



European  
Global Navigation  
Satellite Systems  
Agency



**EGNOS**

NAVIGATION SOLUTIONS  
POWERED BY EUROPE

# EGNOS market strategy and achievements

EGNOS service provision workshop 2017

Gian Gherardo Calini

3<sup>rd</sup> October 2017 – Athens, Greece

# Updates and recent achievements in transport markets



- 372 LPV/LPV200/PINS procedures + 85 EGNOS enable LNAV/VNAV procedures operational
- Almost 30% EGNOS penetration in Business aviation aircraft
- Third EGNOS for aviation support programme scheduled to be published in Q4 2017
- New market segments booming: RPAS



- Road Tolling for truck in EU: EGNOS readiness in 93% of GNSS receivers (1.95 million)
- eCall and Smart Tachograph regulations (EU) will make EGNOS mandatory in all new cars and vans models and heavy trucks from April 2018 and June 2019 respectively

# Updates and recent achievements in transport markets



- IALA Guidelines for the transmission of SBAS corrections via marine radiobeacons and AIS stations' finalised with full consensus in IALA eNAV meeting, 18-21 Sep
- Pilot project for the use of EGNOS in AIS kicked off
- Fundamental elements project on Development of SBAS-enabled Shipborne Receivers under evaluation



- Following conclusion of ERSAT EAV H2020 project, **stakeholders show interest to carry the project results with E-GNSS virtual balise** forward from demonstration into operational phase
- UNIFE coordinated project STARS is finalising measurement campaign, supported by majority of European railway signalling stakeholders in order to evaluate European GNSS performances in rail environment

# Updates and recent achievements in high precision markets



- GEO visibility maps for EGNOS published online allowing high precision users to evaluate the EGNOS satellite visibility in their specific location
- CNH field demo of agriculture machinery illustrate EGNOS performances



- More than 70% of GIS-handset receivers are EGNOS compatible
- EUREF publicly acknowledged the EGNOS benefits to the surveying community
- Collaboration framework established with Madrid Region ('Comunidad de Madrid') to foster EGNOS for urban and land management

# Market and Technology monitoring support our integrated approach



Available for download on GSA website



The first edition of the **GNSS Technology Report** was issued on 2016 providing an in-depth analysis of 3 GNSS macrosegments:

- *Mass market solutions*
- *Transport safety and liability-critical solutions*
- *High precision, timing and asset management solutions*

Available for download on GSA website



> 12200 downloads

**GNSS Market Report 5** was released in 2017, main enhancements are:

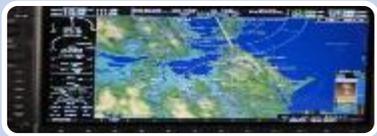
- *Expanded session on “macro trends”*
- *Addition of segment-specific “user perspectives”*
- *The E-GNSS added value per segment*



# EGNOS applications in aviation



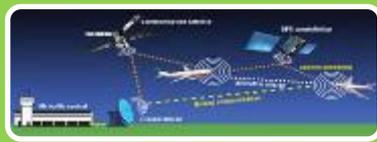
**Performance Based Navigation (PBN):** applications used when an aircraft follows a specific procedure or route within a prescribed error margin (e.g. airport approach).  
Different applications for fixed wing (e.g. LPV, SBAS Cat-I) and rotorcraft (PinS, SNI, RNP0.3)



**Navigation aid:** systems designed as additional aid to GA pilots flying according to (Visual Flight Rules). They are also used to alert when they get too close to restricted airspace



