

navisp

Programme Structure: 3 Elements
How to Apply





Element 1





Perform **feasibility studies** and viability analysis for the emergence of new concepts in the PNT world (both upstream and downstream)



Contribute to the formulation and implementation of PNT technology **strategies** and **roadmaps**



Prove concept of promising PNT-based services



Element 1: **Innovation**

- Develop novel PNT-related systems and technologies along the entire value chain.

Pave the way for future products and services



ESA DRIVEN

BASED ON YEARLY WORKPLAN



FULLY FUNDED

Workplan 2024 schedule

ID	Name	2024											
		J	F	M	A	M	J	J	A	S	O	N	D
EL1-086	Instantaneous High-Accuracy Positioning based on Hybrid-Meta-Signal Solutions					ITT							
EL1-087	Verifiable AI/ML techniques for PNT applications												
EL1-088	Proof-of-concept of advanced navigation algorithms based on factor graph optimization												
EL1-089	Modelling Quantum Sensors in a realistic navigation environment												
EL1-090	Robust Navigation for Autonomous Driving with Low-Cost/SWaP Antennas												
EL1-091	Proof-of-concept of SOOP with broadband satcom signals in Ku/Ka-band												
EL1-092	Integrity in 5G Private Networks for Industry 4.0												
EL1-093	Enabling PPP ambiguity resolution in satellite and terrestrial frequency-varying carrier-phase signals												
EL1-094	High-accuracy formation flying technologies for future distributed instruments												
EL1-095	Exploitation of Geo-spatial Data for Automated Vehicles												
EL1-096	Advanced visual INS for high-end handheld devices												
EL1-097	Use of ML techniques to optimize the adaptive beam-steering capabilities of CRPAs for GNSS user receivers												
EL1-098	Metrics to Assess the Performance of GNSS Authentication Schemes												
EL1-099	Location, Tracking and Salvage support of lost shipping containers at sea												

- EL 1-092: Close date 10/02/25
- EL 1-096: Close date 07/02/25
- EL 1-099: Close date 17/02/25

Work Plan 2025 ITT Schedule

		2025											
		J	F	M	A	M	J	J	A	S	O	N	D
EL1-101	Underwater and underground navigation using Muons					ITT							
EL1-102	Quantum receiver for navigation applications		ITT										
EL1-103	Precise and Stable Navigation with Quantum Accelerometer			ITT									
EL1-104	AI for Anomaly Detection in Multi-Sensor PNT	ITT											
EL1-105	Hybrid black-white-modelling estimation and machine learning algorithms for PNT engines											ITT	
EL1-106	Beamforming user antenna for wideband radionavigation signals in C-band				ITT								
EL1-107	Ultra-high spatial resolution GNSS receiver for automotive industry					ITT							
EL1-108	Assessment of Time Transfer Techniques for Resilient Regional (Transnational) UTC Infrastructure					ITT							
EL1-109	5G Localisation for Safety of Life Applications in Rail						ITT						
EL1-110	User Equipment Platform for Positioning with 5G/6G Non-Terrestrial Networks								ITT				
EL1-111	Managing GNSS Local Effects in the Railway Environment for Advanced Safe Train Positioning			ITT									
EL1-112	Development of a GNSS Receiver Size Weight & Power Model					ITT							
EL1-113	Low profile thermal cell optical clock based on acetylene-filled hollow core fibre for future ground & space PNT	ITT											
EL1-114	Geodesy-enabled applications	ITT											
EL1-115	ADAS Technology and PNT		ITT										

EL1-104: Close date 25/02/25

EL1-114: Close date 14/02/25

Element 2



nausp Element 2 Objectives



Developing PNT-related products targeting commercial / institutional opportunities



Mitigating industrial R&D risk (technology, market, regulatory)



Accelerating Industrial Return on Investment



Element 2: **Competitiveness**

Improve European industry's capabilities in the global market for PNT technologies and services (products and services)

**Open Call,
Co-funded**

Market est. ~ \$54.0 bn by 2030
CAGR 15 – 20 %

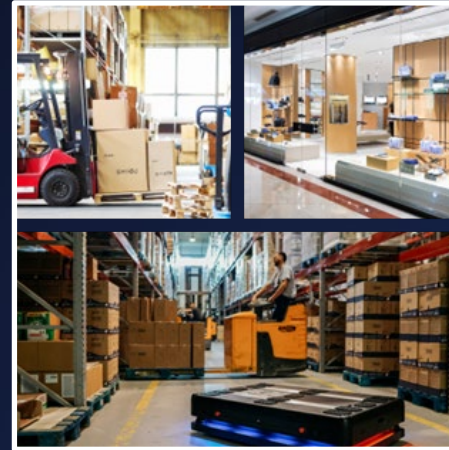
PNT Drivers:

