Europe's Satellite Navigation Programmes

GALILEO and EGNOS

European GNSS Supervisory Authority

A bold European vision

Europe is building a state-of-the-art Global Navigation Satellite System (GNSS) to provide accurate and guaranteed positioning for all types of civilian applications: including car navigators, mobile phones, maritime, road, rail and air transport. Modern and efficient GALILEO satellite infrastructure will enhance Europe's technological independence and keep it at the centre of a commercial revolution based on positioning products and services, a revolution now expected to create many new jobs in Europe by 2020.

Satellite positioning as become essential to socio-economic prosperity, and GNSS already forms the backbone of a growing multi-billion-euro industry. The improved accuracy and reliability of GALILEO, with its guaranteed and tailored-made services, will provide unparalleled service quality in global satellite navigation, positioning and timing.

What is GALILEO?

In space, GALILEO will consist of 30 orbiting satellites which will provide positioning information with unprecedented accuracy and reliability. The satellites will be operated and monitored from various locations on Earth to ensure their proper functioning.

The GALILEO configuration will deliver continuous coverage of the whole Earth, with any given point covered by between six and eight satellites at any time. This means full and highly accurate positioning data for the entire planet , including high-rise cities where buildings can obstruct signals. GALILEO will be compatible with both the American GPS and Russian GLONASS systems. Compatibility with other GNSS is an important goal for Europe, including new systems being developed by the People's Republic of China. In addition, GALILEO will also be interoperable with GPS. The EGNOS system is a first step on the way to GALILEO quality, and is already up and running and available all over Europe and the Mediterranean area. EGNOS is now providing all GPS applications with improved accuracy and a better level of service in safety-critical applications.

Why GALILEO?

GALILEO will enable Europe to fully exploit the multiple benefits of satellite navigation, with exciting new business opportunities for equipment manufacturers and application developers.

GALILEO is a key part of Europe's ambition to be the most competitive and dynamic knowledge-based economy by 2010. It will stimulate European industry, enhance technological independence and improve the accuracy of GNSS for users worldwide.

GALILEO, and its existing precursor EGNOS, will make possible a virtually limitless range of liability-critical services, applications and business opportunities under independent European control.

Continuous coverage of the planet

European technology

Based on strong experience in the space industry, Europe has demonstrated its scientific and technical capabilities with the EGNOS system. With first-class European companies in key technology areas, Europe is a major player in satellite navigation infrastructure and application sectors.

Improved performance

GALILEO will radically improve the performance of existing satellite navigation systems. An effective positioning service is currently only available in 50% of large cities, due to the 'urban canyon' effect where buildings impede reception of satellite signals. GALILEO satellites will increase this to 95%, and will improve indoor satellite positioning capability.

GALILEO signals will be more robust against interference and errors caused by signal reflections from surfaces such as buildings. For professional users, a third civilian frequency will enable even greater accuracy.

The integrity concept, already present in EGNOS, will enable GALILEO to support liability-critical applications around the globe. GALILEO will also support strategic applications with a dedicated signal that is characterised by its robustness (resistance to jamming and spoofing) and its availability in crisis situations.

But perhaps the main innovation from GALILEO will be its guarantee of a specified level of quality for its high-end services.

Opportunities for SMEs

SMEs represent 99% of business in Europe and employ two-thirds of the workforce. Research in satellite navigation has attracted many SMEs and the application market offers high potential for growth. European SMEs are also entering the receiver and chipset market traditionally dominated by large companies. GALILEO

Powering a new commercial boom

European industry

Satellite navigation affects many economic sectors and has seen exponential growth during the past decade. The worldwide annual market for positioning services and equipment climbed from €1 bn in 2000 to €20 bn in 2005. Recently, the market has started to accelerate. For example, over 20 million personal navigation devices were sold in 2007 – a fivefold increase over 2005.

GALILEO and EGNOS are already stimulating European companies to develop skills, services and markets in satellite navigation technologies. By 2025, the market in Europe is predicted to reach €135 bn and support many new jobs. The world's biggest market will be in the Far East, with hundreds of millions of receivers to be sold on the mass market. The European application industry, already present in the Far East in many areas, will be able to increase market share, exploiting the new opportunities offered by GALILEO.