**Rotorcraft navigation:** focus on Helicopter Emergency Medical Services



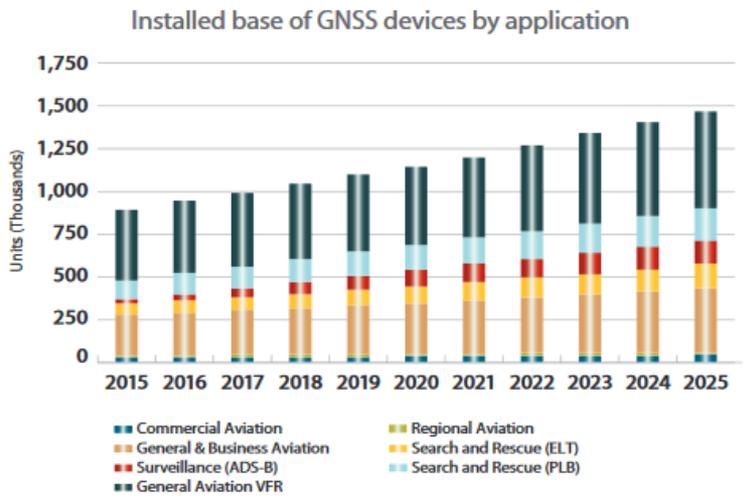
**Automatic Dependent Surveillance – Broadcast (ADS-B)**



**Unmanned Vehicles Systems:** growing market, demanding robust positioning and navigation



# EGNOS in Aviation



## Where we want to be by 2020:

- More than 500 EGNOS based procedures planned
- Growing number of retrofit solutions and equipped operators
- EGNOS/EGNSS as a key enabler for Communication, Navigation and Surveillance for all flight phases
- EGNOS as an enabler of robust UAV navigation

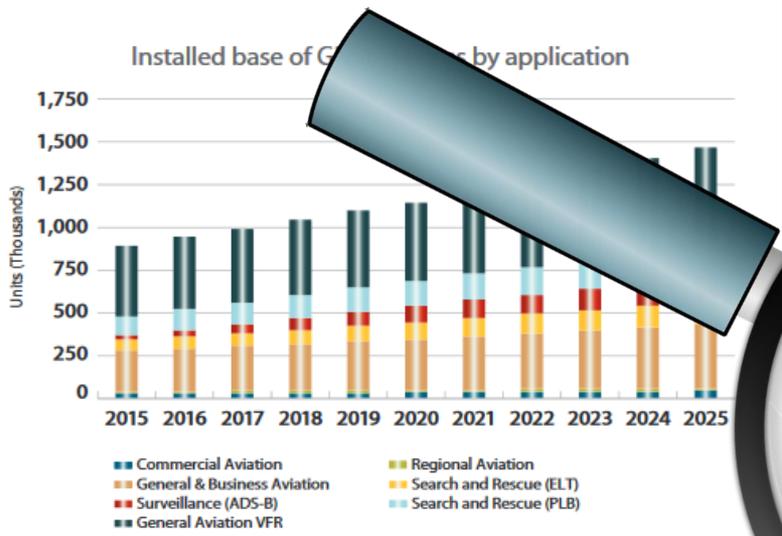
## How to get there:

- Promote benefits of EGNOS based approaches and other applications
- Funding for procedure/operators and other applications
- Feasibility studies, CBAs, technical assistance and new applications development and validation
- Partnership with user communities and user groups establishment
- Contribution to regulation (e.g. PBN in the EATMN, SPI IR, pilot training, non instrument runways)

