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Space systems — Programme management — Management of product characteristics

Systèmes spatiaux — Management de programme — Management des caractéristiques des produits

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document was prepared by ISO/TC 20, Aircraft and space vehicles, Subcommittee SC 14, Space systems and operations.

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Introduction

During the development of space products, it is important to identify critical and major characteristics, and to annotate them in drawings and technical specifications. In design, proper product characteristic classification helps to improve the design quality. In production, proper product characteristic classification helps manufacturing activities successfully implement design requirements, and also helps producers control the characteristic classification facilitates effective allocation of inspection effort. Meanwhile, it ensures realization of critical and major characteristics, quality of end product and the preset mission by performing management requirements through all of the development stages.

This document mainly defines the critical, major and minor characteristics of space products, describes the whole management process of product characteristics and specifies related management requirements.

This document focuses on management requirements for identification and control of space product characteristics, especially for critical and major characteristics, which are closely connected with end product quality and mission success, and enhances cost-effective applications in the life cycle of a space product.

In addition, this document will help to clarify and enhance current practices to improve quality assurance, and promote international cooperation.

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Space systems — Programme management — Management of product characteristics

1 Scope

This document defines management requirements of product characteristics, including their classification, in order to highlight those areas of the product to which specific attention, control or inspections are applied.

This document is applicable to direct implementation of space product characteristic management, especially for mechanical parts and fluidic equipment.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 27025, Space systems — Programme management — Quality assurance requirements iTeh STANDARD PREVIEW

Terms and definitions (standards.iteh.ai) 3

For the purposes of this document, the terms and definitions given in ISO 9000 and ISO 10795 and the ISO 19826:2017 following apply.

https://standards.iteh.ai/catalog/standards/sist/50d9874e-d030-47a5-a149-ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at <u>http://www.electropedia.org/</u>

ISO Online browsing platform: available at http://www.iso.org/obp

3.1

critical characteristic

kind of characteristic whose fault would cause failure of the whole system or major subsystem to perform a required mission or create serious harm to the safety of humans

3.2

end product

product in the assembled and completed state at which acceptance will take place

3.3

inspection unit

unit on which characteristic inspection is performed

3.4

major characteristic

kind of characteristic whose fault would cause the end product fails to perform a required mission

Note 1 to entry: It would not cause failure of the whole system or major subsystems which perform a required mission.

3.5

minor characteristic

kind of characteristic significant to product quality, but whose fault could not affect realization of mission performance of product

3.6 product characteristic distinguishing feature of a product

Note 1 to entry: Product characteristics can be classified variously, including physical, sensory, functional and so on. In this document, according to the severity of consequences caused by characteristic faults and non-conformance with design requirements, product characteristics are mainly divided into three categories: critical, major and minor.

4 General requirements

4.1 In support of product quality and mission functions, management of product characteristic shall be implemented. As part of management process of product characteristics, the suppliers shall identify and classify product characteristics which shall conform to the requirements submitted by their customer, and implement control measures according to classification in order to highlight those areas of the product to which specific attention, control or inspections shall be applied.

4.2 The suppliers shall especially identify critical and major product characteristics during design phase, focus on their control during the process generating critical and major characteristics, and inspect their conformance with the design requirements.

4.3 According to the severity of the consequences caused by failure and non-conformance with the design requirements, product characteristics are classified into critical characteristics, major characteristics and minor characteristics. The suppliers shall strengthen control of critical and major characteristics with proper measures during the production and inspection process.

4.4 Product designers are mainly responsible of product characteristic identification and classification, and product assurance and process personnel participate. Processes, manufacturing, inspection and other factors shall be taken into consideration during product characteristic identification and classification. The analysis procedure and results of identification and classification shall be documented and reviewed. If necessary, the customer shall take part in the review.

4.5 Identification and classification of product characteristics are implemented over the project phases. The suppliers shall begin to identify and classify product characteristics during the preliminary definition phase in which results of product characteristics analysis including product characteristic category and their control measures shall be preliminarily defined. The suppliers shall continue to make further identification of critical and major characteristics referring to product design and verification, and to update the results of classification during the detail definition phase in which characteristic categories are determined finally.

4.6 Product characteristic management should be supervised by the department with responsibility for quality assurance/configuration and data management.

5 Management process

Management of product characteristic generally includes product characteristic identification and classification, management implementation and management close-out. Figure 1 gives the management process of product characteristics.



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Figure 1 — Management process of product characteristics

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6 Identification, and classification and address of the state of the s bff83449213f/iso-19826-2017

6.1 General

Product characteristics identification and classification is a part of design activity. Integrated engineering, dependability, quality assurance disciplines, product characteristics identification and classification is a complicated process with the effort of comprehensive analysis. Engineering experience is needed in accomplishment of identifying and classifying product characteristics.

