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Space systems — General requirements for control engineering

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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

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Contents

Page

Foreword

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

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

The development of control systems applied to space systems requires cooperation among multi-disciplinary technology fields. A control system is often comprised of a large system integration of these technology fields. The development also requires cooperation with higher-level systems and the systems engineering method.

The purpose of this document is to provide general requirements for the entire life cycle in control systems development including the systems engineering method required for developing control systems applicable to space systems. Control engineering refers to systematic activities using systems engineering methods to realize the control system. The concepts, methods and models of system engineering are also applicable to control engineering. This document focuses on the special requirements of control engineering.

The development of a control system involves important aspects of system engineering, electrical and electronic engineering, mechanical engineering, software engineering, communications, ground systems and operations – all of which have their own dedicated standards. This document does not intend to duplicate them.

This document focuses on the specific issues involved in control engineering and is intended to be used as a structured set of systematic engineering provisions, referring to the specific standards and handbooks of the discipline where appropriate. For this and given the very rapid progress of control component technologies and associated “de facto” standards, this document does not go to the level of describing equipment or interfaces. Specific project or program standards are prepared for these purposes.

This document is not intended to replace textbook material on control systems theory or technology; and such material is intentionally avoided. The users of this document are assumed to possess general knowledge of control systems engineering and its applications to space missions.

Space systems — General requirements for control engineering

1 Scope

This document deals with control systems developed as part of a space project. It is applicable to all the elements of a space control system, including the space segment, the ground segment and the launch service segment.

This document establishes general principles for all technical activities of space control engineering, including control engineering management, requirements definition, analysis, design, production, verification and validation, operation, maintenance, and disposal. It also provides requirements to progressively refine and manage control system realizations in space systems including multiple control systems.

The requirements of this document can be tailored for each specific space program application.

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 14300-1, *Space systems — Programme management — Part 1: Structuring of a project*

3 Terms and definitions

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

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

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

— IEC Electropedia: available at https://www.electropedia.org/

3.1
activity
set of cohesive *tasks* (3.26) of a *process* (3.21)

[SOURCE: ISO/IEC/IEEE 15288:2015, 4.1.3]

3.2
actuator
component that performs the moving function of a mechanism

Note 1 to entry: An actuator can be either an electric motor, or any other mechanical (e.g. spring) or electric component or part providing the torque or force for the motion of the mechanism.

[SOURCE: ISO 26871:2020, 3.1.1]

3.3
control
purposeful action on or in a *process* (3.21) to meet specified objectives

Note 1 to entry: Control includes function of the *controller* (3.14) to derive *control commands* (3.4) to match the current or future estimated state with the desired state.