**EGNOS reaching all European Instrument Airports by 2024**



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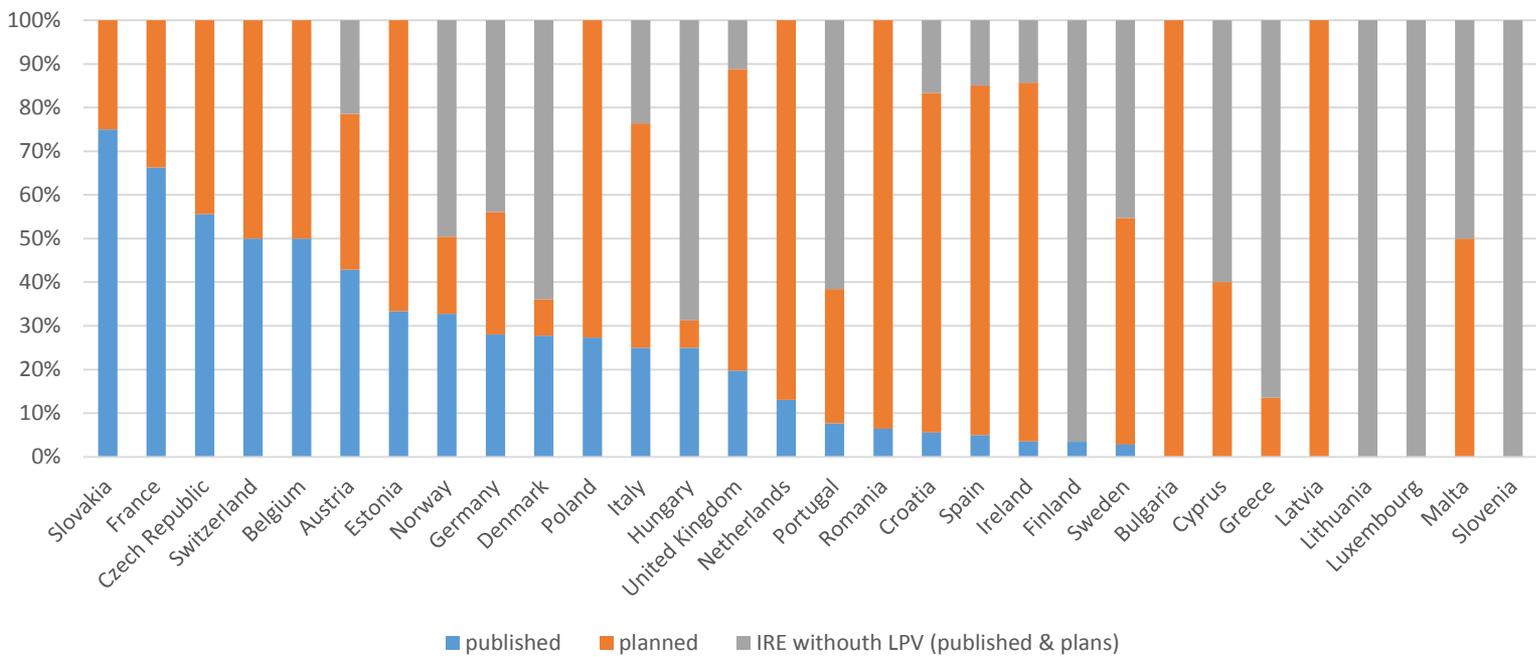
**EGNOS reaching all European Instrument Airports by 2024**



# Overall penetration based on operational LPV is 27% and plans foresee growth to 43% in 2020



LPV implementation as percentage of total number of IRE



**Penetration based on total operational procedures (LPV + Baro) is 33% and plans foresee growth to 50% by 2020**



# Staying close to stakeholders: Aviation



## Business Aviation (BA)

- BA is the Largest adopter and pioneer user of EGNOS
- 30 % of BA aircraft in EU are EGNOS capable
- EBAA-GSA LPV Working Group and MoU is providing user support to respond to needs, identify requirements and foster adoption

→ GSA awarded for its valuable support to the business aviation community



GSA award



## General Aviation (GA)

- GA is the main market in number of airframes, and user of smaller aerodromes
- >17% of EU GA aircraft are EGNOS capable
- GSA cooperates with AOPA and EASA to respond to GA user needs

→ GSA Proposal to develop guidelines for LPV Implementation to non-instrument runways in EASA General aviation safety committee accepted and welcome by General aviation stakeholders.

→ GA pilots acknowledge EGNOS benefits at GSA specific EGNOS workshops at the most important GA event, in cooperation with EASA, AOPA, PPL/IR



# EGNOS applications in maritime

**Recreational navigation:** GNSS systems are widely used across recreational vessels, both overseas and in high traffic areas

**Merchant Navigation:** commercial vessels transporting goods or passengers differentiating in SOLAS\* ("regulated" by IMO) and Non-SOLAS vessels

**Inland Waterways (IWW) Navigation:** GNSS is used to ensure safe navigation in rivers, canals, lakes and estuaries

**Search & Rescue (SAR):** Provision of aid to people in danger by means of dedicated beacons and transponders (e.g. AIS-SART)

**Fishing vessels:** GNSS enables to track fishing vessels position and to monitor the access to protected marine areas

**Inland Waterways (IWW) traffic info:** Provision of traffic information to IWW users

**Traffic management and surveillance:** Activities supported by GNSS-based systems including Automatic Identification System (AIS) and Long-Range Identification & Tracking (LRIT)

