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## Space systems — Space debris mitigation requirements

*Systèmes spatiaux — Exigences de mitigation des débris spatiaux*



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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 24113 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 24113:2010), of which it constitutes a minor revision.

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## Introduction

Space debris comprises all non-functional, man-made objects, including fragments and elements thereof, in Earth orbit or re-entering the Earth's atmosphere. The growing population of these objects poses an increasing hazard to missions. In response to this problem, there is international consensus that space activities need to be managed to minimize debris generation and risk. This consensus is embodied in space debris mitigation guidelines published by organizations such as the International Telecommunication Union (ITU)<sup>[1]</sup>, the Inter-Agency Space Debris Coordination Committee (IADC)<sup>[2][3]</sup> and the United Nations (UN)<sup>[4]</sup>. The transformation of debris mitigation guidelines into engineering practice is a key purpose of this International Standard.

The importance of this International Standard can be seen within the context of four UN treaties<sup>[5]</sup> that were established under the United Nations Committee on the Peaceful Uses of Outer Space (UNCOPUOS) to govern the involvement of nations in space activities. These are the *Outer Space Treaty*, the *Liability Convention*, the *Registration Convention* and the *Rescue Agreement*. Through some of these treaties, a Launching State has total liability for damage caused by its spacecraft or launch vehicle orbital stages (or any parts thereof) on the surface of the Earth or to aircraft in flight, as well as in outer space where fault can be proven.

All countries are encouraged to abide by these international agreements in order not to endanger or constrain existing and future space missions. A Launching State can choose to appoint licensing or regulatory authorities to administer its approach for complying with the above-mentioned UN treaties. In several Launching States, these authorities have implemented national legislation to enforce the UN treaties. Such legislation can include the mitigation of space debris. Some Launching States meet their obligations by appointing non-regulatory government bodies, such as national space agencies, to provide the necessary guidelines or requirements, including those for space debris mitigation.

The general aim of space debris mitigation is to reduce the growth of space debris by ensuring that spacecraft and launch vehicle orbital stages are designed, operated and disposed of in a manner that prevents them from generating debris throughout their orbital lifetime. This is achieved by the following actions:

- a) avoiding the intentional release of space debris into Earth orbit during normal operations;
- b) avoiding break-ups in Earth orbit;
- c) removing spacecraft and launch vehicle orbital stages from protected orbital regions after end of mission;
- d) performing the necessary actions to minimize the risk of collision with other space objects.

Such actions are especially important for a spacecraft or launch vehicle orbital stage that has one or more of the following characteristics:

- a large collision cross-section;
- remains in orbit for many years;
- operates near manned mission orbital regions;
- operates in highly utilized regions, such as protected regions;
- operates in regions of high debris population.

This International Standard transforms these objectives into a set of high-level debris mitigation requirements. Methods and processes to enable compliance with these requirements are provided in a series of lower-level implementation standards.