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Space systems — Disposal of orbital launch stages

Systèmes spatiaux — Élimination des étages orbitaux de lanceurs

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ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

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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).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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, *Space systems and operations*.

Introduction

A launch vehicle stage plays a critical role in moving a spacecraft toward or into its final mission orbit. Once the spacecraft has been delivered to the desired orbit, the stage can be separated from the spacecraft. If the stage itself is in orbit and is deactivated at this point, it becomes another object added to the growing population space debris – an uncontrolled object that may threaten operating satellites for the remainder of the stage's orbit lifetime. And a launch vehicle stage may also be a source for large numbers of smaller threatening objects if residual propellants, pressure vessels or other sources of stored energy explode or if it is involved in a collision with another object.

This International Standard in one of several standards focused on minimizing the growth of space debris, and removing orbital launch stages from orbit or moving them to non-threatening orbits at the end of their missions is an important component of this strategy. This International Standard provides guidance on how a spacecraft owner and a launch service provider can work together to develop spacecraft deployment options leading to removal of an orbital launch stage either by re-entering the stage into the atmosphere in a short time or by leaving the stage in or moving the stage to an orbit that does not intersect regions of heavy use by satellite missions for a very long time. This International Standard also calls for eliminating all sources of stored energy remaining in the stage prior to its final disposal (except in cases where the stage will execute a controlled re-entry into the atmosphere).

Space systems — Disposal of orbital launch stages

1 Scope

This International Standard focuses on disposal of launch vehicle stages used during launch of spacecraft to be operated in space where the orbital launch stages are left in orbit after the spacecraft are released.

End-of-mission disposal of launch vehicle orbital stages broadly means removing the stages from the protected regions of space (see ISO 24113) so as not to collide or otherwise interfere with the other users of those protected regions in the future. ISO 24113 also requires that "During the disposal phase, a spacecraft or launch vehicle orbital stage shall permanently deplete or make safe all remaining on-board sources of stored energy in a controlled sequence." These "passivation" actions are typically either accomplished in the course of disposal, or immediately follow the disposal operations. In this document, the term "disposal actions" refers to both disposal manoeuvres and to passivation actions (note: passivation actions are not required after the final manoeuvre leading to a controlled re-entry).

ISO 24113 provides six options for spacecraft or orbital launch stage disposal. This International Standard specifies techniques for planning and executing disposal of orbital launch stages that are consistent with ISO 24113 requirements, reflect current internationally accepted guidelines, and consider current operational procedures and best practices.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 24113:2011, *Space systems — Space debris mitigation requirements*

ISO 27852, *Space systems — Estimation of orbit lifetime*

ISO 27875, *Space systems — Re-entry risk management for unmanned spacecraft and launch vehicle orbital stages*

3 Terms and definitions

For the purpose of this document, the terms and definitions given in ISO 24113:2011, and the following apply.

3.1
decay orbit
orbit which will result in the re-entry of the space system within a specified time

3.2
decay phase
period that begins at the end of the operational phase of a space system, when it has been placed into its decay orbit, and ends when the space system has performed a re-entry

Note 1 to entry: This only applies for space systems performing re-entry.

3.3
deorbit manoeuvre
action of moving a space system to a new orbit that will cause the space system to re-enter the atmosphere