- Autonomous flight
- Sensors / cameras for data / geolocation
- Reliable navigation & collision avoidance
- Operations in GNSS-denied environments
- 5G connectivity for enhanced control and data transmission

Drones



Indoor / seamless Navigation



Market est. ~ \$55.0 bn by 2030
CAGR 7 – 12 %

PNT Drivers:

- Robotic indoor operations
- AR / VR / Digital twinning
- Store customer segmentation
- Spillovers in other markets (e.g., automotive, logistics)

Market est. ~ \$200.0 bn by 2030
CAGR 7 – 12 %

PNT Drivers:

- Resilient & Alternative PNT
- Time to First Fix
- SLAM & Navigation on Autopilot through highways
- V2X comms & location

ADAS & Autonomous Driving



Internet of Things



Market est. ~ \$2.0 tn by 2030
CAGR 6 – 8 %

PNT Drivers:

- Industry 4.0
- New services on consumer platforms (smartphones, wearables, AR headsets)
- SLAM
- V2X comms & location

Emerging PNT markets - Timing



Timing is a growing concern across Europe:

- Critical infrastructures will fail without good timing and synchronisation:
 - Telecom networks: 4G/5G data dropped after 3 hours, calls dropped after 2-3 days
 - Power grids: blackouts and component failure beginning between 3 – 7 days
 - Data centres: lose sync lost amongst distributed databases with evident effects starting after 24 hours

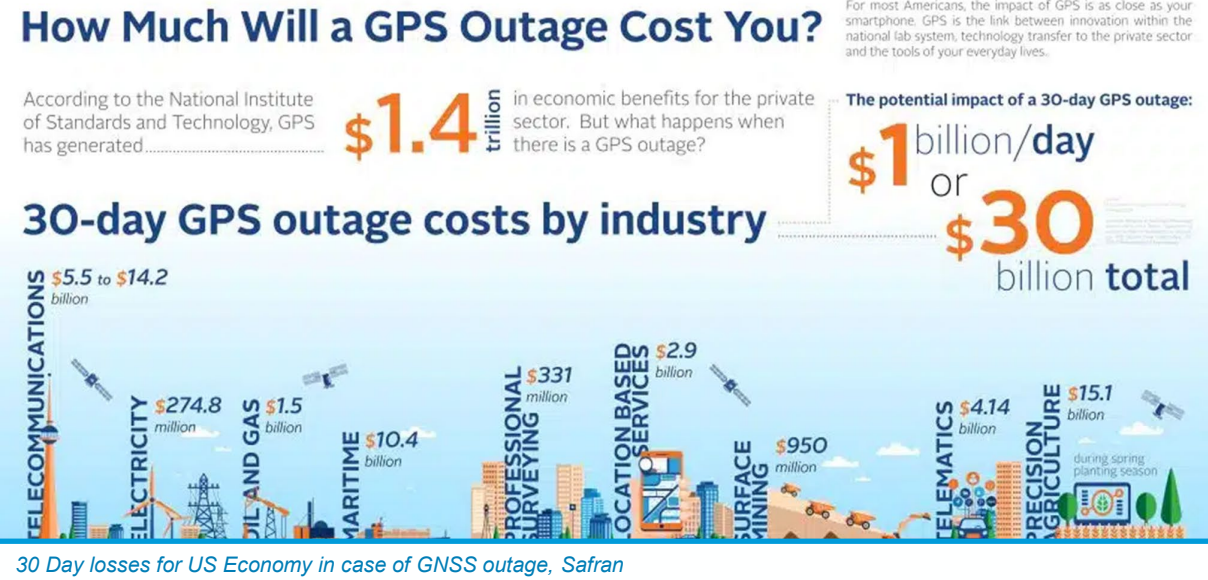
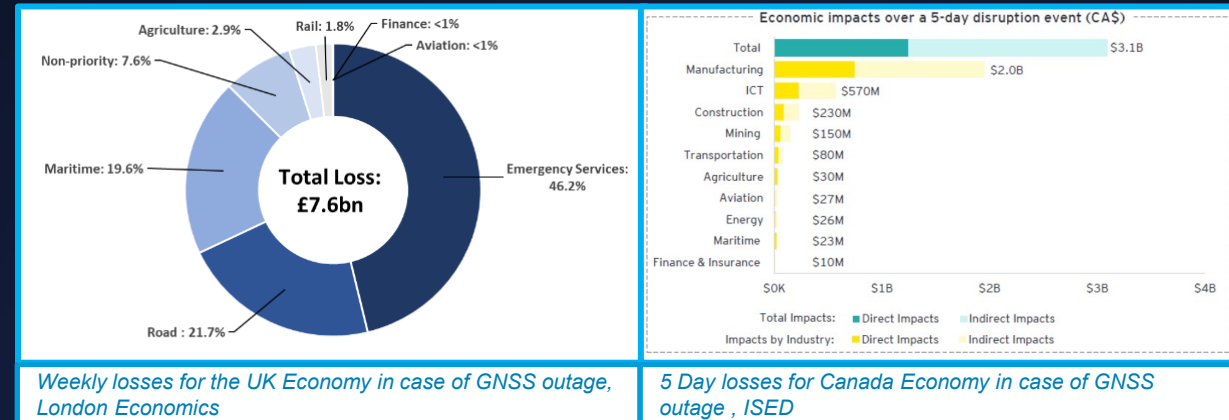
- Financial services require UTC stamped transactions (MiFID II): GNSS widely used but not UTC traceable: requires GNSS monitoring bulletin from certified UTC centre

