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Space systems — Definition of the Technology Readiness Levels (TRLs) and their criteria of assessment

Systèmes spatiaux — Definition des Niveaux de Maturité de la Technologie (NMT) et de leurs critères d'évaluation

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Foreword

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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. www.iso.org/directives

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

Introduction

Technology Readiness Levels (TRLs) are used to quantify the technology maturity status of an element intended to be used in a mission. Mature technology corresponds to the highest TRL, namely TRL 9, or flight proven elements.

The TRL scale can be useful in many areas including, but not limited to the following examples:

a) For early monitoring of basic or specific technology developments serving a given future mission or a family of future missions;

b) For providing a status on the technical readiness of a future project, as input to the project implementation decision process;

c) In some cases, for monitoring the technology progress throughout development.

The TRL descriptions are provided in Clause 3 of this International Standard. The achievements that are requested for enabling the TRL assessment at each level are identified in the summary table in Clause 4. The detailed procedure for the TRL assessment is to be defined by the relevant organization or institute in charge of the activity.

This International Standard was produced by taking due consideration of previous available documents on the subject, in particular including those from the National Aeronautics Space Administration (NASA), the US Department of Defence (DoD) and European space institutions (DLR, CNES and ESA).

Space systems — Definition of the Technology Readiness Levels (TRLs) and their criteria of assessment

1 Scope

This International Standard defines Technology Readiness Levels (TRLs). It is applicable primarily to space system hardware, although the definitions could be used in a wider domain in many cases.

The definition of the TRLs provides the conditions to be met at each level, enabling accurate TRL assessment.

2 Terms and definitions

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

2.1
breadboard
physical *model* (2.10) designed to test functionality and tailored to the demonstration need

2.2
critical function of an element
mandatory function which requires specific *technology* (2.19) verification

Note 1 to entry: This situation occurs when either the element or components of the element are new and cannot be assessed by relying on previous realizations, or when the element is used in a new domain, such as new environmental conditions or a new specific use not previously demonstrated.

Note 2 to entry: Wherever used in this International Standard, “critical function” always refers to “technology critical function” and should not be confused with “safety critical function”.

Note 3 to entry: Wherever used in this International Standard, “critical function” always refers to “critical function of an element”.

2.3
critical part of an element
element (2.4) part associated to a critical function

Note 1 to entry: The critical part of an element can represent a subset of the element and the technology verification for the critical function may be achievable through dedicated tests achieved on the critical part only.

Note 2 to entry: Wherever used in this International Standard, “critical part” always refers to “technology critical part”.

Note 3 to entry: Wherever used in this International Standard, “critical part” always refers to “critical part of an element”.

2.4
element
item or object under consideration for the technology readiness assessment

Note 1 to entry: The element can be a component, a piece of equipment, a subsystem or a system.

2.5
element function
intended effect of the *element* (2.4)