History data, lessons learned and customer requirements which contain technical requirements, acceptance requirements and project management requirements are the inputs of product characteristics identification and classification. Identified critical, major and minor characteristics are the outputs of product characteristics identification and classification.

6.2 Product characteristic identification

6.2.1 General

Product characteristics identification which includes activities of requirements analysis, design analysis and selection of units of inspection is the basis for product characteristics classification. Through product characteristic identification, the characteristics related to product quality and acceptance of product can be identified, and levels of inspection can be determined.

6.2.2 **Requirements analysis**

Requirements analysis is a systematic procedure for determining the demands made on product by its intended mission. Requirements analysis shall be performed by the analysis of mission functions of hardware elements, duration of required performance, environmental limits of the mission, availability of maintenance and effects of failures on the mission. Contents of each analysis are generally as follows.

- a) Functions analysis: all functions of the product shall perform during its mission.
- b) Duration of performance analysis: the duration of performance required of each function.

When the performance times are random variables, their maximum values should be used.

- c) Environmental limits analysis: environmental extremes applicable to the mission.
- d) Availability of maintenance analysis: if the product can be maintained in use, consider what maintenance is feasible in the worst case of conditions.
- e) Effects of failures analysis: whether partial or complete failure of product can be accepted, and the effects of failure to the mission.

6.2.3 Design analysis

Design analysis is a procedure for identifying and understanding in detail the means by which a product is able to respond to the requirements of its mission. Complete design analysis is required for a new design. Design analysis of existing design is to evaluate history data of similar items. Design analysis is to analyse the design features of hardware elements relative to the requirements of coordination, life, interchangeability, function and safety, and to study material properties, fabrication, assembly and testing processes, tolerances, design life, failure modes, effects of failure on performance and safety. Contents of design analysis are generally as follows: A RD PREVIEW

- a) material properties which are significant in determining the quality;
- b) means of the item to be processed, fabricated, assembled and tested;

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- c) interface; https://standards.iteh.ai/catalog/standards/sist/50d9874e-d030-47a5-a149-
- d) interchangeability;
- e) design life and characteristics determining the life;
- f) product failure modes and failure effects;
- g) safety hazard to humans caused by failure; and
- h) ways of handling, shipping and storing the product.

6.2.4 Selection of units of inspection

Selection of inspection units shall also take possibility and economical efficiency of inspection into consideration. A product should generally be selected as an inspection unit if it meets one of the following criteria:

- a) the end product;
- b) the spare part which is needed for maintaining or repairing the end product;
- c) the product which is required to be interchangeable for use and safety;
- d) the product which is required to be very safe and reliable in using;
- e) the product whose characteristics can be determined only in actual service condition (e.g. the product which must be tested destructively); and
- f) the product which cannot be inspected, repaired or replaced after installation or whose inspection, repair or replacement costs too much.

NOTE Generally, it is more effective to find the defective product at lower assembly level, and quality control effect is maximized. However, it is more economic to inspect at higher assembly level.

6.3 Product characteristics classification

Based on the results of product characteristics identification, classification is implemented with mainly assessing the seriousness of the relevant defects of the product contributing to the mission. The results of classification are critical, major and minor. Categories shall properly reflect the seriousness of the product defects. It shall not be over-classified or under-classified.

Take solar array drive assembly (SADA) as an example.

Based on the effort of technical requirement analysis, design analysis and selection of inspection unit, examples of SADA's critical, major and minor characteristics are in <u>Table 1</u>.

Characteristic	Classification	Reason description
Power transmission and driving functions	critical	If any of these two characteristics is lost, abnormity and malfunction of satellite would happen because of energy lost.
Supporting and load bearing of major structural components iTeh S (S	^{major} FANDARD PREVIE tandards.iteh.ai)	It influences load-carrying capabil- ity and operation stability of SADA. It may cause SADA to fail to perform required mission, but this may not cause the consequence as serious as critical characteristics.
Weight	minor <u>ISO 19826:2017</u>	It may not affect the realization of mission performance of SADA.

Table 1 — Examples of SADA's critical, major and minor characteristics

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7 Management implementation

7.1 Establishment of control plans to critical and major characteristics

After classification of product characteristics, proper control plans to critical and major characteristics are required and documented to assure these characteristics are effectively controlled during development and ongoing production. As a minimum, a control plan shall contain the following:

- a) product name (name of system, subsystem or equipment);
- b) characteristic and its classification code;
- c) inspection unit;
- d) inspection methods;
- e) control measures adopted;
- f) criteria for judgment of conformity with requirements;
- g) time of completion of implementing control measures; and
- h) resource support.