Level of Accuracy	Time Error Requirements (error with respect to a common reference)	Typical Applications
1	500 ms	Billing, alarms
2	100 µs	IP delay monitoring, Asynchronous Dual Connectivity
3	5 µs	LTE TDD (large cell), Synchronous Dual Connectivity (for up to 7 km propagation difference between eNodeBs)
4	1.5 µs	UTRA-TDD, LTE-TDD (small cell), WiMAX-TDD (some configurations), Synchronous Dual Connectivity (for up to 9 km propagation difference between eNodeBs)
5	1 µs	WiMAX-TDD (some configurations)
Level of Accuracy	Maximum Relative Time Error Requirements (pk-pk between elements in a cluster)	Typical Applications
6A	260 ns	Intra-band non-contiguous carrier aggregation with or without MIMO or TX diversity, and inter-band carrier aggregation with or without MIMO or TX diversity
6B	130 ns	Intra-band contiguous carrier aggregation with or without MIMO or TX diversity
6C	65 ns	MIMO or TX diversity transmissions at each carrier frequency

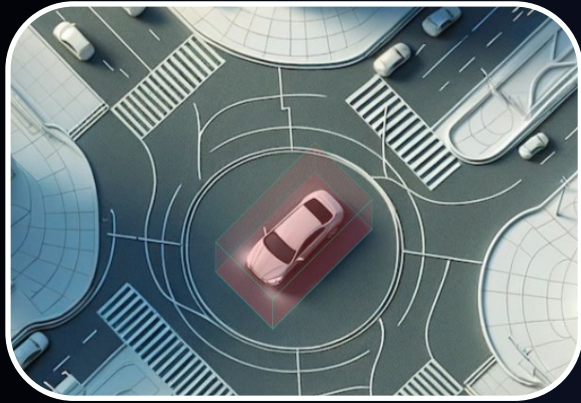
Source: Timing Solutions

GNSS Outages

- Norwegian Communication Authority reports that in 2024, there were almost daily disturbances to its GNSS navigation
- The U.S. Department of Homeland Security identified that 15 out of the 18 Critical National Infrastructure sectors were vulnerable to GNSS failure
- Eurocontrol, the European Organization for the Safety of Air Navigation: during the first two months of 2024, it received 985 GPS outages compared with 1,371 for the whole of 2023
- Data from *GPSJam.org (2024)* confirmed widespread GPS/GNSS interference across Europe and beyond due to Ukraine, affecting regions from Finland, Poland and Romania to Turkey.
- UK Risk Registry 2023: Categorizes the impact of a loss of PNT services as more severe than the loss of space-based services.
- Risk of spectrum usage from other applications, Example Ligado



Some Success Stories



Improved Location Mapping using Imaging Radars, GNSS and Point-Cloud Registration



Grimaldi Assisted Berthing



GIVAS - Glass-Integrated Vehicular Antenna System



RAIM prediction system for avionics



New method for accurate vehicle positioning when PNT data is unavailable or to improve accuracy when combined with PNT.



Advancing autonomous berthing operations for large vessels, enhancing manoeuvre efficiency, safety, and reducing CO2 emissions integrating satellite-based multi-sensor technologies and AI-driven algorithms.



