Designation: F3153 – 22

Standard Specification for Verification of Aircraft Systems and Equipment[1]

This standard is issued under the fixed designation F3153; 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 provides a process for performing system level verification of aircraft systems and equipment. It provides a means of compliance that can be used for systems and equipment with software and Airborne Electronic Hardware (AEH) that have not been addressed by traditional development assurance methods.

1.2 This process can be used to show compliance to regulations that require a demonstration that functionality was implemented as intended, including safety mitigations that address failure conditions for software and AEH aspects for aircraft systems and equipment.

1.3 While this specification was developed with systems and equipment installed on aircraft certification level 1 and 2 (or class I and II in accordance with Advisory Circular (AC) 23.1309-1) normal category aeroplanes in mind, the content may be more broadly applicable. It is the responsibility of the Applicant to substantiate broader applicability as a specific means of compliance and obtain concurrence for its use from the applicable Civil Aviation Authority (CAA).

1.4 When using this specification, regulations that govern system safety requirements applicable to the aircraft still apply. In complying with those regulations, additional architectural mitigations such as redundancy, independence, separation, system monitors, etc., may be required in addition to the verification process specified in this specification.

1.5 The system level verification activities expected by this specification increase as the severity of the failure conditions applicable to or affected by the function increase. Those functions, which have hazardous and catastrophic failure conditions, receive additional activities through this process to provide detailed scrutiny. For normal category aircraft, refer to Practice F3309, Practice F3230, or AC 23.1309-1 for more information on the identification and classification of system failure conditions. Involvement of the applicable CAA personnel or their designees in this system verification process should be discussed early in the project.

1.6 This verification process specifically addresses definition, identification, and verification of system functions. Processes conducted under this specification may not satisfy all applicable external requirements; additional review on the part of the system developer, integrator, or installer may be required to meet specific requirements or the specified mission of the aircraft, or both.

1.7 The values stated in inch-pound units are to be regarded as standard. No other units of measurement are included in this standard.

1.8 *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.*

1.9 *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

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

F3309 Practice for Simplified Safety Assessment of Systems and Equipment in Small Aircraft

2.2 *Aeronautical Radio, Inc. (ARINC) Standard:*[3]

ARINC Mark 33 Digital Information Transfer System (DITS), Specification 429, Parts 1–15, November 2012

[1] This specification is under the jurisdiction of ASTM Committee F39 on Aircraft Systems and is the direct responsibility of Subcommittee F39.03 on Design of Avionics Systems.

Current edition approved April 1, 2022. Published April 2022. Originally approved in 2015. Last previous edition approved in 2015 as F3153–15. DOI: 10.1520/F3153-22.

[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 ARINC Industry Activities, SAE ITC, 16701 Melford Blvd, Suite 120, Bowie, MD 20715, https://www.aviation-ia.com/product-categories/arinc.

