



ESTB NEWS

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Contents

- **New Safety Standards in the Aegean Sea**
- **EGNOS Explained**
- **ESTB Helpdesk**
- **Italian Navy Trials EGNOS**
- **Fiat Trials EGNOS at the ITS2000 Conference**
- **Frequently Asked Questions**
- **Further Information Resources**

Gauthier Welcomes ESTB News



It is with great pleasure that we present to you this first edition of ESTB News. It is aimed at all potential future EGNOS users, as well as anyone else with an interest in state-of-the-art satellite navigation. In ESTB News, you will find the latest information and results from trials performed via the EGNOS System Test Bed (ESTB), the EGNOS prototype operational since February 2000. These tests demonstrate the remarkable performance offered by Satellite Based Augmentation Systems such as EGNOS, for the future benefit of a wide range of applications such as: personal, cars, trains, ships and aircraft navigation and positioning determination. Web links and/or relevant points of contact throughout this letter will acquaint the reader with news and events of relevance to EGNOS/ESTB System. These contacts, such as the ESTB Help Desk, can provide a first level of support in planning and setting up experimental applications using the available EGNOS Test signal. We hope you will find ESTB News useful and informative.

Laurent Gauthier, ESA EGNOS Project Manager

EGNOS Brings New Safety Standards to the Aegean Sea

EGNOS trials in the Aegean Sea demonstrate potential safety benefits, and stimulate interest from Greek government ministries.

Ktimatologio and ESA conducted an EGNOS trial on the "Blue Star Aegean" in March 2001 in the framework of the European Commission's GALA project.

The aim of the trials was to identify and demonstrate an accuracy and integrity performance equivalent to that expected from the future Galileo system. However, EGNOS has the potential to bring significant benefits to maritime users in terms of safety in an area that currently lacks the marine radiobeacon differential GPS systems available in other parts of Europe. *Continued on Page 2*

EGNOS Explained

The European Geostationary Navigation Overlay Service - EGNOS - is being developed to provide regional satellite-based augmentation services to aviation, maritime and land users in Europe.

The European Space Agency, together with both the European Commission and Eurocontrol, is currently implementing EGNOS - the European contribution to the first phase of the Global Navigation Satellite System (GNSS-1). EGNOS augments GPS and GLONASS, providing and guaranteeing the availability of navigation signals for aeronautical, maritime and land mobile trans-European network applications. It will become operational at the start of 2004. *Continued on Page 3*

The European Commission Grants €5M Support to the ESTB

The European Commission recently approved a €5M grant for the EGNOS System Test Bed. This grant will be used to support a number of application demonstrations. It will also secure the operations of the Test Bed beyond the end of this year and will enable its technical consolidation. Moreover, it will support the ESTB Help Desk operations, and to a certain extent, funding will also be available for the extension of the Test Bed operations beyond the European area. Thanks to this grant the ESTB

will anticipate the true performance of EGNOS. The ESTB signal will become available for 24hrs every day later this year, and there are now concrete prospects for the ESTB to continue seamlessly to the start of EGNOS operations, due in early 2004.

ESTB Helpdesk Opens for Business

ESA has set up an ESTB helpdesk to provide system information and to advise potential users on how to exploit the ESTB.

ESA has set-up the ESTB Helpdesk to support its ESTB service. This e-mail service is available for all current or future ESTB users as well as anyone else with an interest in state-of-the-art satellite navigation. The helpdesk will respond to questions on the ESTB architecture and performance, EGNOS receivers, ESTB Signal in Space (SIS) status

and ESTB evolutions. The helpdesk will also advise users how to exploit the ESTB for their specific application or service developments.

The helpdesk address is ESTB@esa.int



Italian Navy Trials EGNOS

The Istituto Idrografico della Marina and ESA trialled EGNOS as a cost-effective alternative to commercial and local area differential services.

The Istituto Idrografico della Marina (IIM) and ESA conducted the first EGNOS maritime trials in Genoa using signals from the EGNOS System Test Bed (ESTB) in February 2000. The IIM is, among other tasks, responsible for hydrographic surveying in the waters under Italian responsibility as well as investigating navigation systems for the Italian Navy. It is interested in EGNOS as a cost-effective alternative to local area differential and commercial services.

