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Space systems — Simulation requirements for control system

Systèmes spatiaux — Exigences de simulation pour le système de contrôle

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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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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 WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 20, *Aircraft and space vehicles*, Subcommittee SC 14, *SC14 Space Systems and Operations*.

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Introduction

This International Standard provides space system control system engineers, simulation engineers and customers with guidance of use simulation to support their system engineering tasks. This International Standard is intended to help reduce the develop time and cost of space system control system design and also enhance its quality and reliability. This International Standard focuses on requirements and recommendations for what should be done during simulation. It does not prescribe how the requirements are to be met.

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Space systems — Simulation requirements for control system

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1 Scope

This International Standard provides guidance to control system engineers on what to simulate and how to use simulation to support their system engineering tasks. Ground testing limitations typically preclude a comprehensive "test as you fly" approach to most space system control systems. Likewise, flight tests are prohibitively expensive. Therefore, high-fidelity simulation models of the control system components must be validated. Wherever, possible ground test results should be compared to simulation model outputs. Validated models are then used in various simulation environments to predict flight performance. As an important means of design, analysis and validation, simulation of the control system is widely used in each phase of the control system development, including conceptual design, detailed design, prototype validation, and integrated system verification. This International Standard provides simulation requirements of control system for different phases in the process of designing a control system. Control system engineers can carry out various types of simulation experiments during various phases, according to this International Standard. This International Standard establishes a minimum set of requirements for simulation of control system. The requirements are generic in nature because of their broad applicability to all types of simulations. Implementation details of the requirements should be addressed in project-specific standards, requirements, handbooks, etc.

In general, standards can focus on engineering/technical requirements, processes, procedures, practices, or methods. This International Standard focuses on requirements and recommendations. Hence, this International Standard specifies what must be done; it does not prescribe how the requirements are to be met, nor does it specify who the responsible team is for complying with the requirements. Conflicts between this International Standard and other requirements documents shall be resolved by the responsible technical designer.

2 Terms and definitions

2.1
accuracy
measure of how close a value is to the "true" value

[SOURCE: ISO 14952-1:2003]

2.2
control system
closed-loop configuration of sensors, processors/algorithms, and actuators designed to manage the dynamic behavior of space systems

2.3
emulator
prototype of the flight equipment, which has the identical input/output interfaces as the flight equipment and has similar operating behaviour

2.4
fidelity
degree to which a model or simulation reproduces the state and behaviour of a real world object or the perception of a real world object, feature, condition, or chosen standard in a measurable or perceivable manner

2.5
hardware in the loop simulation
kind of simulation, in which some simulation models of control system are implemented by real equipment

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