esa EGNOS NEWS

Volume 3, Issue 2, April 2003

Contents

Editorial

Welcome to this seventh issue of the EGNOS News. We have moved on considerably since our first issue in May 2001. At that time we had to hunt for enough material to fill the newsletter. Now, every time we have an editorial meeting there are new and exciting system developments and applications that we want to talk about, and I am pleased to tell you that we are rapidly running out of space!

Looking through this issue, there has been great progress behind the scenes with the successful positioning of Artemis in its geostationary orbit and a change in the signal format to provide a better service for EGNOS Test Bed users. We also report on two fascinating trials: a maritime trial in Hamburg that promises to improve safety, and one using ESA's SISNET technology to guide blind people in Spain. We have introduced a new section, "Out and About", that brings news of EGNOS aviation trials in the Caribbean and South America and the first Euro-Mediterranean GNSS seminar. During the last few issues, we have heard a lot about SISNET, but for the first time we are looking here at two other candidate EGNOS datalinks: an aviation VHF link known as VDL Mode 4 and a Radio Data System (RDS) link on FM radio. Together with "News From Brussels" and "Frequently Asked Questions" this is a full issue.

We hope you are going to enjoy the GNSS2003 conference. This is a great opportunity to meet, to learn about current developments, and to plan for the future. Perhaps most importantly, we are approaching the start of EGNOS operations in 2004, so we look forward to hearing how you are going to take advantage of this exciting European technology.

Improving Safety In Hamburg Harbour

Ships currently enter harbours relying on just radar images and verbal information from the team on the adjacent tug boats. Recently a harbour in Hamburg, Germany tested a new system called MARLET (the Maritime LOPOS EGNOS Test Bed) developed by Lopos Technologies GmbH, who initiated the project with sponsorship from the European Space Agency (ESA).

MARLET's aim was to demonstrate the value of EGNOS-based position accuracy and integrity for port manoeuvres and, more generally, for maritime Automatic Information System (AIS) applications.

AIS is an independent, self-organising system that supports surveillance activities in the maritime environment, broadcasting a vessel identifier, direction, speed and other information to all other ships and coastal

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Out And About

EGNOS Trials in the Caribbean and South America. On 6th and 7th March, the European Commission and the European Space Agency met with the International Civil Aviation Organisation (ICAO) in Montreal, Canada, to launch a joint demonstration project in Latin America.

The project, EDISA, consists of deploying infrastructure in the Caribbean and South American region to demonstrate a satellite based augmentation system for civil aviation based on an extension of EGNOS, the precursor to Galileo.

These trials will be carried out in a critical area with

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Making Guide Dogs Redundant?

We are all used to seeing guide dogs helping blind people to find their way around city streets, but will the latest EGNOS trials challenge their supremacy? Read on …

Cities are probably the most demanding environments for satellite navigation systems. Urban canyons block some signals to degrade service continuity and reflect others to degrade signal accuracy. This results in erratic position fixes with an accuracy that can be little better than 30 or 40 m. As a result of this, the

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TORMES Trials in Valladolid

Extending Access To EGNOS

EGNOS, as we all know, broadcasts its correction and integrity data from three geostationary satellites. While this approach is very effective in many environments, there are potential limitations at high latitudes and in

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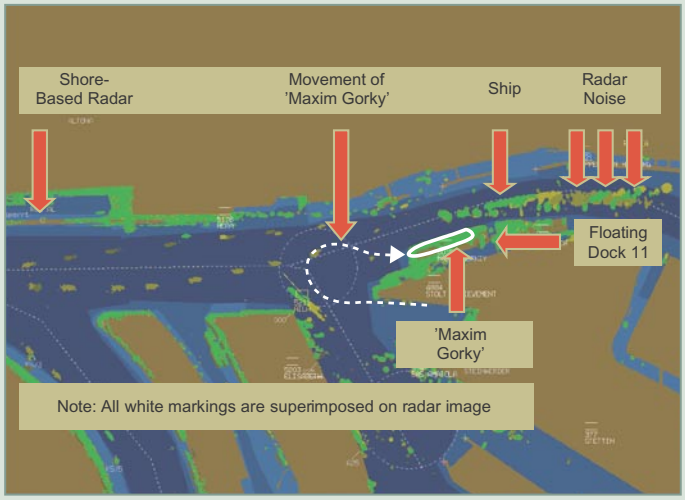
Improving Safety In Hamburg Harbour *(continued from front cover)*

stations within reach of a maritime VHF communications link. However, there are potential vulnerabilities arising from a lack of standardisation of the GNSS receiver used in AIS.

