

Il ruolo della tecnologia spaziale nell'innovazione ferroviaria e nella sostenibilità

ESA-TIAA-HO-2022-2534

Genova, 07/11/2022

ESA Business Applications and Space Solutions

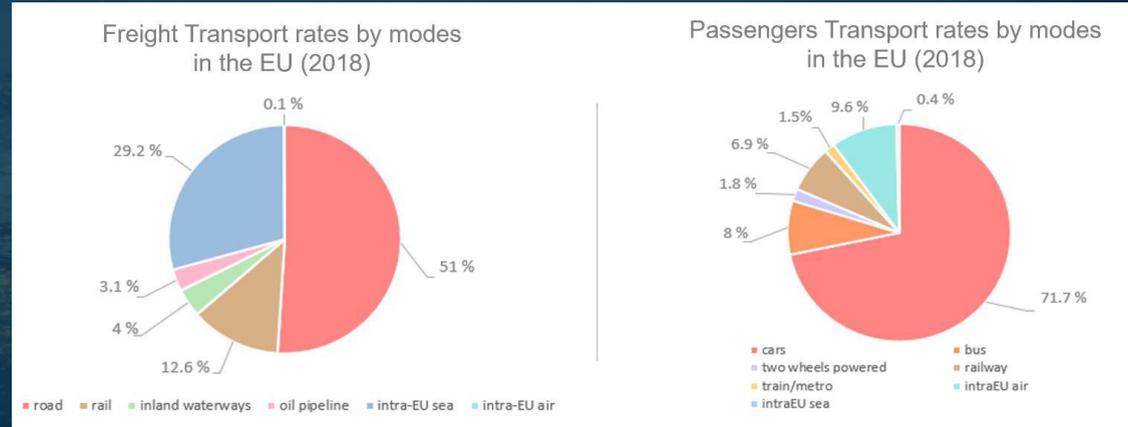


Using **any space asset(s)** and integrating them with terrestrial assets for the **benefit of life on Earth**

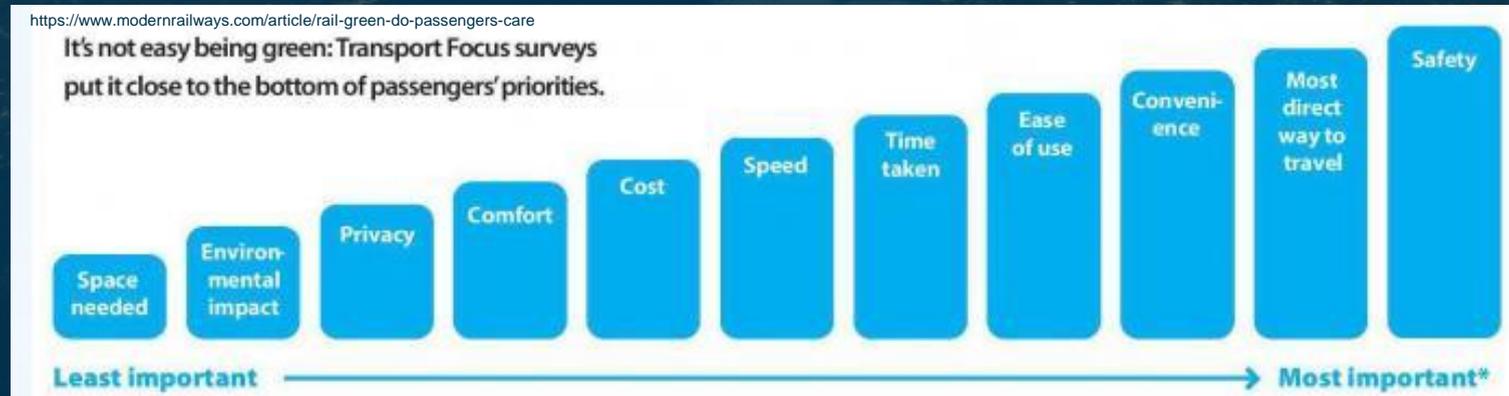


Rail opportunities and challenges in transports

The transport sector is one of the key contributor to GHG emissions, along with the energy sector as well as the agriculture and forestry sectors.



EU transport in figures - Publications Office of the EU (europa.eu)



Why space is important to rail



Satellite Navigation

Enabling **global positioning** functions.

Supports applications such as **enhanced train localisation** for **eco-driving & signalling**, **interactive mapping**, **surveying**, **safety of trackworkers** and **predictive maintenance**.

The use of sensors with satellite navigation may improve the position and velocity performances (relative and absolute).



Satellite Communications

Supporting **5G** architectures, that is key to the **Future Railway Mobile Communication System**, superseding the current GSM-R infrastructure.

Providing **ubiquitous coverage**, enabling an extension of **reliable** and **secure connectivity** to complement terrestrial communications, including satellite-based **Internet of Things** for rail freight and cargo monitoring, and satellite broadband for enhanced on-board and in-station connectivity.