**Homeland Security:** GNSS supports border patrolling operations

**Ports:** GNSS helps monitoring the transit progress of cargos and supervising docking and loading operations

**Marine Engineering:** Construction activities in harbors and off-shore rely on GNSS (e.g. cable and pipeline laying)

NAVIGATION APPLICATIONS

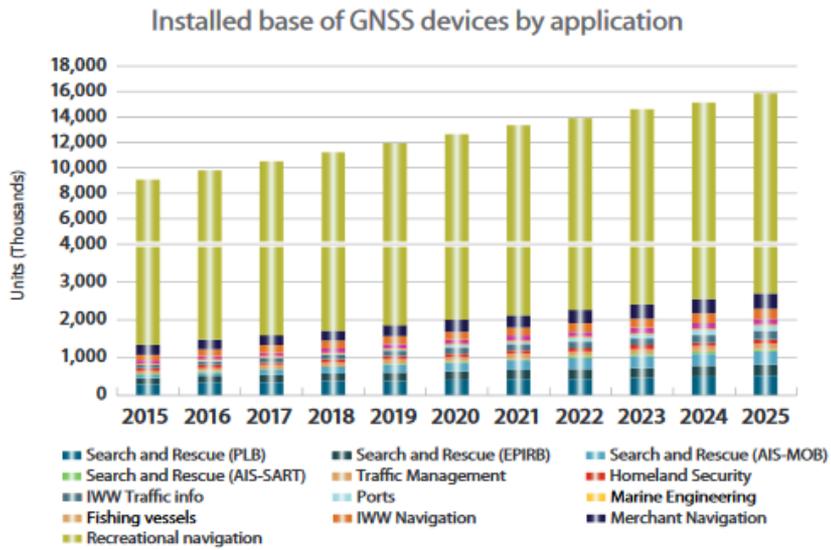
Including Autonomous vessels

POSITIONING APPLICATIONS

(\*) All passenger and cargo ships larger than 500 gross tonnage (300 tons for international voyages) fall into this category  
AIS-SART = Search and Rescue Transponder, SOLAS = Safety of Life at Sea



# EGNOS in Maritime



## Where we want to be:

EGNOS adopted by maritime users for safety-related applications.

By 2020: EGNOS complementing DGNSS infrastructure providing integrity information for inland and coastal waters.

## How to get there:

- EMRF WG: Service provision aspects
- IALA PNT WG: Guidelines for the transmission of EGNOS corrections via IALA beacons and AIS
- Pilot project for transmission of EGNOS corrections via IALA beacons/AIS with National Maritime authorities
- RTCM SBAS WG: Guidelines for SBAS shipborne receivers

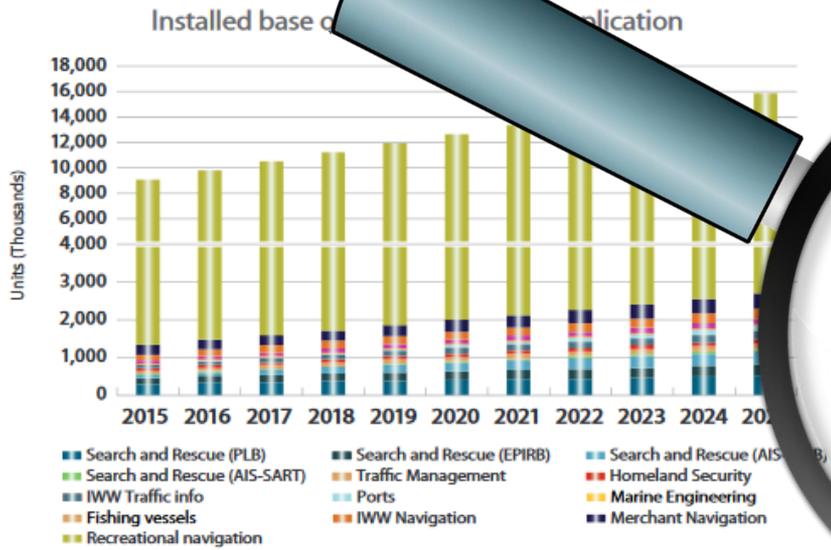
**Ca. 80% of GNSS receivers models are EGNOS enabled**



# EGNOS in Maritime



Join us on 5-6 October!



