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Space systems — Structural design — Determination of loading levels for static qualification testing of launch vehicles

Systèmes spatiaux — Conception des structures — Détermination des niveaux de chargement pour un essai statique de qualification des véhicules lanceurs

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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 document 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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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 14953:2000), which has been technically revised.

The main changes are as follows:

- the formula for J_C has been changed so that all the terms are multiplicative,
- a new correction factor has been introduced to take into account the structure imperfections.

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.

Space systems — Structural design — Determination of loading levels for static qualification testing of launch vehicles

1 Scope

This document specifies a procedure for determining the loading level of a qualification test of a launch vehicle structure and takes into account all the minimum allowable strength characteristics necessary for these structures.

2 Normative references

There are no normative references in this document.

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

external loading

system of forces, moments and pressures external to a structure and applied to that structure

3.2

failure mode

manner in which failure occurs

Note 1 to entry: A failure mode may be defined by the function lost or other state transition that occurred.

Note 2 to entry: Structural failure modes include: rupture, collapse, detrimental deformation, excessive wear or any other phenomenon resulting in an inability to sustain loads, pressures and corresponding environments, or that jeopardizes mission success.

[SOURCE: IEC 60050-192:2015, 192-03-17, modified ~~—~~ Note 2 to entry has been added reflecting the ~~former term~~ definition in ISO 10786:2011, 3.19.]

3.3

limit load

design limit load

maximum load, or combination of loads, which a structure or a component in a structural assembly is expected to experience during its service life, in association with the applicable operating environments

Note 1 to entry: Load is a generic term for thermal load, pressure, external mechanical load (force, moment, or enforced displacement) or internal mechanical load (residual stress, pretension, or inertial load).

Note 2 to entry: The corresponding stress or strain is called limit stress or limit strain.

~~Note 3 to entry: In the above definition, “limit load” is a preferred term, and “design limit load” is an admitted term.~~

~~[SOURCE: ISO 24638:2021, 3.13, modified—“—”maximum expected load” has been replaced by “maximum load”].]~~

~~[SOURCE: ISO 14623:2003, 2.36, modified—“design limit load” has been added as an admitted term; Note 3 to the entry describing “design limit load” has been deleted.]~~

~~[SOURCE: ISO 10785:2011, 3.19, modified—“design limit load” has been added as an admitted term; Note 3 to the entry describing “design limit load” has been deleted.]~~

~~[SOURCE: ISO 10786:2011, modified—“design limit load” has been added as an admitted term; Note 3 to the entry describing “design limit load” has been deleted.]~~

3.4

qualification test

required formal contractual test conducted to demonstrate that the design, manufacturing, and assembly have resulted in hardware conforming to specification requirements

Note 1 to entry: Qualification tests are conducted on a flight-quality article at load levels and durations sufficient to demonstrate that all design requirements have been met under the specified environmental conditions. Both protoflight and prototype tests are considered qualification tests.

Note 2 to entry: The qualification test may also validate the planned acceptance programme including test techniques, procedures, equipment, instrumentation, and software.

~~[SOURCE: ISO 10785:2011, 3.25, modified— The wording, “contractual tests” have been changed to “contractual test”. The wording, “at load levels and durations in order”, “of flight quality hardware”, and “that” have been deleted from the definition. The wording “conforms” has been changed to “conforming”. Note 1 to entry has been moved to note 2 to entry. New note 1 to entry as shown on the above has been added.]~~

~~[SOURCE: ISO 10786:2011, 3.47, modified— The wording, “contractual tests” have been changed to “contractual test”. The wording, “at load levels and durations”, “of flight quality hardware”, and “that” have been deleted from the definition. The wording “conforms” has been changed to “conforming”. Note 1 to entry has been moved to note 2 to entry. New note 1 to entry as shown on the above has been added.]~~

~~[SOURCE: ISO 10795:2019, 3.187, modified — The word, “used”, has been replaced by “conducted”. Note: “hardware designs” has been changed to “hardware”; note 1 to entry and note 2 to entry have been added.]~~

~~[SOURCE: ISO 14623:2003, 2.52, modified— the term has been changed from “qualification tests” to “qualification test”, and the wording, “used”, has been replaced by “conducted”. Note 1 to entry and note 2 to entry have been added.]~~

~~[SOURCE: ISO 21648:2008, 2.1.32, modified— the term has been changed from “qualification tests” to “qualification test”. The wording, “required formal tests” and “used”, has been replaced by “required formal contractual test” and “conducted”, respectively. Note 1 to entry and note 2 to entry have been added.]~~