Designation: F3179/F3179M – 24a

Standard Specification for Performance of Aircraft[1]

This standard is issued under the fixed designation F3179/F3179M; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This specification covers the airworthiness design standards associated with general aeroplane performance. The material was developed through open consensus of international experts in general aviation. This information was created by focusing on Normal Category aeroplanes. The content may be more broadly applicable; it is the responsibility of the Applicant to substantiate broader applicability as a specific means of compliance. The topics covered within this specification are: Stalling, Takeoff and Landing Speeds; Takeoff Performance, Distances and Path; Climb; Landing Performance and Distances; Balked Landing.

1.2 An applicant intending to propose this information as Means of Compliance for a design approval must seek guidance from their respective oversight authority (for example, published guidance from applicable civil aviation authorities (CAAs)) concerning the acceptable use and application thereof. For information on which oversight authorities have accepted this standard (in whole or in part) as an acceptable Means of Compliance to their regulatory requirements (hereinafter "the Rules"), refer to ASTM Committee F44 webpage (www.astm.org/COMMITTEE/F44.htm).

1.3 *Units*—This specification may present information in either SI units, English Engineering units, or both. The values stated in each system are not necessarily exact equivalents; therefore, to ensure conformance with the standard, each system shall be used independently of the other, and values from the two systems shall not be combined.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

F3060 Terminology for Aircraft

F3061/F3061M Specification for Systems and Equipment in Aircraft

F3063/F3063M Specification for Aircraft Fuel Storage and Delivery

F3064/F3064M Specification for Aircraft Powerplant Control, Operation, and Indication

F3083/F3083M Specification for Emergency Conditions, Occupant Safety and Accommodations

F3117/F3117M Specification for Crew Interface in Aircraft

F3120/F3120M Specification for Ice Protection for General Aviation Aircraft

F3173/F3173M Specification for Aircraft Handling Characteristics

F3180/F3180M Specification for Low-Speed Flight Characteristics of Aircraft

F3233/F3233M Specification for Flight and Navigation Instrumentation in Aircraft

2.2 *EASA Standard:*[3]

CS-25 Certification Specifications for Large Aeroplanes

2.3 *FAA Standard:*[4]

14 CFR 25 Airworthiness Standards: Transport Category Airplanes

3. Terminology

3.1 Refer to Terminology F3060.

3.2 In addition, the following definitions apply only in the context of this standard:

3.2.1 *loss of thrust*—for conventional aeroplanes (reciprocating or turbine engine-powered), loss of thrust means one

[1] This specification is under the jurisdiction of ASTM Committee F44 on General Aviation Aircraft and is the direct responsibility of Subcommittee F44.20 on Flight.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at www.astm.org/contact. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] Available from European Union Aviation Safety Agency (EASA), Konrad-Adenauer-Ufer 3, D-50668 Cologne, Germany, https://www.easa.europa.eu.

[4] Available from Federal Aviation Administration (FAA), 800 Independence Ave., SW, Washington, DC 20591, http://www.faa.gov.

engine inoperative. For other aeroplanes, the amount of thrust loss shall be proposed by the applicant and accepted by the CAA.

3.2.2 V_R—rotation speed is the speed at which the pilot makes a control input with the intention of lifting the aeroplane out of contact with the runway or water surface.

3.3 Where reference is made to V_S (V_{SR}), use V_S or V_{SR} as appropriate for the stall speed basis established for the aeroplane per Section 5.

4. Performance Data

4.1 Unless otherwise prescribed, the performance requirements of this specification shall be met for still air and standard atmosphere; and

4.1.1 **For Level 1 and 2 high-speed aeroplanes and all Level 3 and 4 aeroplanes**, ambient atmospheric conditions within the operating envelope.

4.2 **For all aeroplanes, except for aeroplanes with $V_{S0} \leq$ 45 KCAS**, performance data shall be determined over not less than the following conditions:

4.2.1 Airport altitude from sea level to 3048 m [10 000 ft];

4.2.2 The temperature from standard (ISA) to 30 °C [54 °F] above standard (ISA +30 °C [ISA +54 °F]) or the maximum ambient atmospheric temperature at which compliance with the cooling provisions of Specification F3064/F3064M is shown, if lower;

4.2.3 Any temperature lower than standard (ISA) and within the operating limitations established for the aeroplane at which takeoff or landing speeds or distances are higher, or climb gradients are lower, than at standard (ISA).