Its ship, MIRTO, was equipped with four different satellite systems: Natural GPS (NGPS), Local Area Differential GPS (LAD), EGNOS, and Long Range Kinematic GPS (LRK).

EGNOS met the requirements for coastal and precision navigation, port entrance and exit operations, and the use of electronic navigation support. It also offers attractive benefits for hydrographic operations.



MIRTO, equipped with the EGNOS system

EGNOS met the hydrographic and maritime requirements during the trials for the following operations:

- hydrography;
- coastal and precision navigation;
- port entrance and exit operations; and
- use of electronic navigation support (ENC).

EGNOS offers the following attractive benefits for hydrographic operations:

- EGNOS is accurate enough for ordinary hydrographic surveys (i.e. excluding harbours, berthing areas and associated channels with minimum under-keel clearances);
- EGNOS versatility and performance (suitable for Order 1 large scale surveys) means that hydrographers do not need to establish geodetic points on land, thus minimising the logistic support required; and
- the use of geostationary satellites for broadcasting the EGNOS corrections overcomes the range limitations of the VHF or UHF communications links used by many DGPS and LRK systems.

EGNOS demonstrated its suitability for both coastal navigation and coastal approach operations. The availability of EGNOS receivers at similar prices to current GPS receivers will encourage its acceptance as an alternative positioning system in the Mediterranean Sea.

EGNOS Brings New Safety Standards to the Aegean Sea ...*(continued from front cover)*

The trial took place on one of the ship's normal voyages, starting at Piraeus (Athens' main port) with visits to Syros, Paros, Naxos, Ios and Thera (Santorini). These trials used the ESTB signal (with the Mediterranean Test Bed stations connected to the ESTB for the first time) in a number of different navigation modes: open sea, coastal approach and port entrance.



The course of the ship's voyage

This high profile trial stimulated significant interest from a number of Greek government departments as well as the Greek Navy. Detailed results are expected shortly.

Fiat Trials EGNOS at the ITS2000 Conference in Turin

The Centro Ricerche Fiat and ESA trialled EGNOS to coincide with the ITS2000 conference in Turin.

ESA and the Centro Ricerche Fiat (CRF) performed the first EGNOS land-mobile trials to coincide with the Intelligent Transport Systems conference in Turin in November 2000. The trials were carried out at the Fiat Safety Centre near to Turin. An EGNOS receiver was installed in a car and linked to a PC running digital mapping software. The car drove around the test track, capturing data. An accuracy of 1-3 metres was achieved and accuracy plots from the ESA project office in Toulouse indicated the relative consistency of EGNOS compared with GPS, even with Selective Availability de-activated.

EGNOS is a cost-effective enabling technology in the ITS sector, and brings aviation quality performance and safety to the motor car.

EGNOS can make an important contribution towards many of the key



areas for progress identified during the conference:

- A minimum common functionality template;
- Interoperable electronic fee collection;
- Adoption of best practices from other main modes of travel; and
- The development of a safety policy framework within which applications can be developed, tested and brought to the market.

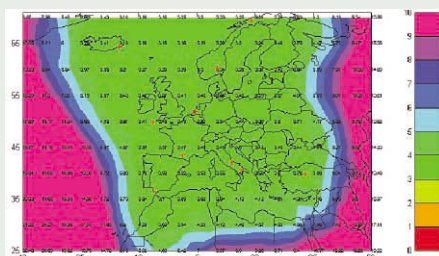
EGNOS is a strong contender in any market based on accuracy/Euro, and is highly desirable in a market where integrity/quality will become an important differentiator. Including EGNOS functionality enhances performance with little or no cost impact.

EGNOS Explained ...*(continued from front cover)*

EGNOS users will benefit from improved performance, removing the need for local-area differential and commercial services in many cases.