Glass-roof antenna capable to acquire GNSS signals and other signals of opportunity for navigation, including 5G/6G and SatCom.



Flight-planning solution including Receiver Autonomous Integrity Monitoring (RAIM), dynamic flight trajectory optimisation and advanced decision support

How to apply?

Outline proposal submission



4 months



Outline Proposal:
<https://ideas.esa.int/>



National Delegation support:
<https://navisp.esa.int/nationaldelegation/>



Full Proposal (requires supplier reg):
<https://doing-business.sso.esa.int/>



Contract Negotiation and award

Element 3

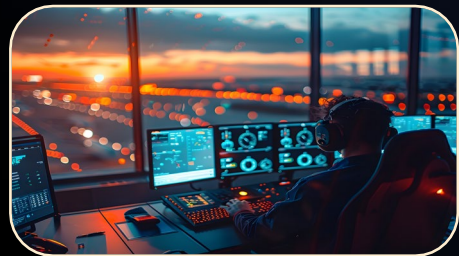




Test-Ranges for mobility



Understanding of PNT Resilience and Mitigation Measures i.e. for National Critical Infrastructures



Public Services Preparation



Element 3:

Member States Initiatives

Support European National Programmes and initiatives along the whole value chain

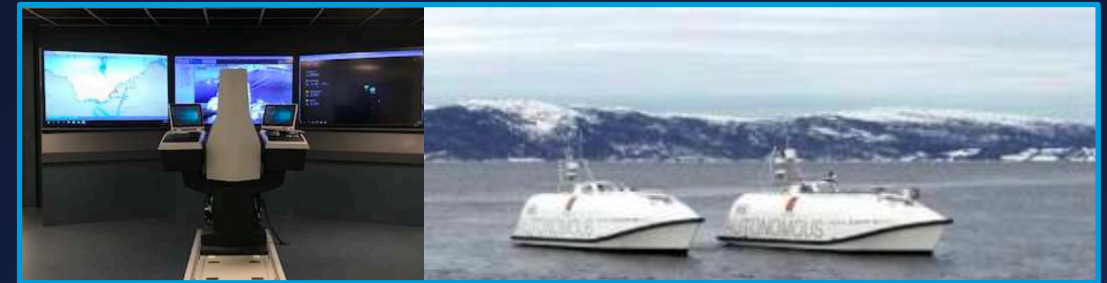
 **INDUSTRY DRIVEN** (linked to Institutional Needs)
BASED ON CALL FOR PROPOSALS

 **FULLY FUNDED**

Autonomous Maritime Mobility

Trodheimsfjorden Test Area for Autonomous Ships (NO)

- World's first test-site for autonomous ships
- Foster knowledge building
- Stimulate technology development
- Develop rules and regulations
- Test and Verify concepts and solutions
- Collaboration with other test-sites and facilities



Autonomous Road Mobility

PNT Center for Automated Road Transport (IT)

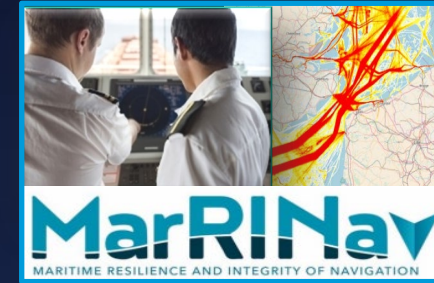
- Safety and Performance Evaluation for PNT in Connected Autonomous Driving
- Supports between the design and certification of the CAD solution
- Hardware-In-the-Loop test
- Network operation with external laboratories
- Extension of the lab capabilities to support the autonomous mobility use cases of Smart Roads being planned



Element 3: PNT Resilience

Integrated Navigation System-of-Systems PNT Integrity for Resilience (UK)

- Definition and validation of autonomous user level integrity solutions for maritime use cases with focus on PNT resilience (system-of-systems and multi-sensor approach)
- Definition of a service for supporting maritime user level integrity and the related cost-benefit analysis



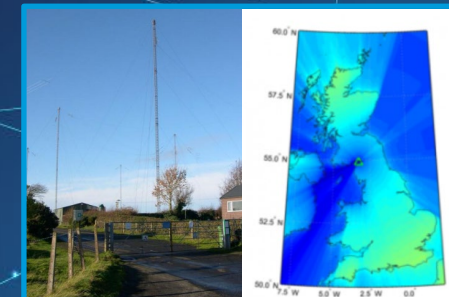
Resilient PNT for the Black Sea and Danube Region (RO)