GALILEO services

- The free **Open Service (OS)** is aimed at the mass market with positioning accurate to within a metre for vehicle navigation and location services on mobile phones.
- The encrypted **Commercial Service (CS**) offers accuracy at the centimetre scale for specialised applications. It will be available to users who will be charged a fee for guaranteed service.
- The **Safety of Life Service (SoL)** will automatically inform users within seconds of a failure of any satellite or similar problem affecting the performance. This will make it suitable for applications where safety is crucial, such as running trains, guiding cars, ships and aircraft.
- The **Public Regulated Service (PRS)** for government users will be encrypted and is designed to be more robust with anti-jamming mechanisms and reliable problem detection. This service will be used for security, law enforcement as well as for strategic infrastructure (e.g. energy, telecoms, finance).
- The global GALILEO **Search and Rescue Service (SAR)** will aid the transfer of distress signals to a Rescue Coordination Centre. Users will receive a signal advising that help is on the way.

A range of services under independent European control

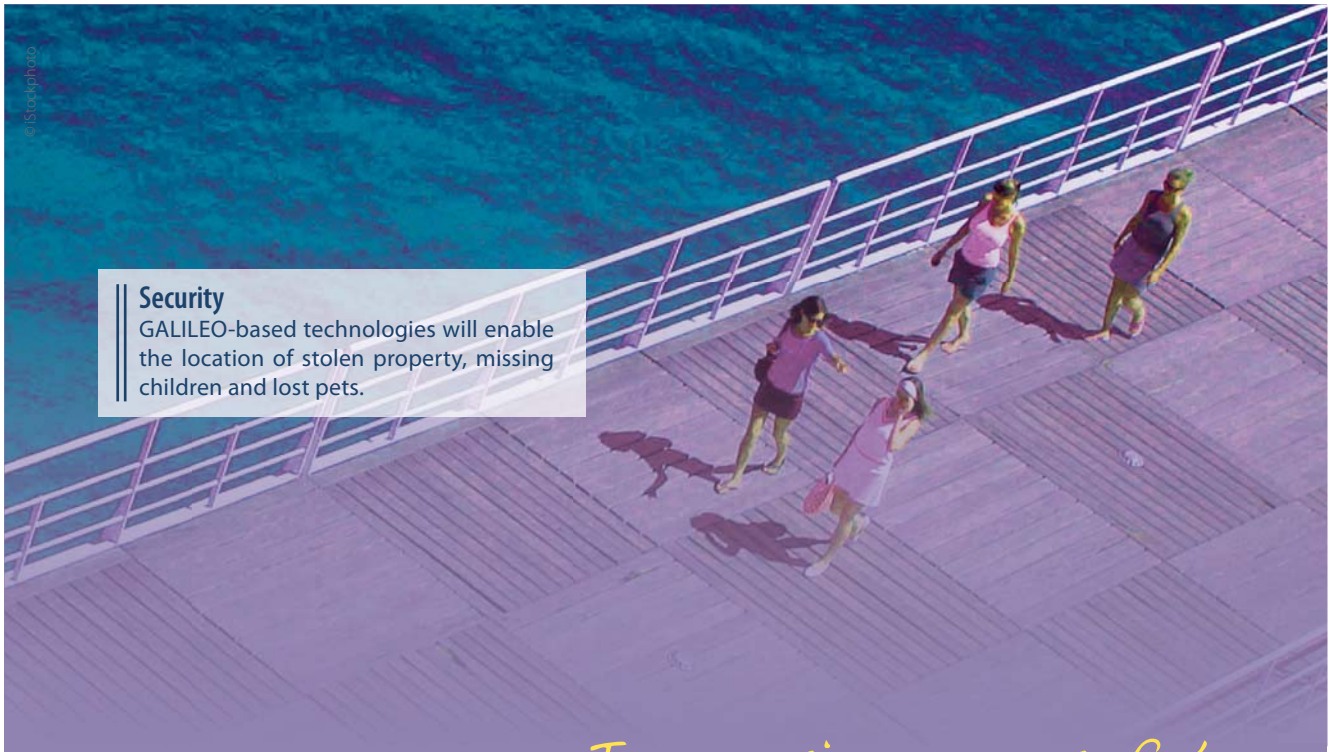
GALILEO applications

Application developers, manufacturers and public authorities are urged to prepare now for the multiple opportunities presented by the quality and reliability of GALILEO signals. The opportunities are limited only by the imaginations of innovators, entrepreneurs and service providers.