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- EMRF WG: Service provision aspects
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# Maritime achievements



## EGNOS as part of WWRNS:

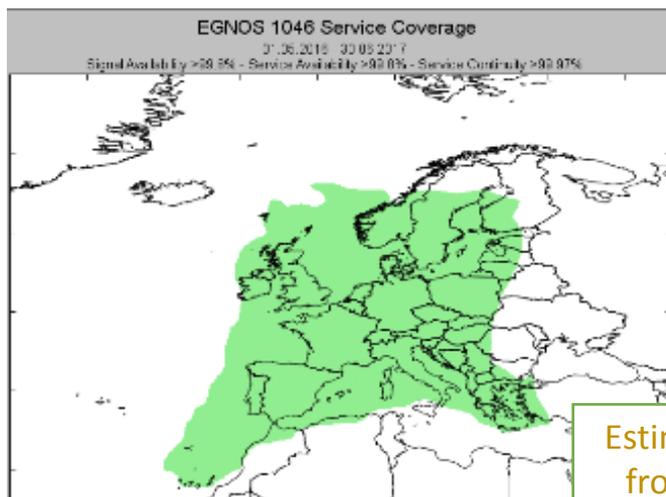
- IMO declared that formal recognition is not needed since GPS and Galileo are already part of WWRNS

## Use of EGNOS from IALA beacons and AIS stations:

- IALA Guidelines for the transmission of SBAS corrections over IALA beacons and AIS stations finalized and submitted for approval to IALA Council
- Pilot project for the pioneer implementation of EGNOS in IALA beacon and AIS stations accepted as IALA testbed

## Use of EGNOS from SIS:

- SBAS Guidelines for shipborne receivers including tests specifications acknowledged by manufacturers and maritime authorities at RTCM
- EGNOS preliminary performance analysis compliant with requirements from IMO Resolution A.1046. (Green area is fully compliant for navigation)



Estimated Service Coverage  
from May '16 to June '17

**Leading to 2020:**  
80% of maritime receiver models EGNOS-enabled



# EGNOS applications in Rail



**Asset Management** includes several functions such as fleet management, needs-based maintenance, infrastructure charges and **intermodal logistics**. GNSS is increasingly seen as a standard source of positioning and timing information in these systems

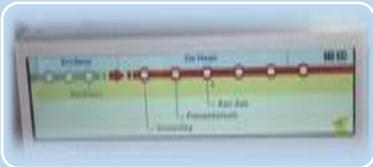
## Signalling and train control applications:



- **Low Density Line Command & Control Systems** will provide full signaling capabilities supported by GNSS on lines with small to medium traffic. These lines are usually located in rural areas, where cost savings can be vital for the viability of a service



- **Main Line Command & Control Systems** assist train command and control on main lines, referring primarily to the European Train Control System (ETCS) in Europe and some regions in the rest of the world, as well as Positive Train Control (PTC) in North America. GNSS can also be a source of additional input, e.g. for enhanced odometry in ETCS



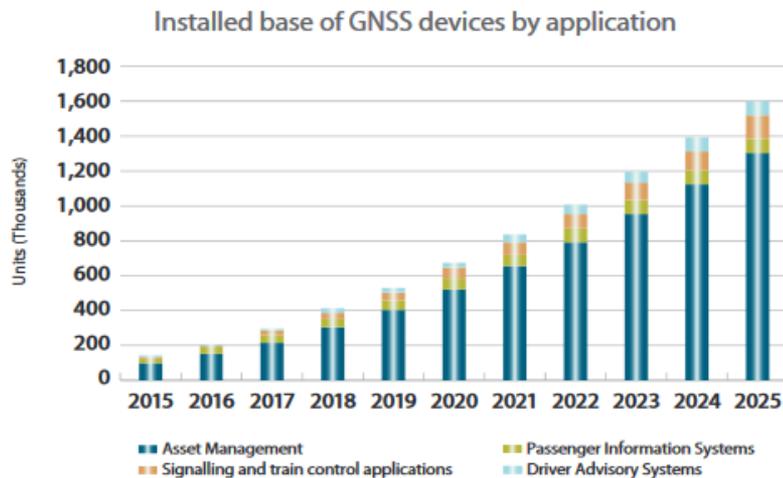
**Passenger Information systems** on-board trains show the real-time location of a train along its route. The GNSS location of a train is also supporting online passenger information platform and services



