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BSI Standards Publication

## Space systems — Launch window estimation and collision avoidance

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## National foreword

This British Standard is the UK implementation of ISO 21740:2025.

The UK participation in its preparation was entrusted to Technical Committee ACE/68, Space systems and operations.

A list of organizations represented on this committee can be obtained on request to its committee manager.

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**ISO 21740**

**Space systems — Launch window estimation and collision avoidance**

*Systèmes spatiaux — Estimation de la fenêtre de lancement et évitement des collisions*

**First edition  
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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*.

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## 0.1 Overview

Human-inhabited and inhabitable space stations and space capsules are exposed to the risk of collision with new launch vehicle stage(s) and spacecraft during their launch and early orbit phase. While such collision threats also exist during on-orbit spacecraft operations, the launch and early orbit phase is unique in that potential collisions with inhabitable space stations and space capsules can be avoided at minimal cost (i.e. without the expenditure of on-orbit manoeuvring fuel) through the proper selection of suitable launch times.

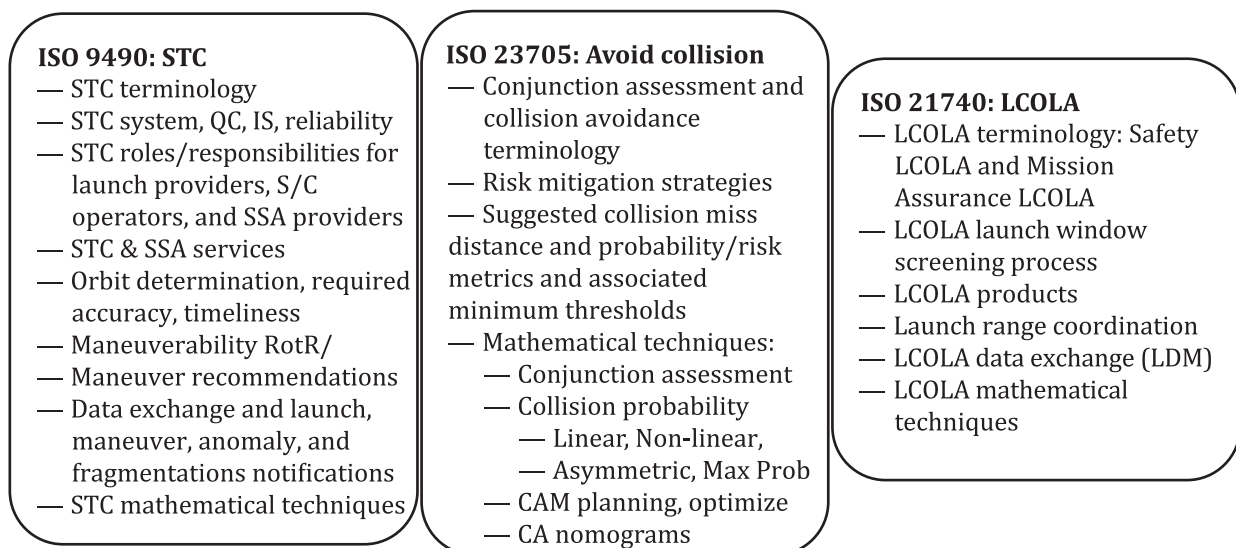
Consistent with Clause B.5 of the United Nations Long Term Sustainability guidelines<sup>[1]</sup> and to protect human missions from the danger of collision with newly launched objects, the LCOLA approving agent may apply launch collision avoidance (LCOLA) methods to assess either collision risk, close approach, or both. If this assessment determines that launch at certain times would incur unacceptable risk to the human missions, the LCOLA approving agent may delay the time of launch.

In addition to establishing requirements for the safety LCOLA process, [Annex A](#) provides details on algorithms, processes, and screening criteria that may be used to conduct safety LCOLA assessments. [Annex A](#) is intended to ensure the safety and integrity of human-inhabited or inhabitable space stations.

[Annex B](#) provides additional details on algorithms, processes, and screening criteria that may be used to conduct mission assurance LCOLA assessments. [Annex B](#) is intended to ensure the safety and integrity of both the newly launched space objects and any on-orbit active spacecraft that can potentially collide with the launched objects for the initial LCOLA screening time period, and also to reduce the risk of unintended fragmentation events caused by collision of the newly launched space objects with orbital debris during that same initial screening period. A selection of general procedures for the determination of unacceptable risk that result in the identification of all collision-safe launch opportunities is described.

## 0.2 Breakdown of space safety constituents across ISO standards

The space flight safety-relevant topics of space traffic coordination (STC), on-orbit collision avoidance, and launch collision avoidance are closely related. To minimize duplication and maximize document consistency, the various content that serve as the basis for these three disciplines has been divided up as shown in [Figure 1](#).



NOTE ISO 9490 and ISO 23705 are under development.

**Figure 1 — Division of space safety operations content spanning several ISO standards**

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# Space systems — Launch window estimation and collision avoidance

## 1 Scope

This document establishes the general safety launch collision avoidance (safety LCOLA) requirements for the avoidance of collision between the collection of newly launched objects resulting from a space launch [including launch vehicle stage(s) and payloads or released objects] and human-inhabited or human-habitable space stations and space vehicles.

The document specifies the requirements for the analysis of launch times and procedures for identifying safe launch opportunities. It also describes the assessment and constraints for collision avoidance risk evaluation metrics (launch collision probability and standoff distance).

## 2 Normative reference

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 conjunction

event where the positional separation between two objects is at a local minimum and that minimum is either closer than a specified minimum distance threshold, or the estimated probability of collision at this local minimum exceeds a specified *launch collision probability* (3.5) threshold

### 3.2 integrated LCOLA

integrated launch collision avoidance  
composite *launch window* (3.9) stemming from the combination of *safety LCOLA* (3.15) and *mission assurance LCOLA* (3.13) analyses

### 3.3 miss distance

minimum approach distance between a launching body and an orbiting body at their closest approach point

### 3.4 launch collision avoidance LCOLA

process of mitigating the risk of collision between the newly launched objects resulting from a space launch and any space objects in their paths