Location-based services

Navigation technologies in consumer devices such as mobile phones are enabling a massive boom in location-based services, with new commercial opportunities based on the ability of users to identify their precise location relative to services, amenities and other people.

Exciting business opportunities for developers and manufacturers



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Security

GALILEO-based technologies will enable the location of stolen property, missing children and lost pets.

Increasing our safety and security

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Civil protection

GALILEO will help in the coordination of rescue efforts and communication during natural disasters such as forest fires, earthquakes and floods.

EGNOS

Transport

GALILEO will make transport safer and more efficient by road, rail, sea or air. It will offer new services for people or goods on the move, for instance the monitoring of passenger transport in coaches or of dangerous goods, real-time information on transport conditions and driver assistance.

Energy

More accurate and reliable location and timing information will aid in the distribution of electricity, and in the discovery and exploitation of new oil and gas reserves.

www.gsa.europa.eu

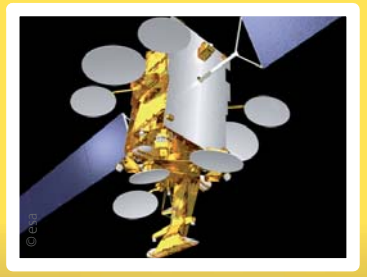
GALILEO

Social and economic benefits

Finance, banking, insurance

Security, data integrity, authenticity and confidentiality in the financial sector all depend on the ultra accurate time stamps enabled by a state-of-the-art satellite navigation system.

EGNOS

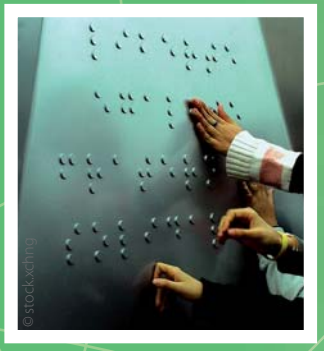


Telecommunications

Advanced satellite navigation systems will help synchronise telecommunication networks, increasing their efficiency and capacity. The integration of location services with mobile phones will enable a huge range of new consumer applications.

Civil engineering

Accuracy and reliability are essential to civil engineering. Combined with digital mapping, GALILEO represents a powerful tool for reducing costs and increasing productivity while maintaining the highest construction standards, from the planning of structures to the maintenance and surveillance of existing infrastructure.



People with disabilities

GALILEO will speed up the introduction of practical and affordable technology solutions for disabled people, from maps for the blind to route planning for people in wheelchairs.

Precision agriculture

The integration of GALILEO with other technologies means the agriculture community can improve distribution and dilution of chemicals, better manage land and improve yields with the targeted application of nutrients.

Fisheries

Better navigation aids for fishermen and more effective exchange of information between vessels will enable better management of fish stocks. The Safety of Life service will mean more lives saved when fishing accidents occur.

Environment

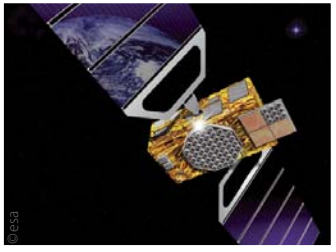
GALILEO services will be used to track pollutants, dangerous goods and icebergs, and to study tides, currents and sea levels. They will be used to monitor the atmosphere, forecast the weather and to predict climatic changes.

GALILEO and EGNOS: for people and policies

GALILEO

Time reference

The scientific community will benefit from high-accuracy GALILEO time signals, allowing close adherence to international time standards and calibration of atomic clocks. Accurate time will also improve efficiency in applications such as telecommunications, electronic banking, e-commerce and stock transactions.



Future services

While many GALILEO applications have been identified, based partly on the experience of GPS-based services, the increased accuracy and reliability of signals will open up unlimited opportunities for new products and services.