4.3 Performance data shall be determined with any means for controlling the engine cooling air supply (for example, cowl flaps) in the position used in the engine cooling tests;

4.4 The available propulsive thrust shall correspond to engine power, not exceeding the approved power, less:

4.4.1 Installation losses.

4.4.2 The power absorbed by the accessories and services appropriate to the particular ambient atmospheric conditions and the particular flight condition.

4.5 The performance, as affected by engine power or thrust, shall be based on a relative humidity:

4.5.1 Of 80 % at and below standard temperature.

4.5.2 From 80 % at the standard temperature (ISA), varying linearly down to 34 % at 28 °C [50 °F] above standard (ISA +28 °C [ISA +50 °F]).

4.6 Unless otherwise prescribed in determining the takeoff and landing distances, changes in the aeroplane's configuration, speed, and power shall be made in accordance with procedures established by the applicant for operation in service. These procedures shall be able to be executed consistently by pilots of average skill in atmospheric conditions reasonably expected to be encountered in service.

4.7 Takeoff and landing distances, takeoff run, and accelerate-stop distances, as applicable and defined in each applicable section, shall be determined on a smooth, dry, hard-surfaced runway.

4.7.1 The effect on these distances of operation on other types of surfaces (for example, grass and gravel) when dry, may be determined or derived, and these surfaces listed in the aeroplane flight manual in accordance with Specification F3117/F3117M, Types of Surface.

4.8 **For Level 3 and Level 4 high-speed multiengine aeroplanes**, the following also apply:

4.8.1 Unless otherwise prescribed, the applicant shall select the takeoff, en route, approach, and landing configurations for the aeroplane;

4.8.2 The aeroplane configuration may vary with weight, altitude, and temperature to the extent they are compatible with the operating procedures required by 4.8.3;

4.8.3 Unless otherwise prescribed, in determining the takeoff performance, takeoff flight path, and the accelerate-stop distance, all with a critical loss of thrust, changes in the aeroplane configuration, speed, and power shall be made in accordance with procedures established by the applicant for operation in service;

4.8.4 Procedures for the execution of discontinued approaches and balked landings associated with the conditions prescribed in 7.3.3.4 and 7.4.1.3 shall be established;

4.8.5 The procedures established under 4.8.3 and 4.8.4 shall:

4.8.5.1 Be able to be consistently executed by a crew of average skill in atmospheric conditions reasonably expected to be encountered in service,

4.8.5.2 Use methods or devices that are safe and reliable;

4.8.5.3 Include allowance for any reasonably expected time delays in the execution of the procedures.

5. Stall Speed

5.1 V_{S0} and V_{S1} are the stalling speeds or the minimum steady flight speeds in knots (KCAS) at which the aeroplane is controllable.

5.2 At the option of the applicant, for Levels 1, 2, and 3 high-speed multiengine aeroplanes, and all Level 4 multiengine aeroplanes, reference stall speeds (V_{SR0} and V_{SR1}) may be established in lieu of the stalling speeds (V_{S0} and V_{S1}) defined in 5.1.

5.2.1 The reference stall speeds, V_{SR0} and V_{SR1}, are calibrated airspeeds defined by the applicant. V_{SR} may not be less than a 1-g stall speed. V_{SR} is expressed as:

$$V_{SR} \geq \frac{V_{CL\max}}{\sqrt{n_{ZW}}} \tag{1}$$

where:

V_{CLMAX} = Calibrated airspeed obtained when the load factor-corrected lift coefficient ($\frac{n_{ZW}W}{qS}$) is a first maximum during the maneuver prescribed in 5.4. In addition, when the maneuver is limited by a device that abruptly pushes the nose down at a selected angle of attack (for example, a stick pusher), V_{CLMAX} may not be less than the speed existing at the instant the device operates;

n_{ZW} = load factor normal to the flight path at V_{CLMAX};

W = aeroplane gross weight;