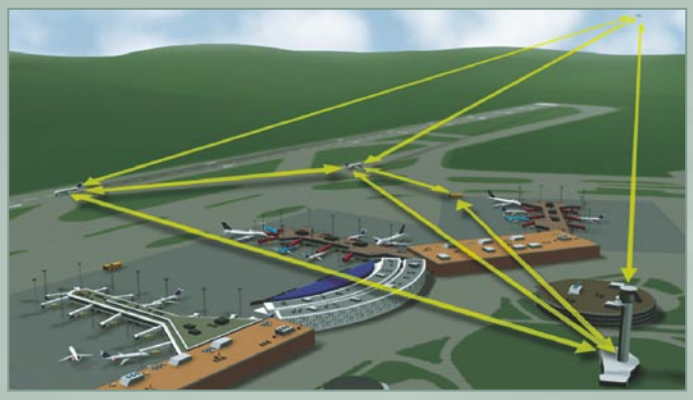
The MARLET trials were performed in the port of Hamburg in December. This was a tough environment for EGNOS with stacked containers, cranes, docks and other ships. A number of test runs were performed on board tugs, but perhaps the most demanding trial on 2 December involved the tug 'Bugsier' towing a passenger ship, the 'Maxim Gorky', from its berth to a floating dock. This included tug-assisted turning and docking. A position accuracy of 1.4m (99.7%) was obtained

This MARLET demonstration showcased the potential of EGNOS and Galileo to support vessel operations in the port of Hamburg and on the river Elbe. MARLET greatly improves the quality of the AIS standard. This will ultimately support a Vessel Traffic Management and Information System (VTMIS) in which radar and electronic chart images can be combined, for the benefit of safer manoeuvres in confined waters.



MARLET Trials In Hamburg Harbour

Extending Access To EGNOS *(continued from front cover)*



The VDL Mode 4/GRAS Concept

urban environments, and this has prompted ESA to investigate the use of other data links. We have talked about SISNeT – providing EGNOS signals over the Internet – in previous issues. Here, you will see how an aviation VHF data link, VDL Mode 4, and RDS on FM radio can extend access to EGNOS.

EGNOS TRAN Using VDL Mode 4

ESA has recently funded a contract called EGNOS TRAN – EGNOS and Terrestrial Regional Augmentation Network – to provide enhanced navigation and surveillance functionality without the need for expensive infrastructure and in locations where EGNOS satellite visibility is limited. One EGNOS TRAN application is focusing on APV-1 precision approach and surface movement surveillance and guidance.

The aviation community has a very straightforward objective – to provide a seamless operation from departure gate to arrival gate. EGNOS availability, however, cannot always be guaranteed in difficult terrain and northern latitudes and this VDL Mode 4 concept, also known as GRAS (Ground-based Regional Augmentation System), is used to help overcome the lack of GEO availability and to compensate for the possible loss of EGNOS services.

GRAS is a broadcast service that provides GNSS augmentation data to mobile aviation users using a VDL Mode 4 data link. VDL Mode 4 is an ICAO standardised self-organising TDMA VHF data link, providing digital communications between mobile users (aircraft and airport surface vehicles) and between mobile and fixed ground stations. It has been developed for CNS/ATM (communications, navigation and surveillance/air traffic management) aviation applications with protocols that support ADS-B (Automatic Dependent Surveillance) and similar applications through the broadcast of short repetitive messages with graceful adaptation to increasing traffic loads.

A VDL Mode 4/GRAS architecture comprises a number of VDL Mode 4/GRAS Stations (VGS) linked through a local ground network to an EGNOS Receiving Station (ERS). The ERS receives EGNOS signals from the EGNOS geostationary satellite and the GNSS signals from the GNSS constellation. The VGS computes optimum correction signals and integrity data from the ERS data and these are broadcast over the datalink to mobile users in the area as well as through a terrestrial network to other VGS for onward broadcast to other users.

This innovative combination of EGNOS and VDL Mode 4/GRAS technology not only extends the benefits of EGNOS using the terrestrial network to remote and inaccessible regions, but also provides and efficient communication, navigation and surveillance capabilities in these difficult regions.

More EGNOS TRAN demonstrations for car applications, involving GPRS based disseminations in city environments, are to follow later this summer.

RDS – The Radio Data System

Today, most of our car radios are equipped with RDS: we can receive traffic reports without having to listen to a particular radio station all the time; we do not have to retune the radio when travelling between different transmitter coverage areas; and we can see the name of the current radio station on the display.

There are good reasons for using RDS to broadcast EGNOS corrections: RDS transmitters exist in many countries, so no additional infrastructure is required and service deployment could be rapid; and low-cost mass-market receivers are already available in many cars.

