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Space systems — Design qualification and acceptance tests of small spacecraft and units

Systèmes spatiaux — Qualification de la conception et essais de réception des petits véhicules spatiaux

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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*.

This second edition cancels and replaces the first edition (ISO 19683:2017), which has been technically revised.

The main changes are as follows:

— updated terms and definitions;

— added 5.10 on testing of satellite constellation program;

— added Clause 8 on satellite constellation tests;

— updated Clause 9 on test requirements;

— updated Annex C.

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There is an increasing demand for small, micro, nano or pico satellite development and utilization worldwide; yet, there is no clear and globally accepted definition of what is considered “small”, “micro”, “nano” or “pico” satellites. These satellites are often built with emphasis on low cost and fast delivery. They are characterized by extensive use of non-space-qualified commercial-off-the-shelf (COTS) units (component). For the sake of convenience, the term “small spacecraft” is used throughout this document as a generic term to refer to these satellites.

A small spacecraft is a satellite that utilizes non-traditional risk-taking development and management approaches to achieve low cost and fast delivery with a small number of team. To achieve these two points, low cost and fast delivery, satellite design relies on the use of non-space-qualified COTS units (components), making satellite size inherently smaller. The design accepts a certain level of risk associated with the use of COTS. Because of the risk taking approach, small spacecraft often fails in orbit. But the replacement spacecraft is quickly built and launched reflecting the lessons obtained in the previous spacecraft. As the launch cost depends on the spacecraft size and/or mass, the spacecraft size becomes “small”.

Figure 1 illustrates the applicability of this document.

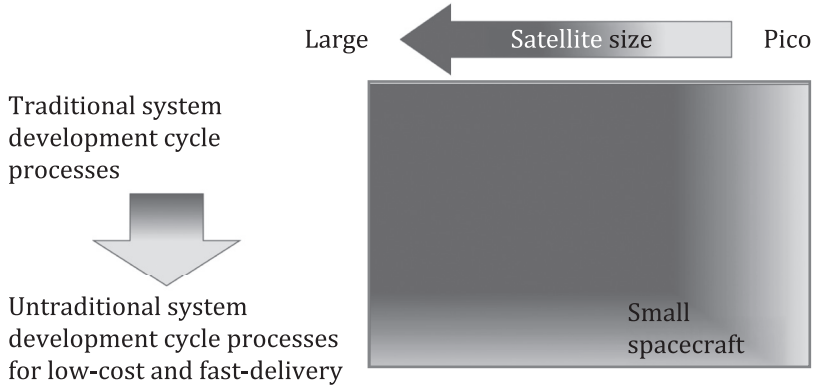

Figure 1 — Applicability of this document

A certain set of tests is necessary to ensure the mission success of small spacecraft. Applying the same test requirements and methods as those applied to traditional large or medium satellites, however, nullifies the low-cost and fast-delivery advantages possessed by small spacecraft.

This document is meant to improve the reliability of small spacecraft, especially those with commercial purpose, with emphasis on achieving reliability against infant mortality after satellite launch to orbit, while maintaining the low-cost and fast-delivery nature of small spacecraft.

This document intends to promote worldwide trade of small spacecraft products by providing a minimum level of assurance that a product made of non-space-qualified commercial-off-the-shelf parts and units can work in space. This document also aims to serve as a testing guideline for those who intend to enter satellite manufacturing through development of small spacecraft products.