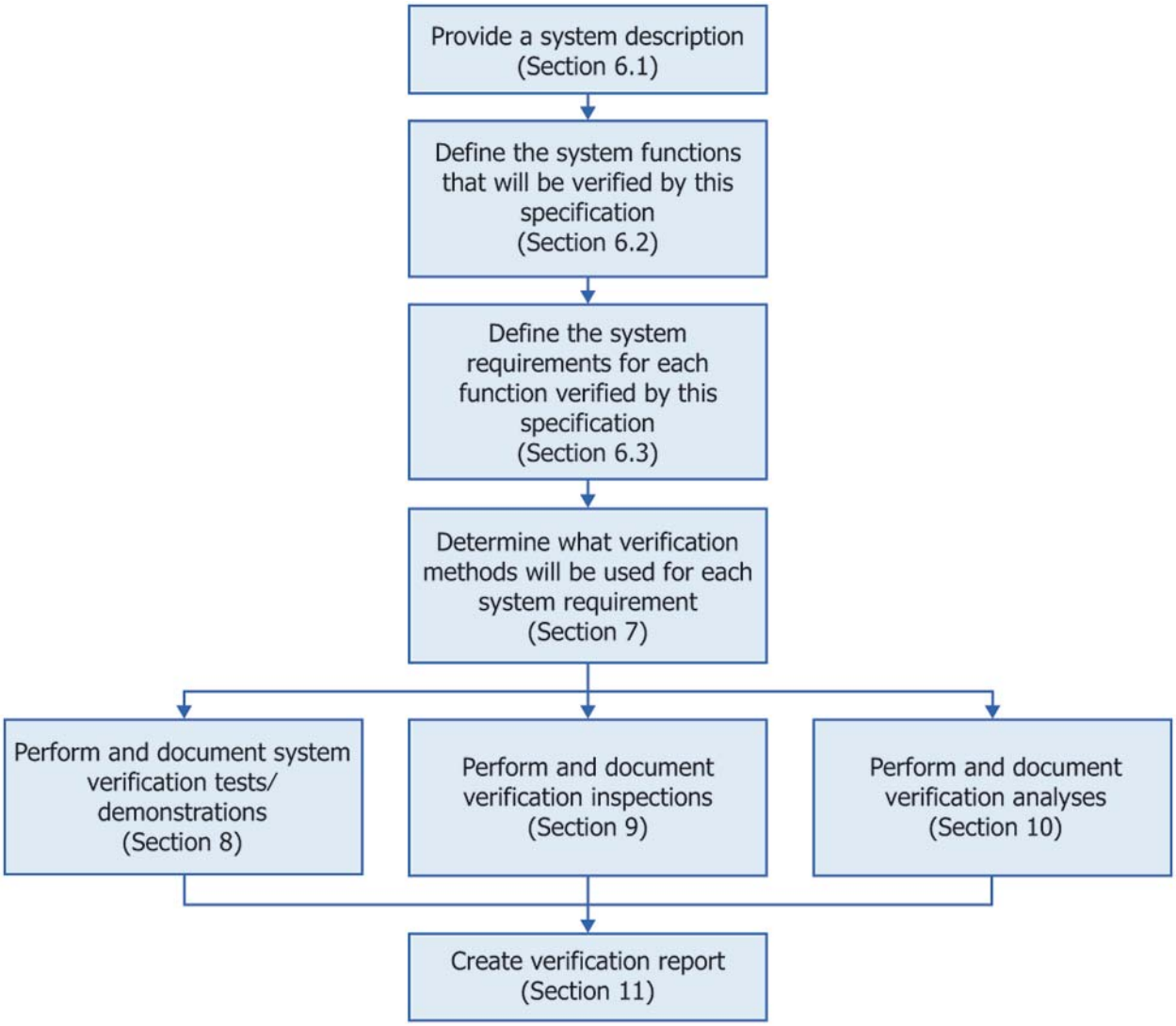

FIG. 1 System Verification Process Overview

2.3 *Federal Aviation Administration (FAA) Advisory Circular:*[4]

AC 23.1309-1E System Safety Analysis and Assessment for Part 23 Airplanes

2.4 *RTCA Standards:*[5]

DO-178( ) Software Consideration in Airborne Systems and Equipment Certification

DO-254( ) Design Assurance Guidance for Airborne Electronic Hardware

3. Terminology

3.1 The following are a selection of relevant terms. See Terminology F3060 for more definitions and abbreviations.

3.2 *Definitions:*

3.2.1 *defect, n*—an unexpected or improper behavior.

3.2.2 *intended function, n*—a capability the system is designed to provide when installed on an aircraft.

3.2.3 *system, n*—a combination of components, parts, and elements that are interconnected to perform one or more functions.

3.2.4 *test case, n*—a set of inputs, pre-conditions, execution steps, expected results, and pass/fail crtieria defined by the manufacturer to verify proper function. Test cases are derived from the intended functions established for the system.

3.2.5 *verification, n*—confirmation, through the collection and review of objective evidence, that specified requirements have been fulfilled.

4. Process Overview

4.1 Fig. 1 provides an overview of the system verification process defined by this specification.

[4] Available from FAA's Dynamic Regulatory System, Federal Aviation Administration, 800 Independence Avenue, SW, Washington, DC 20591, https://drs-uat.faa.gov/browse.

[5] Available from RTCA, 1150 18th NW, Suite 910, Washington, D.C. 20036, https://www.rtca.org.