Telediffusion de France's research centre, TDF-C2R, is currently evaluating the feasibility of broadcasting EGNOS data over RDS and is going to characterise the performance in a laboratory environment. Their initial activities have focused on adapting the EGNOS data so that it can be broadcast on the RDS channel. This has included selective data/message filtering, optimising the data update rate and designing a reliable transmission protocol.

The potential benefits are clear. In the leisure/service industry it is a low-cost route to improving car navigation systems and is likely to improve location based services. In the professional sector it should offer improved quality of service for fleet management, is a low-cost alternative to fleet management, and could support some form of route charging.

Making Guide Dogs Redundant? *(continued from front cover)*

current GPS system provides neither sufficient accuracy nor sufficient continuity of service to guide pedestrians in cities.

We can improve GPS using inertial systems, but today these are relatively expensive and hence unsuitable for the mass market. However, EGNOS is a more cost-effective solution. It broadcasts GPS corrections and integrity data from geostationary satellites to improve GPS accuracy to a few metres, making it sensitive enough to locate obstacles in the street. But the urban canyons can also block the EGNOS signals, and this is why ESA has developed its complementary SISNET technology that relays the EGNOS signal in real-time over the Internet and wireless networks.

ESA has been working to test EGNOS and SISNET with the Tormes personal navigator for the blind developed by GMV Sistemas and ONCE, the Spanish national organisation for the blind. Tormes is based on the Sonobraille platform that includes a Braille keyboard and a voice synthesiser. It also includes a GPS receiver. TORMES not only provides users with their position but also with routing and guidance.

Valladolid city in Spain is the location for the EGNOS trials. These have been defined by ONCE, and will quantify the improvements provided by EGNOS and SISNET by comparing the upgraded Tormes against the previous version in three representative districts: Parquesol (peripheral residential zone), Rondilla (central residential zone) and downtown. The flexible data processing approach means that the results can be analysed graphically and statistically.

Upgrading Tormes with EGNOS and SISNET is potentially very powerful. It allows the blind user to navigate using a map in a similar way to a sighted person. Moreover, the internet connection can be exploited to contact a control centre to ask for directions or help if there has been an accident.

This is just one of the ways that EGNOS can improve the accuracy of GPS to demonstrate new uses for satellite navigation. The benefits outlined here will be extended when Galileo, the future European satellite navigation system, becomes operational. On its own, Galileo will deliver an independent, civil controlled positioning service worldwide with metre-scale accuracy. Together with GPS, Galileo will significantly improve continuity of service in urban environments.

Out And About *(continued from front cover)*

EDISA Participants

a high traffic density and involves Civil Aviation Administrations from Colombia, Cuba, Panama, Costa Rica, Nicaragua, El Salvador and Honduras.

Bringing The Benefits Of Satellite Navigation To The Mediterranean

The 1st Euro-Mediterranean Global Satellite Navigation System (GNSS) Seminar, organised by the European Commission, was held in Cairo on 16-17 February. This was the first of a series of actions planned to strengthen the Euro-Mediterranean partnership and its regional transport policy through GNSS.

The seminar, attended by 200 officials and business executives, discussed the wide-ranging potential of satellite navigation to address the needs of the Mediterranean countries. Discussions focussed on the benefits to transport safety, agriculture, water management, fisheries and trade.

The seminar successfully increased the awareness of decision makers, service providers and product manufacturers of the potential of Galileo and EGNOS for the Mediterranean region. It also provided an opportunity to identify key priorities and common interests in the GNSS sector and initiated contacts at institutional and industrial levels. The European Commission plans to establish a cooperation office in the region and launch a EURO-MED GNSS project by the end of 2003.

Behind The Scenes With EGNOS

ESA has taken great steps forward during the first part of 2003. You have probably already heard about our great success with Artemis, and many users with EGNOS receivers should now see improvements since we have modified the signal format.

Meeting The Artemis Challenge

The Artemis (Advanced Relay and Technology Mission) satellite was launched on 12 July 2001, but you probably remember that launcher malfunctions left it stranded a long way from its intended position in geostationary orbit.

Faced with a potential catastrophe, ESA and industry specialists responded vigorously with a series of innovative control procedures to rescue the spacecraft. They used Artemis' groundbreaking ion propulsion system together with innovative use of its chemical thrusters to place the satellite in geostationary orbit.

