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Space systems — Space-based services for a high accuracy positioning system with safety requirements

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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).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 20, *Aircraft and space vehicles*, Subcommittee SC 14, *Space systems and operations*.

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.

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Introduction

This document is a technical specification of space-based services. Space systems provide a huge merit for the society and economy in each country today; and space-based services contribute to people's quality of life across the world. Space systems should be utilized furthermore in the industry worldwide in the future.

Space systems are utilized in the application of other areas. Therefore, this document has harmonized the content in the GNSS (global navigation satellite system) relevant area as shown in Figure 1.

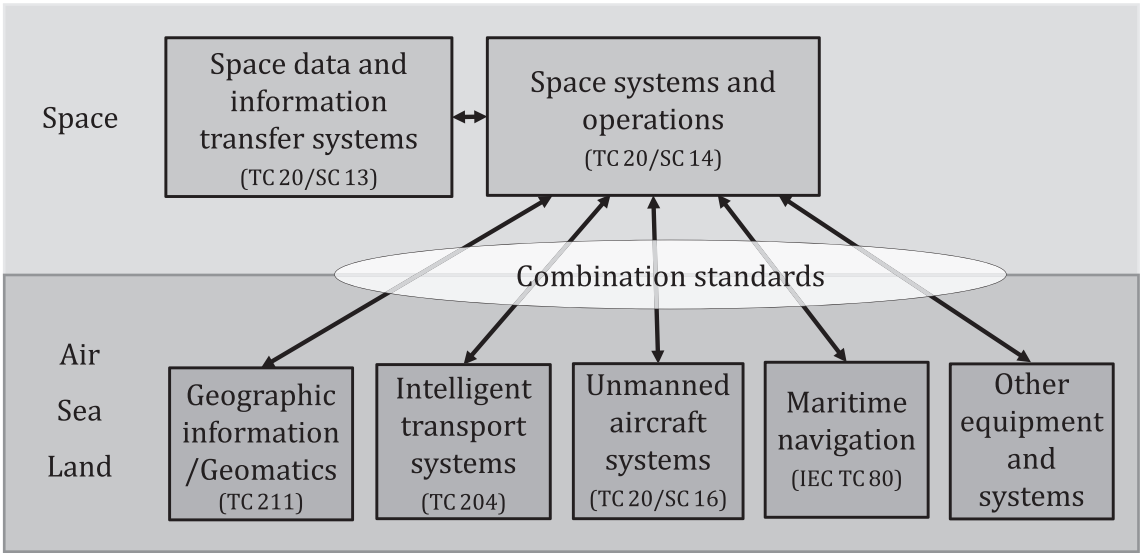


Figure 1 — Standardization of space-based services: GNSS relevant area

Space systems often become the last hope for people in harsh weather conditions to ensure the safety of life. This document is intended to ensure the safety with the power of space systems.

The operation of moving machines under such harsh conditions is difficult and unsafe for machine operators. For example, snow removal work with a snowplough is very difficult and unsafe for non-skilled workers. It is necessary to have experience and skills to operate the vehicle near the edges and features of a course. Because it takes a long period of training time to learn the operation skills for manoeuvring a work vehicle, it is becoming a serious problem in areas with heavy snow to secure the highly skilled workers who operate these vehicles and to maintain a continuous plan for subsequent replacement due to the retirement of skilled workers.

The purpose of this document is to mainly determine the safety requirements for a space-based high accuracy positioning system by which vehicles can be operated safely even in low visibility conditions with less experienced operators having minimum experience and skills.

This document refers to some general systems such as agricultural machines, road cleaning machines or construction machines which require positioning accuracy. It applies to general works such as staying the course, docking, and unloading works.

In general, it is difficult and dangerous to operate machines in low visibility due to harsh optical conditions. In such situations, the machine's positioning system requires a high degree of accuracy. This document considers the following two distinctive features commonly observed in the high accuracy positioning applications requiring safety.

— Generally speaking, a rover needs to be operated in situations where image sensors (cameras or LiDARs or both) cannot be used and the risk of accidents becomes higher.

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— In addition, a machine needs to be operated in close proximity to various kinds of obstacles such as signals, signs and guide-rails on boundary lines because of its purpose. This is the main reason for the necessity of having skilled operators.

Ultimately, this document aims to help system design by which a rover can be operated safely even in low visibility situations with less experienced operators to contribute to improving the quality of life through the space-based service.

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Space systems — Space-based services for a high accuracy positioning system with safety requirements

1 Scope

This document provides requirements and recommendation for space-based systems that, using satellite radionavigation services, provide high accuracy positioning of rovers. It is particularly intended for rovers whose operation requires meeting specific safety requirements, including in situations of low visibility. This document also provides methods to verify the system requirements, as well as complementary information on particular applications (Annex A), mobile mapping systems (Annex B) and augmented positioning (Annexes C and D).

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 18197:2015, *Space systems — Space based services requirements for centimetre class positioning*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
satellite radionavigation
satellite radiodetermination (3.2) used for *radionavigation* (3.3)

[SOURCE: IEC 60050-725:1994, 725-12-51]

3.2
satellite radiodetermination
radiodetermination (3.4) which makes use of a satellite system

[SOURCE: IEC 60050-725:1994, 725-12-49]

3.3
radionavigation
radiodetermination (3.4) used for the purpose of navigation, including obstruction warning

[SOURCE: IEC 60050-725:1994, 725-12-50]

3.4
radiodetermination
determination of the position, velocity and/or other characteristics of an object, or the obtaining of information relating to these characteristics, by means of radio waves

[SOURCE: IEC 60050-725:1994, 725-12-48]

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