**Driver Advisory Systems** provide additional information to the train driver based on accurate position acquired through GNSS fused with other track reference data and operational characteristics to enable energy efficient driving



# EGNOS in Rail



## Where we want to be:

- EGNSS adopted as one of the key elements of the train command and control solutions enabling safe and efficient operations of low density lines
- EGNSS adopted within evolutions of ERTMS for main lines

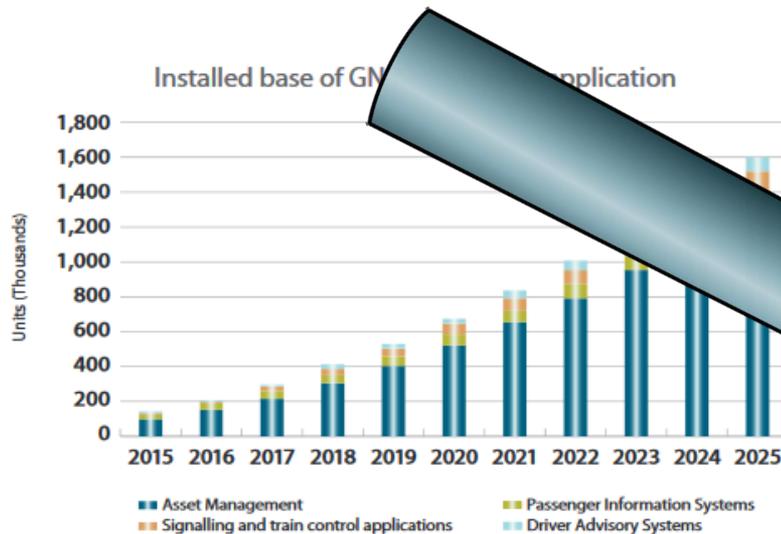
## How to get there:

- Support UNISIG in their effort to define industry requirements
- Coordinate relevant R&D activities together with key funding and standardization bodies (EC, ERA, ESA, ESSP, UNIFE, UNISIG and Shift2Rail)
- Cooperate with railway associations and EC to foster the role of EGNSS in the evolutions of ERTMS standard and in the standardization and certification of EGNSS receivers

**GSA is leading development of signalling and train control solutions based on GNSS together with key partners with the key objective to include E-GNSS into ERTMS**



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# Rail: the accent will stay on safety relevant applications



## How to get there

- Work with key stakeholders **within the agreed roadmap for E-GNSS adoption within ERTMS:**
  - to define requirements on E-GNSS receivers in the challenging railway environment
  - to support the design of train positioning system architecture, leveraging work with UNIFE and Shift2Rail
  - To cooperate with EC and associations to **foster the role of E-GNSS in the evolutions of ERTMS**
- Support the EC in the **certification of E-GNSS receivers** as a component of the **train positioning subsystem**: a study was launched in Jan 2016
- Support the definition of service provisioning scheme for rail safety relevant applications
- **Support the establishment of E-GNSS enabled asset and cargo tracking** solutions for positioning of rail as a key player in the future European multimodal transport



# EGNOS applications in Road



**In-Vehicle-Systems** are car embedded platforms that deliver entertainment, infotainment & personal navigation applications



**Personal Navigation Devices** are portable stand alone devices specifically designed to run road navigation applications



**Insurance Telematics** are solutions enabling a new category of car insurance with costs depending upon the time, location, distance, etc



**Fleet Management Systems** uses GNSS to locate fleet of vehicles to optimize resource management, reduce travel time and increase security



**eCall** sends an automatic emergency call to 112 in case of an accident, to accelerate emergency assistance to drivers (in EU from 2018)



**Road User Charging (RUC)** applications support the toll collection based on the actual use of the roads and the management of congestion



**Smart Tachograph** leverages on GNSS to support road enforcers to control the driving and resting periods in commercial vehicles (in EU from 2019)