EGNOS has been designed to meet the demanding performance requirements for landing aircraft:

- Accuracy is improved to about 5 metres vertical and 2 metres horizontal through the broadcast of wide-area differential (WAD) corrections;
- Integrity (safety) is improved both through the high degree of redundancy in the system and by alerting users within 6 seconds if something goes wrong with EGNOS, GPS or GLONASS; and
- Availability is improved by broadcasting GPS look-alike signals from three geostationary satellites.



ESTB 95% Horizontal Accuracy

EGNOS provides a European-wide, standardised and quality-assured positioning system suitable for a diverse range of applications. It is highly compatible with GPS, so a single antenna and receiver can process both the GPS and EGNOS signals eliminating the need for a separate radio to receive differential corrections. This will allow many users to dispense with their current local-area differential or commercial services.

The EGNOS architecture is highly redundant, generating wide-area differential corrections and alerting users within six seconds if something goes wrong.

Thirty-four Reference and Integrity Monitoring Stations (RIMS) are deployed to monitor the satellite constellation satellites. Each satellite has to be monitored by multiple RIMS before correction and integrity messages are generated. Four Mission Control Centres (MCC) process data from these RIMS to generate the WAD corrections and integrity messages for each satellite. Only one of these MCCs is active and operational, the other MCCs are hot spares that can be activated if a problem occurs.

Navigation Land Earth Stations (NLES) upload the corrections and integrity messages to the satellites, for onward broadcast to the users. The system will deploy two NLESs (one primary and one backup) for each of the three geostationary satellites, and a further NLES for test and validation purposes.

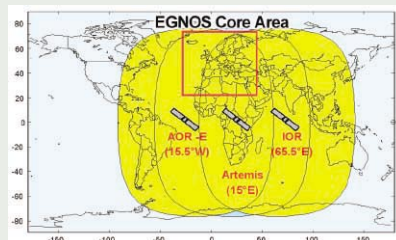
The EGNOS space segment is composed of three geostationary satellites with global earth coverage. The EGNOS operational system is based on the use of two INMARSAT-3 satellites (AOR-E and IOR), as well as the ESA ARTEMIS satellite.

EGNOS users should be able to track at least two geostationary satellites. It takes less than six seconds to notify users about a problem with one of the satellite constellations once it has been monitored by the RIMS network.

Different levels of service are available as a result of the high degree of redundancy required to meet the safety requirements.

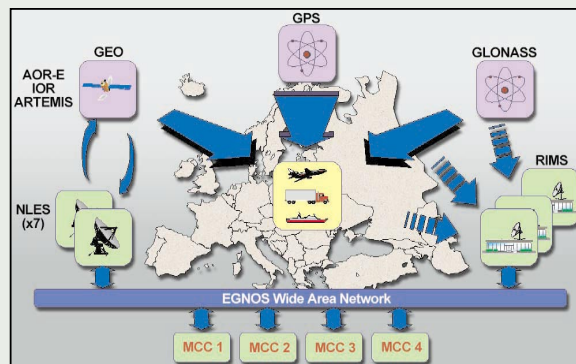
EGNOS provides different levels of service at different parts of the area covered by the geostationary satellites. Optimum performance is obtained within the core coverage area (as shown in diagram). There is degraded performance outside the core area, although there is some potential for improvement through interoperability with the Japanese, American and Canadian systems.

A pre-operational service has been available from the EGNOS System Test-Bed since February 2000. It is already helping companies to develop products, and users to trial applications.



EGNOS Core Coverage Area

A pre-operational service has been available from the EGNOS System Test-Bed (ESTB) since February 2000. The ESTB serves a European service area similar to that of EGNOS, using a much smaller number of RIMS and only two geostationary satellites (see previous diagram). Accuracies of around



The architecture of EGNOS

3 metres horizontal (95%) are being obtained.

This provides a unique opportunity for validating and demonstrating new service and application developments in a realistic environment, not only preparing for the EGNOS operations from 2004 onwards but also in getting ready for the initiation of the Galileo system later this decade.

Receiver and integrated product manufacturers are already using the ESTB signal to test new products as part of their development processes.

