

# EGNOS and GALILEO for RAIL



Increased Safety, Lower Costs



European  
Global Navigation  
Satellite Systems  
Agency





## Increased safety, lower costs

Satellite-based positioning is set to have a substantial impact on the rail industry. By reducing the infrastructure needed for train control systems, space-based technology helps decrease costs and increase the efficiency of railway signalling.

To ensure the European rail segment is able to take full advantage of all that satellite-based positioning offers, the European GNSS Agency (GSA) is working with rail and space stakeholders to further develop the European Train Control System (ETCS). In this sense, GNSS is considered by the rail stakeholders as one of the key game changers for future ETCS evolutions.

## A seamless rail system

The ERTMS is a major industrial project aiming to replace Europe's different national train control and command systems with a single, coordinated solution. The deployment of ERTMS will enable the creation of a seamless European railway system with aligned signalling – essential to increasing the competitiveness of European railways.

Europe's Global Navigation Satellite Systems – Galileo and EGNOS – will actively contribute to the evolution of the ERTMS. Via such initiatives as the Shift2Rail Joint Undertaking, for example, it is foreseen that further R&D activities will foster European GNSS adoption in ERTMS.

## Let's get virtual

To date, GNSS' role in European rail has been limited to non-Safety relevant applications, including asset management and passenger information services. However, the latest technological developments show that augmented GNSS, when complemented by other sensors, can satisfy the stringent European Committee for Electrotechnical Standardisation (CENELEC) Safety and Integrity Level requirements.

For example, train positioning is currently based on balises, a physical element mounted at specific intervals along the railway track. Where possible, the rail community aims to replace the physical balises with European GNSS based positioning solutions. This will enable reduction of the infrastructure related cost, while maintaining the operational safety of ETCS.

As a result of this progress, the demand for cost effective and innovative GNSS applications for both safety critical (signalling and autonomous train control) and non-safety critical (asset management, passenger information systems, rail freight visibility) purposes will increase.



## Roadmap to adoption

Together with the European rail and space stakeholders, the GSA has drafted the GNSS in Rail adoption roadmap, aiming to develop the necessary technology and ensure its establishment in the ERTMS specifications. At present, large scale performance tests with the objective of determining the realistic extent of E-GNSS performance within the rail environment are ongoing. Based on these results, it will be possible to finalise user requirements for the GNSS receiver, which serves as the safety relevant component of the train positioning subsystem.

Scan the QR code to download the E-GNSS rail roadmap.



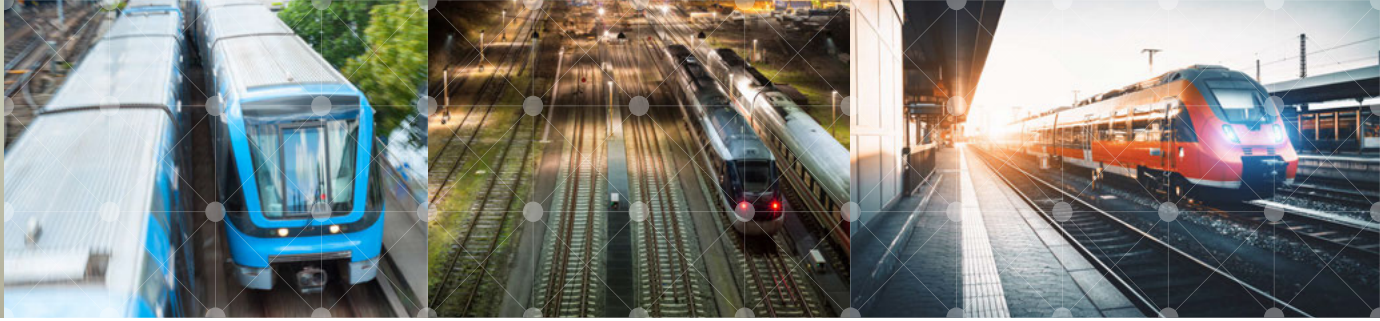
## Benefits all around

Galileo and EGNOS will deliver integrity, improve availability and enhance accuracy for such safety critical applications as railway signalling. As a result of this shift towards a GNSS-based ETCS, rail will benefit from improved safety and lower operational costs, and all of Europe will enjoy safer rail journeys on regional and low-density lines, lower pollution, and more precise passenger information services.

## Why European GNSS?

In comparison to other technologies, the advantages of using European GNSS are many. Research shows increased cost efficiency for European railway infrastructures, which translates into new markets and opportunities for improving safety and reducing operational costs, especially for low-density lines.

1. Combination of GNSS-enabled precise positioning and communication means less infrastructure expenses and lower CAPEX/OPEX for infrastructure managers.
2. EGNOS is already operational and augmenting GNSS signals in Europe and beyond.
3. Improved availability of the GNSS signal thanks to a clearly defined schedule to complete the Galileo system by 2020.
4. The EU's GNSS system is under civilian control.
5. Stable operations already in place.
6. The railway community (UNIFE/UNISIG, CER, EUG) is taking concrete steps, supporting E-GNSS inclusion into the future evolutions of the ERTMS.



## How does EGNOS work?

EGNOS, the European Geostationary Navigation Overlay Service, uses geostationary satellites and a network of ground stations to increase the accuracy of existing satellite positioning signals while providing a crucial 'integrity message' that informs users in the event of signal problems.

The EGNOS reference stations pick up signals from GPS satellites, which are processed in Mission Control Centres (MCC). The accuracy of the original signals is determined and confounding factors are corrected.

This data is then incorporated into EGNOS signals and sent to its three geostationary satellites. The satellites relay these signals back to users on the ground, providing greater positioning accuracy than would be achieved through GPS alone.

## Galileo Initial Services

Galileo - the European Global Satellite Navigation System (GNSS) - has been operational since December 2016.

Users around the world can now be guided using the positioning, navigation and timing information provided by Galileo's global satellite constellation.

By working together with GPS, Galileo satellites provide better positioning and navigation for users, particularly in cities, where satellite signals can often be blocked by buildings. Plus, Galileo's excellent timing accuracy helps make the synchronisation of banking and financial transactions

and telecommunication and energy distribution networks more resilient, allowing them to operate more efficiently.

Galileo's Search and Rescue service reduces the time it takes to detect emergency distress beacon signals from up to three hours to just ten minutes, potentially saving many more lives. The additional resiliency provided by Galileo is expected to help drive economic growth in Europe and beyond by enabling a range of new applications and services.

## useGALILEO.eu

Mass-market devices containing a Galileo-enabled chipset, such as smartphones or vehicle navigation devices, can use Galileo signals for positioning, navigation and timing. The useGALILEO.eu tool helps you keep track of the safety-critical rail applications enhanced by Galileo and EGNOS, and the progress made by Research & Development projects in rail applications.

## GSA: linking space to user needs

The GSA is the European Union Agency in charge of managing operations and service provision of Galileo and EGNOS, ensuring that European citizens get the most out of Europe's satellite navigation programmes in terms of innovation, competitiveness, economic growth, and benefit to users.

As Europe's link between space technology and user needs, GSA keeps users at the centre of Galileo and EGNOS.

[www.gsa.europa.eu](http://www.gsa.europa.eu)

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