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

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# Foreword

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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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# 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.

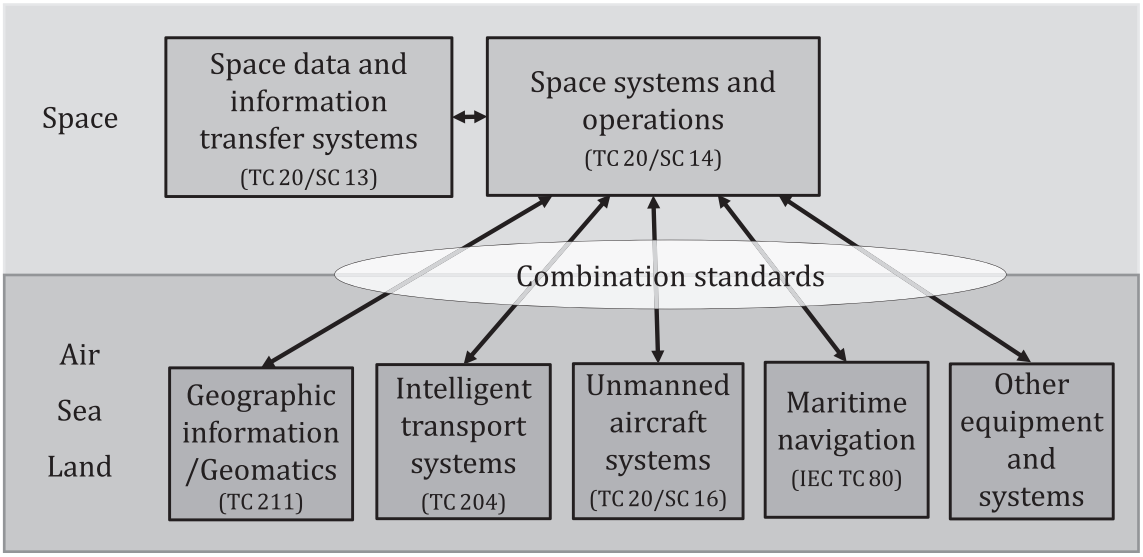


**Figure 1 — Standardization of space-based services: GNSS relevant area**

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.

— 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.