Users have been working with ESA to assess the use of EGNOS in their environments. This has included high-profile aviation trials at the Farnborough and Paris air shows, maritime trials in Genoa and Greece, and land-mobile trials in Turin.

European Commission funding supports the development and operation of the EGNOS System Test Bed.

EGNOS is the European solution for the European environment, but interoperability with other SBAS systems creates a global standard with access to global markets.

Four interoperable satellite-based augmentation systems (SBAS) are being developed: EGNOS in Europe; WAAS in the US; CWAAS in Canada; and MSAS in Japan. Each of these will transmit GPS look-alike signals in a standard format. Furthermore, EGNOS has a built-in expansion capability to extend its services to regions covered by the its geostationary satellites, such as Africa, Eastern Europe and Russia.

Users will benefit from standardisation in terms of global seamless navigation. A significant global market should also promote competition among receiver manufacturers and product developers.

Editorial

EGNOS (European Geostationary Navigation Overlay System) is a joint initiative of the European Commission, the European Organisation for the Safety of Air Navigation (Eurocontrol) and the European Space Agency. The EGNOS System Test Bed (ESTB) forms part of the EGNOS development programme. One primary objective is to enable GNSS application developers, service providers and users to get already today acquainted with

advanced satellite navigation services, to be offered from 2004 onwards by EGNOS and to be further improved from about 2006 onwards by GALILEO. This ESTB newsletter has been produced under contract by Booz-Allen & Hamilton and is made available by the ESA EGNOS office for general promotion purposes with the understanding that no rights can be derived from the information contained herein.

Frequently Asked Questions

Q1. What do I need to do to use the currently available EGNOS pre-operational signal?

A1. The EGNOS pre-operational signal has been broadcast since February 2000. You can choose from a number of receivers available on the market, depending on how you plan to use it. General ESTB information including signal status is available on the ESA website (<http://www.esa.int/EGNOS/>). You can also contact the ESTB Helpdesk email service (ESTB@esa.int) for further information.



Q2. Can my WAAS receiver use the EGNOS signal and vice-versa?

A2. All the satellite-based augmentation systems - EGNOS, MSAS, CWAAS and WAAS - will broadcast a GPS look-alike signal in the same format. This level of interoperability means that you can use any of the systems provided that your receiver is marked as being compliant with the RTCA and EUROCAE Minimum Operational Performance Standards. If in doubt, check with the receiver manufacturer or the ESTB Helpdesk.

Forthcoming Events

GNSS2001, Seville, Spain. 8-11 May 2001.
Further information at: www.gnss2001.com

ION GPS-2001, Salt Lake City, US. 11-14 September 2001.
Further information at: www.ion.org

NAV01, London, UK. 6-8 November 2001.
Further information at: www.rin.org.uk

NAVSAT 2001, Nice, France. 13-15 November 2001.
Further information at: www.navsat-show.com

NAVITEC 2001 - The First ESA Workshop on Satellite Navigation User Equipment Technologies, ESTEC, Noordwijk, Holland. 10-12 December 2001. Further information at: www.estec.esa.nl/conferences/01C09/index.html

Help Us to Help You

The Editorial Team would welcome your comments, suggestions, and inputs for the next issue coming out in September 2001. Please send emails to ESTB-News@esa.int

Links and Contacts

ESA Navigation Web Page:
<http://www.esa.int/navigation>

ESA EGNOS Web Page:
<http://www.esa.int/EGNOS/>

ESA ESTB Web Page:
http://www.esa.int/export/esaSA/GGGE3A50NDC_navigation_0.html

ESA ESTB Help Desk:
ESTB@esa.int

ESTB News:
ESTB-News@esa.int

ESA Galileo Web Page:
http://www.esa.int/export/esaSA/GGGMX650NDC_navigation_0.html

EC Galileo Web Page:
<http://www.galileo-pgm.org>

FAA GPS Product Team:
<http://gps.faa.gov/>

FAA WAAS Test-Bed:
<http://www.nstb.tc.faa.gov/>

USCG Navigation Center GPS Page:
<http://www.navcen.uscg.mil/gps/>