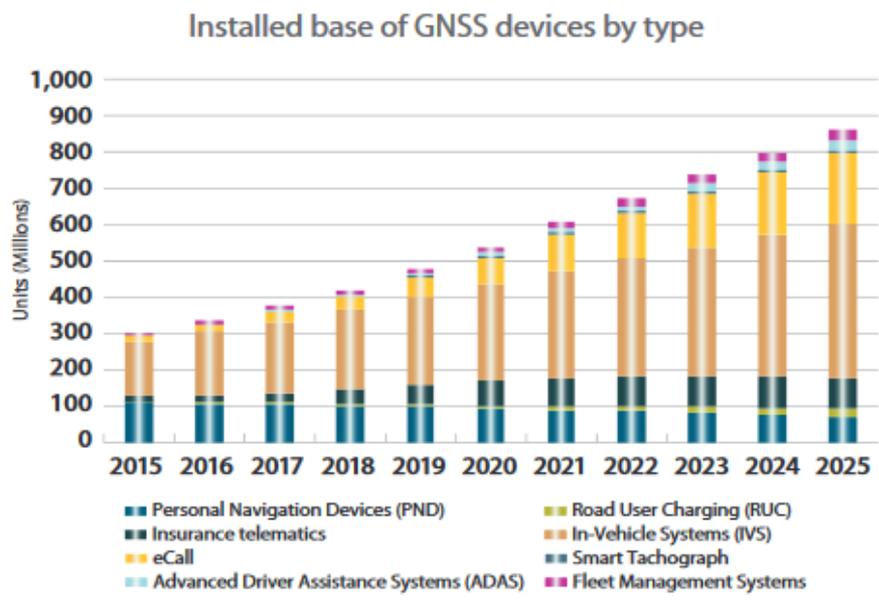
**Hazardous goods tracking devices** are aimed to provide the robust location of a cargo transporting dangerous products, waste or livestock



**Advanced Driver Assistance Systems** are aimed at automating driving tasks mainly to improve road safety and driving experience



# EGNOS in Road



## Where we want to be by 2020:

- EGNOS enabled in every new passenger car model and commercial trucks in Europe:
  - 40 Millions cars and vans
  - 2 Millions heavy trucks

## How to get there:

- Leveraging the benefits of **EGNOS in the EETS regulation review**
- Promote and facilitate **EGNOS testing as of the eCall and Smart Tachograph regulations**
- Strengthen the **cooperation/R&D** with car makers, OEM, Tier 1 suppliers, decision/ standard makers.

**By 2020 ca 100% of GNSS Road Tolling for trucks will be EGNOS ready**



# EGNOS applications in Agriculture



## Precision agriculture:

- Farm machinery guidance
- Variable rate application
- Yield monitoring
- Biomass monitoring
- Soil condition monitoring
- Livestock tracking and virtual fencing
- Forest management

## Agri-logistic applications:

- Farm machinery monitoring and asset management
- Geo-traceability
- Field delineation

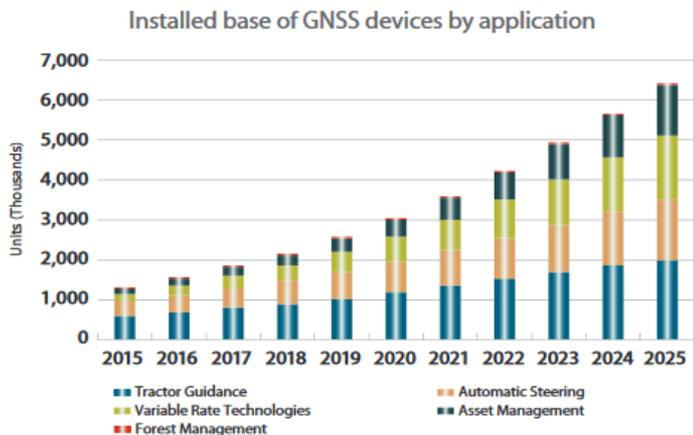


- **Affordable solution** for precision agriculture
- Enables farmers to **optimise yields, increase labour productivity and reduce driver fatigue** – all with minimal investment
- Supports **machinery guidance** solutions with sub-metre level accuracy, which is suitable for basic-value crop cultivation (e.g. cereals)
- Enables more **efficient management** of farming activities such as **spreading, spraying and harvesting**

