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Standard Specification for Aeroelasticity Requirements[1]

This standard is issued under the fixed designation F3093/F3093M; 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 addresses the aeroelasticity requirements of the airplane.

1.2 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard.

1.3 *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 and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

F3061 Specification for Systems and Equipment in Small Aircraft

F3065/F3065M Specification for Installation and Integration of Propeller Systems

F3115 Specification for Structural Durability for Small Airplanes

2.2 *Federal Aviation Administration (FAA) Document:*[3]

Airframe and Equipment Engineering Report No. 45 (as corrected) "Simplified Flutter Prevention Criteria" 1955

2.3 *Federal Aviation Regulations:*[4]

14 CFR 23 Amendment 62

3. Terminology

3.1 *Definitions:*

3.1.1 *GVT*—ground vibration testing

3.1.2 *V-n*—velocity versus load factor

4. Flutter

4.1 It must be shown by the methods in 4.2, and either 4.3 or 4.4, that the airplane is free from flutter, control reversal, and divergence for any condition of operation within the limit V-n envelope and at all speeds up to the speed specified for the selected method. In addition:

4.1.1 Adequate tolerances must be established for quantities which affect flutter, including speed, damping, mass balance, and control system stiffness; and

4.1.2 The natural frequencies of main structural components must be determined by vibration tests or other approved methods. This determination is not required for Level 1 airplanes with V_D up to 260 kph [140 knots] CAS and maximum gross weight up to 750 kg [1650 lbm].

4.2 Flight flutter tests must be made to show that the airplane is free from flutter, control reversal, and divergence, and to show that:

4.2.1 Proper and adequate attempts to induce flutter have been made within the speed range up to V_D/M_D (or V_{DF}/M_{DF} for jets);

4.2.2 The vibratory response of the structure during the test indicates freedom from flutter;

4.2.3 A proper margin of damping exists at V_D/M_D (or V_{DF}/M_{DF} for jets); and

4.2.4 As V_D/M_D (or V_{DF}/M_{DF} for jets) is approached, there is no large or rapid reduction in damping.

4.3 Any rational analysis used to predict freedom from flutter, control reversal, and divergence must cover all speeds up to 1.2 V_D/1.2 M_D, limited to Mach 1.0 for subsonic airplanes.

4.4 Compliance with rigidity and mass balance criteria defined in pages 4-12 of FAA's Airframe and Equipment Engineering Report No. 45 may be accomplished to show that the airplane is free from flutter, control reversal, or divergence if:

4.4.1 V_D/M_D for the airplane is less than 480 kph [260 knots] (EAS) and less than Mach 0.5,

[1] This specification is under the jurisdiction of ASTM Committee F44 on General Aviation Aircraft and is the direct responsibility of Subcommittee F44.30 on Structures.

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

[3] Available from Federal Aviation Administration (FAA), 800 Independence Ave., SW, Washington, DC 20591, http://www.faa.gov.Available from U.S. Government Printing Office Superintendent of Documents, 732 N. Capitol St., NW, Mail Stop: SDE, Washington, DC 20401, http://www.access.gpo.gov.

[4] Available from U.S. Government Printing Office Superintendent of Documents, 732 N. Capitol St., NW, Mail Stop: SDE, Washington, DC 20401, http://www.access.gpo.gov.