- Assessment of PNT vulnerabilities in the Danube and inland waterways
- Develop a resilient PNT solution targeting the particularities of the Black Sea and Danube lower basin

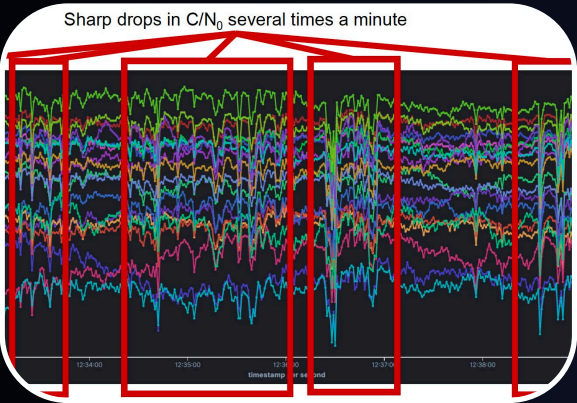


UK Time Distribution (UK)

- Assessing the capability of eLoran transmissions to provide time synchronization as well as to broadcast GNSS data.
- Timing precision to be enhanced with deployment of eLoran differential receivers



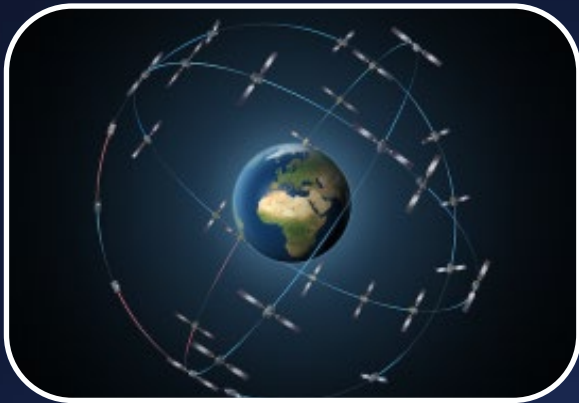
Public services preparation



GNSS event notification service (UK)



National GNSS Knowledge centre (NL)



GNSS Vulnerabilities and Mitigation in the Czech Republic (CZ)



GNSS Monitoring and Interference Detection in Romanian Airports (RO)

Ordnance Survey
SEE > BETTER PLACE

Prioritize detection of interference-related GNSS incidents

Platform offering expertise to organizations in need of a better understanding of GNSS dependencies and degradations of GNSS service

Vulnerability assessment of critical infrastructures (road, maritime, telecom) to GNSS loss through of over-the-air jamming tests in controlled scenarios

Define a GNSS quality monitoring system compliant with international regulations. Deployment of a pilot system in 7 airports.

How to apply?

Outline proposal submission



4 months

**navisp
element 3 –
support to
member
states**



Outline Proposal:
<https://ideas.esa.int/>



National Delegation support:
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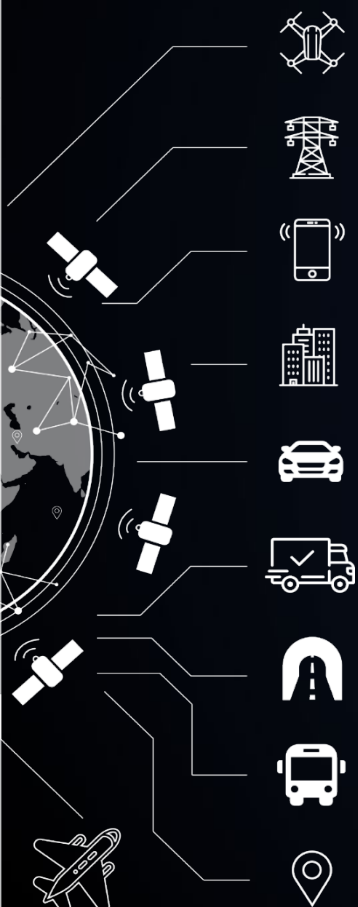


Full Proposal (requires supplier reg):
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Contract Negotiation and award

Connect with us



- Check for upcoming NAVISP events

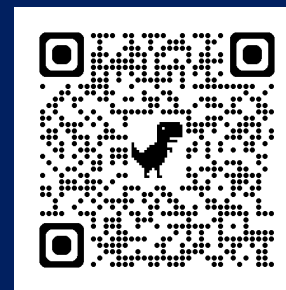
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navisp.esa.int

Impact
assessment
survey



navisp@esa.int

