Designation: F3227/F3227M – 22

Standard Specification for Environmental Systems in Aircraft[1]

This standard is issued under the fixed designation F3227/F3227M; 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 international standards for the environmental system aspects of airworthiness and design for "small" aircraft.

1.2 The applicant for a design approval must seek the individual guidance of their respective CAA body concerning the use of this specification as part of a certification plan. For information on which CAA regulatory bodies have accepted this specification (in whole or in part) as a means of compliance to their Small Aircraft Airworthiness regulations (hereinafter referred to as "the Rules"), refer to the ASTM F44 webpage (www.ASTM.org/COMMITTEE/F44.htm), which includes CAA website links. Annex A1 maps the Means of Compliance described in this specification to EASA CS-23, amendment 5, or later, and FAA 14 CFR Part 23, amendment 64, or later.

1.3 The values stated in either SI units or inch-pound units are to be regarded separately as standard. 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 Following is a list of external standards referenced throughout this specification; the earliest revision acceptable for use is indicated. In all cases later document revisions are acceptable if shown to be equivalent to the listed revision, or if otherwise formally accepted by the governing civil aviation authority; earlier revisions are not acceptable.

2.2 *ASTM Standards:*[2]

F3060 Terminology for Aircraft

F3061/F3061M Specification for Systems and Equipment in Aircraft

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

F3117/F3117M Specification for Crew Interface in Aircraft

F3230 Practice for Safety Assessment of Systems and Equipment in Small Aircraft

F3233/F3233M Specification for Flight and Navigation Instrumentation in Aircraft

2.3 *EASA Standard:*[3]

CS-23 Normal, Utility, Aerobatic and Commuter Aeroplanes

2.4 *FAA Standard:*[4]

14 CFR Part 23 Airworthiness Standards: Normal Category Airplanes

2.5 *SAE Standard:*[5]

SAE AIR825/4, Rev A Chemical Oxygen Systems

3. Terminology

3.1 Terminology specific to this specification is provided below. For general terminology, refer to Terminology F3060.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *aircraft type code, n*—an aircraft type code (ATC) is defined by considering both the technical considerations regarding the design of the aircraft and the airworthiness level established based upon risk-based criteria; the method of defining an ATC applicable to this specification is defined in Specification F3061/F3061M.

[1] This specification is under the jurisdiction of ASTM Committee F44 on General Aviation Aircraft and is the direct responsibility of Subcommittee F44.50 on Systems and Equipment.

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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 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.

[5] Available from SAE International (SAE), 400 Commonwealth Dr., Warrendale, PA 15096, http://www.sae.org.

3.2.2 *BTPS, n*—BTPS stands for "Body Temperature and Pressure, Saturated;" this is defined to be a temperature of 37 °C and a pressure equal to the ambient pressure to which the body is exposed minus 6.27 kPa [47 mmHg]; this is the tracheal pressure displaced by water vapor pressure when the breathed air becomes saturated with water vapor at 37 °C.

3.2.3 *chemical oxygen generator, n*—a chemical oxygen generator is defined as a device which produces oxygen by chemical reaction; for more detailed information, refer to SAE AIR825/4.

3.2.4 *continued safe flight and landing, n*—continued safe flight and landing as applicable to this specification is defined in Specification F3061/F3061M.

3.2.5 *probable, adj*—probable means that the event is anticipated to occur one or more times during the entire operational life of each aircraft.

3.2.6 *STPD, n*—STPD stands for "Standard Temperature and Pressure, Dry." This is defined to be a temperature of 0 °C and a pressure equal to 101.33 kPa (760 mmHg) with no water vapor.

4. Ventilation

NOTE 1—Table 1 provides correlation between various Aircraft Type Codes and the individual requirements contained within this section; refer to 3.2.1. For each subsection, an indicator can be found under each ATC character field; three indicators are used:

An empty cell ( ) in all applicable ATC character field columns indicates that an aircraft must meet the requirements of that subsection.

A white circle (○) in multiple columns indicates that the requirements of that subsection are not applicable to an aircraft *only* if all such ATC character fields are applicable.

A mark-out (×) in any of the applicable ATC character field columns indicates that the requirements of that subsection are not applicable to an aircraft if that ATC character field is applicable.

Example—An aircraft with an ATC of 1SRLLDLN is being considered. Since all applicable columns are empty for 4.1.1, that subsection is applicable to the aircraft. However, since the "L" altitude column for 4.1.2 contains an ×, then that subsection is not applicable.

4.1 *Ventilation:*

4.1.1 Each passenger and crew compartment must be suitably ventilated. Carbon monoxide concentration must not exceed one part in 20 000 parts of air.

4.1.2 The ventilating air in the flightcrew and passenger compartments must be free of harmful or hazardous concentrations of gases and vapors in normal operations and in the event of reasonably probable failures or malfunctioning of the ventilating, heating, pressurization, or other systems and equipment.

4.1.3 If accumulation of hazardous quantities of smoke in the cockpit area is reasonably probable, smoke evacuation must be readily accomplished starting with full pressurization and without depressurizing beyond safe limits.

4.1.4 For aircraft that operate at altitudes above 12 497 m [41 000 ft], under normal operating conditions and in the event of any probable failure conditions (refer to Practice F3230) of any system which would adversely affect the ventilating air, the ventilation system must provide reasonable passenger comfort.

4.1.5 For aircraft that operate at altitudes above 12 497 m [41 000 ft], under normal operating conditions and in the event of any probable failure conditions (refer to Practice F3230) of any system which would adversely affect the ventilating air, the ventilation system must provide a sufficient amount of uncontaminated air to enable the flight crew members to perform their duties without undue discomfort or fatigue.

4.1.6 For aircraft that operate at altitudes above 12 497 m [41 000 ft], under normal operating conditions, the ventilation system must be designed to provide each occupant with at least 0.25 kg [0.55 lbm] of fresh air per minute.

4.1.6.1 In showing compliance with 4.1.6, in the event of the loss of one source of fresh air, the supply of fresh airflow may not be less than 0.18 kg per minute [0.40 lbm] for any period exceeding 5 min.

4.1.7 For aircraft that operate at altitudes above 12 497 m [41 000 ft], other probable and improbable Environmental Control System failure conditions (refer to Practice F3230) that adversely affect the passenger and flight crew compartment environmental conditions may not affect flight crew performance so as to interfere with the reliable performance of published and trained duties to an extent that would interfere with continued safe flight and landing.

4.1.8 For aircraft that operate at altitudes above 12 497 m [41 000 ft], other probable and improbable Environmental Control System failure conditions (refer to Practice F3230) that adversely affect the passenger and flight crew compartment environmental conditions may not affect occupants so as to cause permanent physiological harm.

TABLE 1 ATC Compliance Matrix, Section 4

Section	Airworthiness Level				Number of Engines		Type of Engine(s)		Stall Speed			Cruise Speed		Meteorological Conditions			Altitude		Maneuvers	
	1	2	3	4	S	M	R	T	L	M	H	L	H	D	N	I	L	H	N	A
4																				
4.1																				
4.1.1																				
4.1.2																				
4.1.3																				
4.1.4																	×			
4.1.5																	×			
4.1.6																	×			
4.1.6.1																	×			
4.1.7																	×			
4.1.8																	×			