



Standard Specification for Verification of Avionics Systems¹

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 by which the intended function and compliance with safety objectives of avionics systems may be verified by system-level testing.

1.2 Software and hardware development assurance are not in the scope of this specification and this specification should not be used if a development assurance process is required.

1.3 The specification intentionally does not attempt to define its own applicability with regard to the type, category, class of aircraft, or criticality of function to which avionics systems verified by the specification may be applied as doing so could ultimately place the language of the specification in conflict with external requirements and guidance. Aircraft applicability, intended use, and limitations must ultimately be determined by the designer, installer, and recognizing body.

1.4 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.

1.5 *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
F3060 Terminology for Aircraft

3. Terminology

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

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.

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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.

3.2 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 scenario, n*—a set of inputs, pre-conditions, execution steps, expected results, and pass/fail criteria defined by the manufacturer to verify proper function. Test scenarios 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. Organizational Requirements

4.1 An organization complying with this specification shall manage under configuration control all life cycle data which are generated by applying this specification.

4.2 The organization shall keep a record of the documentation used to show compliance of each approved system configuration produced to all applicable consensus specifications and regulatory requirements in effect at the time of manufacture.

4.3 Revisions to documentation affecting compliance shall be tracked and the change process for developing, reviewing, and incorporating revisions to compliance documentation shall be controlled.

4.4 The organization must ensure and verify the use of the proper revision of any compliance document.

5. Product Definition Process

5.1 Function Identification:

5.1.1 Document the intended function(s) of the system.

5.2 Function Classification:

5.2.1 For each function identified under **5.1**, determine and document whether it is to be verified under this specification or by other means.

NOTE 1—Other means of verification may be proprietary or may be based on other standards, as best suits the developer's objectives with regard to safety, marketability, and compliance concerns.

5.3 Function Specification:

5.3.1 For each function identified for verification under this specification in 5.2, document the specifications of the function, including:

- 5.3.1.1 A description of the function,
- 5.3.1.2 An explanation of the intended use of the function, and
- 5.3.1.3 Operating parameters or limitations that apply to the function.

NOTE 2—The requirements of 5.1 and 5.3 may be met by a suitably annotated copy of the system's user or installation manual or by means of reference to a third-party specification (such as a TSO minimum performance standard).

6. Verification Process

6.1 Functional Verification Planning:

- 6.1.1 Document the system test plan.
- 6.1.2 For each function identified for verification under this specification in 5.2:
 - 6.1.2.1 Define a series of test scenarios and pass/fail criteria that trace to the functional requirement and that verify the function's correct operation within the set limits. In developing the test scenarios, consider known failures in similar systems or components, or both.
 - 6.1.2.2 The test scenario should include failure conditions when appropriate and important to the system level function.

NOTE 3—Where applicable, make use of a functional, non-functional, ground, and flight tests, providing direct reference to the specifications documented in 5.3 that make this specific test necessary.

6.2 Testing:

- 6.2.1 Execute the previously defined test scenarios.
- 6.2.2 Review test results and document pass/fail for each test scenario.

6.3 Test Failure Resolution:

- 6.3.1 Resolve all test failures via one or more of the following means:
 - 6.3.1.1 Revision to the system or its specifications,
 - 6.3.1.2 Revision of the system test plan,
 - 6.3.1.3 Justification for deferral to a future revision.
- 6.3.2 Identify the test(s) to be re-executed to verify the revised version of the system.

6.4 Regression Analysis and Testing:

- 6.4.1 Changes to the system or intended installation which could affect any function verified under this specification should be re-verified at such times that those changes are made. An analysis should be conducted to determine which functions require re-verification based on the design of the system and its integration into the aircraft.

7. Verification Document

7.1 Produce a Statement of Verification that includes:

- 7.1.1 The name of the system;
- 7.1.2 The revision indicators (version numbers) for the system component(s) tested;
- 7.1.3 A list of functions verified under this specification;
- 7.1.4 A list of functions verified by other means;

NOTE 4—Whether and how these other means must be identified is out of scope of this specification.

- 7.1.5 The date upon which the verification was successfully completed;
 - 7.1.5.1 The following statement: "The listed functions of the system have been tested and verified to operate in accordance with the functional and performance characteristics outlined in the system documentation. Testing has been conducted following the process defined in ASTM Specification F3153."

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