rated rotational speed.

(3) A 50-hour endurance block test on an engine shall be conducted at the power and propeller rotational speed for which certification is sought.

(b) *Fixed-pitch metal propellers and adjustable-pitch propellers.* Fixed-pitch propellers with metal blades and adjustable-pitch propellers shall be subjected to one of the endurance tests prescribed in paragraphs (a) (2) and (3) of this section.

(c) *Variable-pitch propellers.* Variable-pitch propellers shall be subjected to one of the following endurance tests.

(1) A 100-hour endurance test shall be conducted on an engine of the same power and rotational speed characteristics as the engine or engines with which the propeller is intended to be used. The endurance test shall be conducted at the maximum continuous rotational speed and power rating of the propeller, except that, in the event a rotational speed(s) and power condition(s) is found to be critical on the basis of the vibration test prescribed in § 14.152, such portion of the 100 hours as the Administrator finds necessary, but not in excess of 50 hours, shall be conducted at the critical rotational speed(s) and power condition(s). If a take-off rating greater than the maximum continuous rating is to be established, a 10-hour block test in addition to the 100 hours shall be conducted at the maximum power and rotational speed for the take-off rating.

(2) The propeller shall be operated throughout the engine endurance tests prescribed in Part 13 of this chapter.

§ 14.154 *Functional test.* Variable-pitch propellers shall be subjected to the following functional tests as applicable. The same propeller as used in the endurance test shall be used in the functional tests and shall be driven by an engine mounted on a test stand or on an aircraft.

(a) *Manually controllable propellers.* 500 complete cycles of control shall be applied throughout the pitch and rotational speed ranges.

(b) *Automatically controllable propellers.* 1,500 complete cycles of control by means of automatic control mechanism shall be applied throughout the pitch and rotational speed ranges.

(c) *Feathering propellers.* 50 cycles of feathering operation shall be applied.

(d) *Reversible-pitch propellers.* 200 complete cycles of control shall be applied from the lowest normal pitch to the maximum reverse pitch. At the end of each cycle the propeller shall be operated in reverse pitch for a period of one minute at the reverse pitch maximum rotational speed and power.

§ 14.155 *Special tests.* Such tests shall be conducted as the Administrator finds necessary to substantiate the use of any unconventional features of design, material, or construction.

§ 14.156 *Teardown inspection.* After completion of the tests, the propeller shall be completely disassembled and a detailed inspection shall be made of the propeller parts to check for fatigue, wear, and distortion.

§ 14.157 *Propeller adjustments and parts replacements.* During the tests servicing and minor repairs of the propeller shall be permissible. If major repairs or replacement of parts are found necessary during the tests or in the teardown inspection, the parts in question shall be subjected to such additional tests as are found by the Administrator to be necessary.

By the Civil Aeronautics Board.

(SEAL) M. C. MULLIGAN,
Secretary.

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