Earth Observation

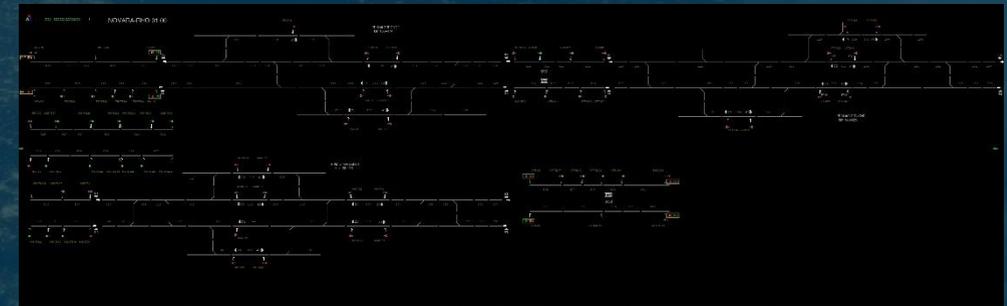
Providing an **effective** and **frequent** way to **monitor land** and **resources**, and can also facilitate **change detection**.

Facilitates applications related to the **monitoring** of **railway assets**, **infrastructure** and **surrounding areas**, or augmented reality applications **enhancing** the **user experience**.



<https://space4rail.esa.int/projects>

Technology Demonstrator for the Certification of a satellite-based ERTMS L2 regional line solution (ERSAT Program)



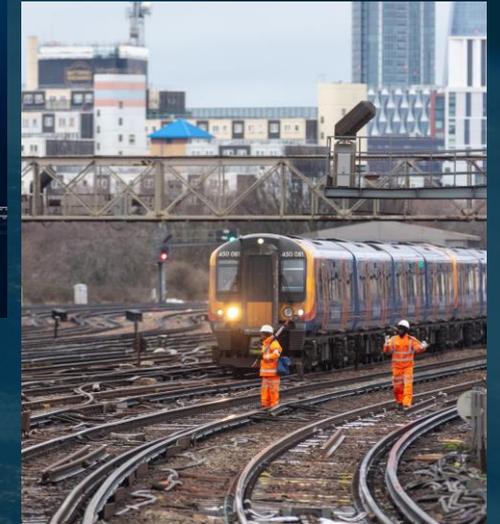
<https://business.esa.int/projects/sbs-rails-phase-21>

Target customers: Railway Infrastructure Managers and Undertakings

Satellite navigation and communications towards satellite-based ERTMS

CertiPro Railway Trackworker Individual Protection Demonstration

- The **Railway Track Worker Protection (TWP)** is an individualized personal warning equipment system for every track worker, providing acoustic, visual and haptic warning in case of approaching trains.
- This service shall be provided to railway track workers and other railway staff in order to reduce the number of casualties and injuries related to track undertakings.



SatNav combined with other sensors to provide precise location and warning systems for the workers

<https://business.esa.int/projects/certipro>

[CertiPro Train Collision Avoidance with Track Worker Protection \(TWP\) - YouTube](#)

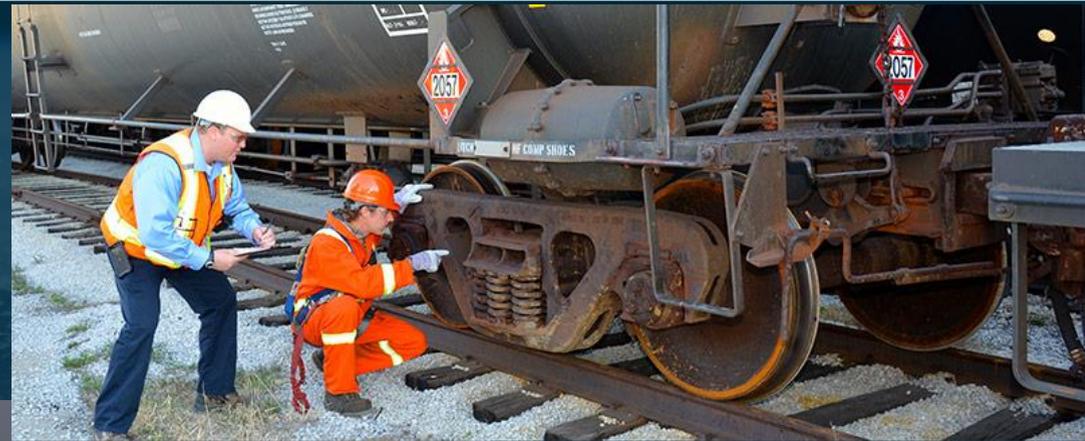
Target customers: primarily small and medium sized railway operators.
Pilot customer: AMT Genova

Satellite Monitoring for Logistics Safety is a comprehensive platform for real-time tracking of rail freight, and monitoring of the cargo and rail tank cars. This allows for more efficient logistics and contribute to a safer and more efficient rail freight.