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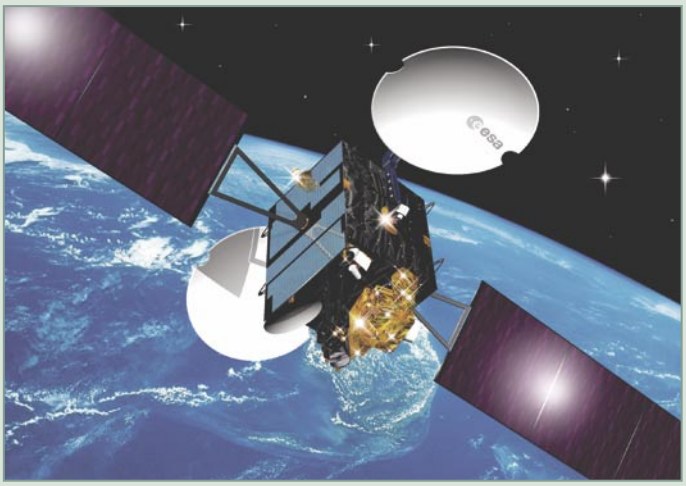

The ARTEMIS Satellite

Behind The Scenes With EGNOS *(continued from page 3)*

Likened to a small boat with one propeller pushing an oil tanker, the ion propulsion system raised the orbit 15 km per day to its final position over a period of 11 months. In the late afternoon of Friday 31 January, a final trim manoeuvre nudged Artemis into its assigned position in geostationary orbit, completing a most remarkable satellite recovery operation that has lasted 18 months from July 2001 to January 2003.

We can now look forward to seeing Artemis commissioned to support EGNOS operations.

A Better Service For EGNOS Test-Bed Users

At 07:30 UTC on Tuesday 1st April the ESTB started to broadcast its signal using the revised Mode 0/2 format, improving interoperability with other systems (WAAS and MSAS) and allowing all GPS/SBAS receivers to process the EGNOS test signal.

This new format allows *all* users equipped with GPS/SBAS receivers to benefit from the improved accuracy obtained when applying the differential corrections broadcast by both the WAAS in the USA and the ESTB in Europe.

News From Brussels

On 18 March 2003 over 500 industry leaders from around the world were present at a Galileo briefing session organised by the European Commission.

Inaugurated by the Commission Vice-President, Loyola de Palacio, the meeting was intended for potential investors in and users of Galileo. She emphasised the strategic nature of Galileo and the importance of keeping to the programme schedule so that we can provide Galileo services that can penetrate the global satellite navigation market in 2008.

During the first part of the day, we were told about the programme development and the potential market for satellite navigation applications. This was complemented by industrialists from various sectors who talked about their practical experience in this area and the opportunities offered by Galileo.

The second part of the day was devoted to the conditions governing the award of the Galileo concession and the various stages leading to the choice of the future concession-holder. A call for expressions of interest in the Galileo concession was published in the Official Journal C 43 of 22 February 2003.

Frequently Asked Questions

Q1. What is the EGNOS implementation schedule and when will it be fully operational?

A1. The system design activities started in 1997 leading to a Preliminary Design Review at the end of 1998. The successful Critical Design Review was held in early 2002, and the Factory Qualification Review will be completed this summer. EGNOS will be declared operational in April 2004 on completion of the Operational Readiness Review.

Q2. When will the ESTB to EGNOS handover take place, and will the ESTB service be interrupted?

A2. The handover from ESTB to EGNOS should be transparent to users with no disruption of service, and our intention is to ensure continuity of ESTB service at least until EGNOS is declared operational. During this period there should always be at least one satellite broadcasting the ESTB signal. It is important to note that arrangements for the ESTB after July 2003 are not yet finalised. Further details will be available on the ESTB web pages.

Forthcoming Events

8th ISU Annual International Symposium, "Satellite Navigation Systems: Policy, Commercial and Technical Interaction", 26–28 May, Strasbourg, France

World Radiocommunication Conference, 9 June–4 July, Geneva, Switzerland, www.itu.int

NavSat2003, 24–27 June, Geneva, Switzerland, www.navsat-show.com

ION 59th Annual Meeting, 23–25 June, Albuquerque, NM, US, www.ion.org

IUGG2003, 30 June–11 July, Sapporo, Japan, www.iugg.org

ION GPS-2003, 9–12 September, Portland, OR, US, www.ion.org

IAIN World Congress 2003, 21–24 October, Berlin, Germany, www.dgon.de

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/ESTB

ESA ESTB Help Desk:
ESTB@esa.int

ESTB News:
ESTB-News@esa.int

ESA Galileo Web Page:
http://www.esa.int/Galileo

ESA Artemis Web Page:
http://www.esa.int/artemislaunch/

EC Galileo Web Page:
http://europa.eu.int/comm/dgs/energy_transport/galileo/index_en.htm

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

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

Help Us To Help You

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