**Almost 80% of European GNSS enabled tractors are using EGNOS**



# EGNOS in Agriculture



**Where we want to be by 2020:** EGNOS preferred entry technology for precision agriculture in Europe, Africa and Middle East

## Getting there leveraging EGNOS Benefits:

- Enhance precision without expensive investments
- Eliminate waste and over-application of fertilisers/herbicides
- Save time and reduce fatigue
- Extend equipment lifetime by optimising its use, optimise crop yields and increase profit margins

## Ongoing actions:

- Communicating EGNOS benefits to farming community - User Fora
- Close cooperation with machine manufacturer to promote EGNOS
- GSA prize Farming by Satellite for Young Farmers
- Identification of opportunities within the new Common Agricultural Policy
- Build on H2020 R&D activities



# EGNOS applications in Mapping & Surveying



**Cadastral:** GNSS is used to establish property boundaries in relation to fiscal policies (e.g. land taxation)



## Construction:

- **Machine control:** GNSS is used to automate construction activities (e.g. control the blades and buckets of construction equipment using 3D digital design)
- **Person based:** GNSS enables many positioning related-tasks, e.g.: on-spot surveys, checking levels, performing as-built checks and staking out reference points or markers



**Mapping:** GNSS is needed to define specific location points of interest for cartographic, environmental, asset management and urban planning purposes



**Mining:** Measurements and calculations at each stage of the mine exploitation are made with GNSS, including a safety check



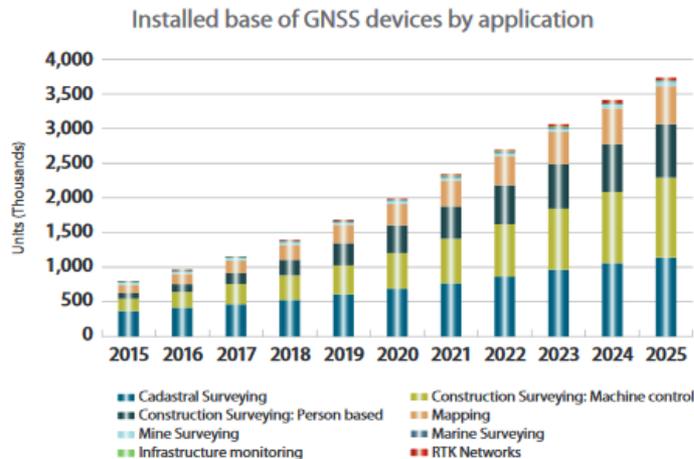
**Infrastructure monitoring:** GNSS supports monitoring of infrastructures such as bridges, high-rises, open-pit mines, off-shore rigs to reveal status of the system and features indicating damages and support public authorities and spatial planners to design smarter cities and new urban corridors



**Marine Surveying:** GNSS is used in marine environmental and construction activities (e.g. seabed exploration, tide estimation, offshore surveying, etc.)



# EGNOS in Surveying/Mapping



**Where we want to be by 2020:** EGNOS preferred entry technology for mapping and GIS in Europe, Africa and Middle East

## Getting there by leveraging EGNOS Benefits:

- An effective option for a wide range of mapping applications where both metre accuracy and real-time positioning is adequate
- It's free and does not require any installation of hardware nor investment in ground infrastructure nor ongoing subscriptions
- Most new GNSS devices are EGNOS-enabled
- Covers the majority of Europe, with no white spots

## Ongoing actions:

- Leveraging surveying associations (e.g. CLGE) to identify user needs for further take up
- Sharing EGNOS benefits with surveying community
- Closer cooperation with GIS industry
- GSA prize for Young Surveyors
- Build on H2020 R&D activities

**87% of GNSS receivers are EGNOS enabled**

# GSA tangibly supports EU players in reaping the market opportunities



Horizon 2020 aims to foster adoption of Galileo and EGNOS mostly via content and application development.

It supports the integration of services into devices and their commercialisation

Around **100 €mln** budget in first 3 calls



Fundamental Elements

Fundamental Elements projects focus on fostering the development of innovative Galileo- and EGNOS-enabled receivers, antennas and chipsets technologies.

It aims to realize products that address user needs in priority market segments

**€100 M budget**

# Linking space to user needs



Get in touch:



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



[EGNOS-portal.eu](http://EGNOS-portal.eu)



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