<https://youtu.be/NV56GVr7n0k>

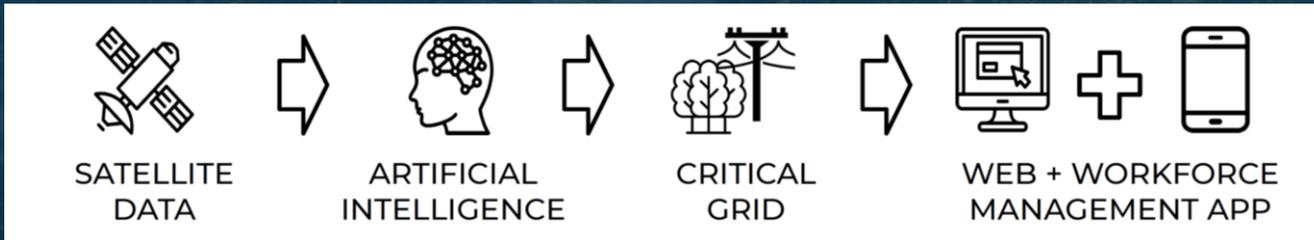
Targeted Users: Chemical companies, rail freight operators, rail network operators



Satellite connectivity and GNSS services guarantee continuous monitoring also in areas not covered by terrestrial connectivity

Space-enabled full-stack solution for Infrastructure Monitoring

Infrastructure monitoring for railways, electricity grids and pipelines that identifies vegetation, ground deformation and third-party interactions in order to progress to predictive maintenance.



This section displays three key capabilities of the solution:

- 3D Vegetation Analytics:** Precise information about location and height of trees combined with line swing geometries. (Accompanied by a 3D visualization of a railway line with green vegetation overlays).
- Risk Analysis & Prioritization:** Risk classification based on the surrounding terrain and vegetation(-height). (Accompanied by a 2D map showing risk levels and a data table).
- Auditing & Cutback Control:** Audit subcontractor work and efficiently prove that you fulfill regulations. (Accompanied by a satellite image with a red line and green areas labeled 'confirmed cutback activities (in green)').

Solution already used by:



Satellite Earth Observation allow for infrastructure monitoring, GNSS allow for location based data processing and distribution

<https://business.esa.int/projects/sim> <https://live-eo.com/>

S4R Downstream Applications Call for Proposals

Open Call for Proposals (CfP) for innovative and sustainable Applications/Services based on at least one space asset (e.g. SatEO, SatNav, SatCom), supported by potential users/customers - *permanently open!*

Three Thematic Areas

Satellite positioning
Next generation Communication Systems
Automatic Train Operations
On-board train integrity proving, etc.



Predictive Maintenance

Monitoring of railway assets and infrastructure and surroundings, with advanced warnings of potentially hazardous situations (e.g. hydrogeological)

Safety (workers, people...)

Optimization of logistics, etc.

Tracking and tracing of freights/cargo

Digitalisation of paper works for freights

Detection of unusual environmental conditions for wagons/boxes/cargos

Innovative integrated ticketing before and during travel, travel companion applications

Smart Stations, etc.

<https://space4rail.esa.int/opportunities/ba-s4r>

| | Feasibility Study | Demonstration Project |
|---|--|---|
| Activity Cost | max. 500'000 EUR (limited to acceptable cost) | case by case assessment (limited to acceptable cost) |
| ESA Co-Funding | | |
| Baseline | max. 50% of company's cost | max. 50% of company's cost |
| Micro, Small and Medium-Enterprises ⁵ | max. 80% ⁶ of enterprise's cost | max. 80% ⁶ of enterprise's cost |
| Universities and Research Institutes with no commercial interest in product/service | max. 100% ⁶ of institute's cost and max. 30% of activity cost | max. 80% ⁶ of institute's cost and max. 30% of activity cost |
| Industry Co-Funding | Remaining part of the cost to carry out the activity | |

- ✓ Activities in Direct Negotiation, streamlined procurement process with ESA guidance
- ✓ ESA will bear up to 50% (non SME) or 80% (SME) of the eligible cost ***pending support from National Delegation***, and the remainder has to be financed by the tenderer and/or other partners.
- ✓ IPRs (Intellectual Property Rights) will remain with the company.

Sustainable mobility & Space



Space can support decarbonisation of each mode of transport and the overall mobility sector enabling connectivity and solutions such as MaaS, intermodal transport, CCAM, etc.

AUTOMOTIVE



AIR



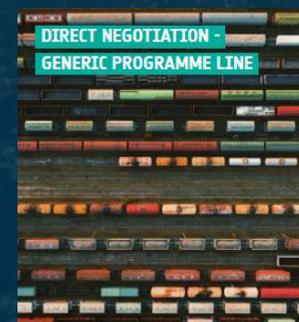
SEA



RAIL



Current Business Applications Funding Opportunities



Thank you

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<https://space4rail.esa.int/opportunities/ba-s4r>

<https://business.esa.int/>₁₃

