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Space systems — General test documentation

Systèmes spatiaux — Documentation générale d'essais

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 17566 was prepared by Technical Committee ISO/TC 20, *Aircraft and space vehicles*, Subcommittee SC 14, *Space systems and operations*.

Introduction

This International Standard provides the minimum requirements for generating test documentation for an individual test of a spacecraft, subsystem or unit. Specifically, information and templates are included which simplify and standardize the writing of the test documentation described herein.

This International Standard covers four types of test documentation:

— test plan;

— test specification;

— test procedure;

— test report.

The scope of this International Standard does not include overall programme test planning. A specific test plan can also be part of the overall spacecraft project test plan.

Although these documents are functionally independent, there is some overlap of the information contained in each. These documents can be combined as appropriate, depending on the nature and complexity of the test in question. For example, for a test of moderate complexity, the test plan and test specification can be combined into one document. For very simple tests, such as unit tests, it may be appropriate to combine the test plan, specification and procedure all into one document. Guidance on combining documents to handle these situations is provided in Clause 4.

Space systems — General test documentation

1 Scope

This International Standard provides a specific format for the development of test documentation for an individual test of a spacecraft, subsystem or unit. It is focused on the definition of the format for test plans, test specifications, test procedures and test reports.

The scope of this International Standard does not include overall programme test planning. A specific test plan can also be part of the overall spacecraft project test plan.

2 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

2.1
analysis
verification method which entails performing a theoretical evaluation using accepted techniques

NOTE These techniques can include mathematics, statistics, qualitative design analysis, modelling and computer simulation.

2.2
characteristic
distinguishing feature

2.3
objective evidence
data supporting the existence or verity of something

2.4
procedure
specified way of carrying out an activity or a process

2.5
process
set of interrelated or interacting activities which transforms inputs into outputs

2.6
requirement
need or expectation, stated or generally implied, whose fulfillment is obligatory

2.7
test
determination of one or more characteristics according to a procedure by which requirements are verified through measurement of product performance and functions during and/or after exposure to simulated environmental loads

2.8
verification
confirmation, through the provision of objective evidence, that specified requirements of the spacecraft system have been fulfilled after exposure to simulated or in-service loads

3 Document descriptions

3.1 Test plan documentation

The test plan document is the master plan describing the process for an individual test on a specified test article. The test plan document contains the following elements:

a) an introduction, comprising

   1) overall test objectives, and

   2) scope of the test plan document;

b) referenced documentation, including

   1) normative references,

   2) applicable references, and

   3) informative references;

c) nomenclature, including

   1) terms and definitions,

   2) symbols, and

   3) acronyms;

d) test purpose, comprising

   1) overall test description, and

   2) test strategy matrix;

e) test description, comprising

   1) test approach and methodology,

   2) test flow,

   3) test article,

   4) test set-up,

   5) specialized test tools,

   6) supporting analyses,

   7) test input data, and

   8) test output data.

3.2 Test specification documentation

The test specification is an intermediate step in the test definition process occurring between the test plan and the test procedure. The test specification document specifies the test parameters to be used to satisfy the test requirements given in the test plan document. Instead of listing all information in the test specification document, other documents may be referenced. This can occur in situations where a large amount of information is to be specified due to the complexity of the test requirements or test article. The test specification document includes the following sections:

a) an introduction, comprising

   1) overall test objectives, and

   2) scope of the test plan document;

b) referenced documentation, including

   1) normative references,

   2) applicable references, and

   3) informative references;

c) nomenclature, including

   1) terms and definitions,

   2) symbols, and

   3) acronyms;

d) test article configuration requirements, including

   1) test article configuration matrix,

   2) test article measured parameters,

   3) deviations from flight configuration, and

   4) test article functional configuration, including

      i) operational mode,

      ii) electrical system state,

      iii) pyrotechnic system state, and

      iv) propulsion system state;

e) test facility requirements, including

   1) test facility identification and location,

   2) equipment,

   3) instrumentation,

   4) interfaces to test article,

   5) environmental conditions,

   6) software,

7) data acquisition and analysis systems,

8) other infrastructure required for performance of the test,

9) test facility constraints,

10) test facility operational limitations, and

11) test facility safety limitations;

f) procedural test requirements, including

1) test set-up,

2) test flow,

3) supporting analyses,

4) test article disposition after testing,

5) test specimen equipment,

6) test specimen software,

7) test specimen ground support instrumentation,

8) calibration,

9) test conditions,

10) test input parameters, tolerances and limits,

11) test output data,

12) data acquisition,

13) data processing,

14) test-specific safety considerations, and

15) test success criteria.

3.3 Test procedure documentation

The test procedure document is a detailed step-by-step set of instructions which, when followed, satisfy the referenced test specification requirements. The test procedure document contains the following elements:

a) an introduction, comprising

1) objectives,

2) scope, and

3) background;

b) referenced documentation, including

1) normative references,

2) applicable references, and

3) informative references;

c) nomenclature, including

   1) terms and definitions,

   2) symbols, and

   3) acronyms;

d) test personnel;

e) a detailed procedural checklist.

3.4 Test report documentation

The test report document describes the execution and results of the test. It provides conclusions with reference to the objectives and test requirements specified in the test plan and test specification documents. The test procedure document may be converted into an as-run test procedure for inclusion in the test report document. The test report document contains the following elements:

a) an introduction, comprising

   1) objectives,

   2) scope, and

   3) background;

b) referenced documentation, including

   1) normative references,

   2) applicable references, and

   3) informative references;

c) nomenclature, including

   1) terms and definitions,

   2) symbols, and

   3) acronyms;

d) as-run test article configuration;

e) as-run detailed procedural checklist;

f) test results, including

   1) test output data,

   2) test processed data,

   3) environmental and facility data,

   4) test documentation, and

   5) photographs, videos and sketches;

g) test data evaluation;

h) test deviations;

i) summaries and conclusions.

4 Combining documents

4.1 General

Although these documents are functionally independent, there is some overlap of the information contained in each. These documents may be combined as appropriate, depending on the nature and complexity of the test in question. For example, for a test of moderate complexity, the test plan and test specification may be combined into one document. For very simple tests, such as unit tests, it may be appropriate to combine the test plan, specification and procedure all into one document. Guidance on combining documents to handle these situations is provided in 4.3 and 4.4.

4.2 Test plan/test specification/test procedure/test report

For complex testing of a space system, the test plan, test specification, test procedure and test report will usually all be written. The elements that each of these should contain are specified in Table 1 below.

Table 1 — Summary of documentation contents for complex testing

Section	Test plan	Test specification	Test procedure	Test report
Introduction	Yes	Yes	Yes	Yes
Referenced documentation	Yes	Yes	Yes	Yes
Nomenclature	Yes	Yes	Yes	Yes
Test purpose	Yes	No	No	No
Test description	Yes	No	No	No
Test article configuration requirements	No	Yes	No	No
As-run test article configuration	No	No	No	Yes
Test facility requirements	No	Yes	No	No
Procedural test requirements	No	Yes	No	No
Test personnel	No	No	Yes	No
Detailed procedural checklist	No	No	Yes	No
As-run detailed procedural checklist	No	No	No	Yes
Test results	No	No	No	Yes
Test data evaluation	No	No	No	Yes
Test deviations	No	No	No	Yes
Summary and conclusions	No	No	No	Yes

4.3 Combined test plan and test specification/test procedure/test report

For moderately complex testing of a space system or subsystem, the documentation set may be reduced to a combined test plan and test specification, a test procedure and a test report. The elements that each of these should contain are specified in Table 2 below.