Increasing satellite navigation reliability and accuracy

International co-operation

Countries around the world have shown interest in GALILEO. Co-operation agreements have already been signed with China, Israel, Ukraine, South Korea and Morocco, while talks have advanced with others, including India, Russia and Argentina. Regional co-operation projects are under way, for example in Northern Africa.

A landmark agreement in 2004 paved the way for the compatibility and joint use of GALILEO and GPS. Among other things, the US and EU authorities adopted at that time a common standard for their respective mass market services (GALILEO Open Service and GPS Standard Positioning Service) making it simple for manufacturers to build equipment capable of receiving both GALILEO and GPS signals. To users ranging from taxi drivers and geodesists to ferryboat captains, this means greater safety, reliability and availability through the doubling of available satellites.

The development of European satellite navigation projects involves frequent and close co-operation with important global organisations like the United Nations' International Telecommunication Union, the International Maritime Organisation and the International Civil Aviation Organisation. The European Community is also a founding member of the International GNSS Committee set up under the auspices of the UN Office for Outer Space Affairs.

Bringing Europe and the world closer together

Search and rescue

GALILEO will increase by tenfold the performance of the existing international search-and-rescue system for vessels in danger at sea. Ideas for an improved GALILEO search-and-rescue functionality have already been adopted by other satellite navigation systems.

European Space Policy

GALILEO enables Europe to harness the social and economic benefits of its competence in space science and infrastructure. It will ensure the European Space Agency maintains its leading position in space technology and deploys its knowledge for applications in transport, agriculture, environmental protection and social services.

What is EGNOS?

The European Geostationary Navigation Overlay Service (EGNOS) is the first step towards independent satellite navigation in Europe. It was developed to increase satellite navigation reliability and accuracy by complementing the American GPS system. EGNOS makes existing satellite navigation services suitable for safety-critical applications such as flying and landing aircraft or navigating ships through narrow channels.

EGNOS entered into pre-operational service in 2006, will be fully operational in 2008 and is undergoing certification for safety-of-life applications which is expected by 2009.

EGNOS is operational now

Why EGNOS?

EGNOS will allow European businesses, service providers and users to benefit from improved GNSS services even before GALILEO is built. It is a stepping stone which allows more European users to become part of the GNSS market.

How can EGNOS be used?

EGNOS will bring unprecedented accuracy and reliability to existing satellite navigation services, including a failure signal that allows development of completely new safety-critical applications. EGNOS-enabled receivers are already available on the market.

Aviation

EGNOS supports aircraft navigation and landing. It will help air traffic control cope with increased traffic, improve safety and reduce ground infrastructure. It will enable new landing procedures that will increase runway capacity and enhance fuel efficiency. It will allow the more efficient use of airports with limited ground-based installations. EGNOS will be the initial backbone of the European Air Traffic Management system (SESAR) before GALILEO becomes operational.

Maritime

EGNOS will improve marine navigation in everything from fisheries to oil and gas exploration and will enable more efficient multimodal transport.

Safety and security

The unique integrity guarantee provided by EGNOS and GALILEO will play a major role in revolutionising security and safety in a wide range of situations and applications.

Land transportation

EGNOS will enable better management of European road and rail transport, with increased safety capacity.

Time standard

EGNOS will broadcast a reliable time standard with unprecedented accuracy to computer and tele–communication networks around the world.

EDAS

The EGNOS Data Access Server will make EGNOS data directly accessible for use in the high-precision differential GNSS industry serving sectors such as oil and gas, surveying, mining and construction.

A crucial stepping stone

A better life for people across the globe

New horizons

Europe is maintaining its leading role in space and pioneering the development of modern satellite navigation systems under civilian control. As such, Europe is politically committed to GALILEO, and through EGNOS has already demonstrated its scientific and technological abilities in GNSS.

GALILEO will deliver the world's more accurate and reliable positioning services that will play a positive role in the European economy through the creation of jobs and new services for business and personal use.

In co-operation with other global systems, GALILEO will make satellite positioning a commodity which underpins applications in every sphere of life – from the economy and the environment, to security and improving the quality of life for people across the globe.

Europe's vision is becoming a reality.

European Commission

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